Report of the March 2006 People's Inquiry into the Impacts and Effects of Aerial Spraying Pesticide over Urban Areas of Auckland

for the
People's Inquiry Inc

Dr Joanna Goven
Prof Tom Kerns
Prof Romeo F Quijano
Dell Wihongi

October 2007

ACKNOWLEDGEMENTS

COMMISSIONERS

Dr Joanna Goven
Senior Lecturer in the School of Political Science
and Communication at the University of Canterbury

Dr Tom Kerns
Professor in Philosophy, Bioethics and
Human Rights, Seattle Community College, USA.

Prof Romeo F Quijano
Professor, Dept of Pharmacology and Toxicology
College of Medicine, Univ of the Philippines.

Dell Wihongi
Te Rawara, Hokianga
Maori elder of national standing

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The People's Inquiry Inc
PO Box 25743
St Heliers
Auckland 1740
New Zealand

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FOREWORD

By the Convenor of the
People's Inquiry Steering Committee

People are not pine trees - a journey of identity

One day in late January 2002 the phone rang with the first of what would be hundreds of calls from residents of West Auckland about the effects of the aerial spraying of pesticide to eradicate an illegal immigrant - the Painted Apple Moth. The first of the targeted sprays over 500 hectares had just been completed after four days of on-off spraying. A year, and thirty six days of spraying later, the target area had expanded to 10,500 hectares. By the end of the programme in May 2004, West Auckland had experienced a continuous 2-3 week cycle of aerial spraying over nearly two and a half years.

But this was not spraying of plantation forest, conservation estate or bush; it was of an urban area with over 200,000 residents, hundreds of schools and childcare facilities, hospitals, offices, markets and shops. Nor was it overseen by Public Health – which would have been expected given the extent and duration of the human exposure. It was a programme executed by the Ministry of Agriculture & Forestry (MAF) to eradicate a pest that supposedly threatened, not human health, but national economic interests.

And for many of us who became caught up in this huge multi-million dollar eradication, it seemed that in the pursuit of this over-riding national interest, the people got in the way - became a nuisance and a burden. They became in essence the human collateral of a biosecurity campaign without precedent in this country. And they paid the price. What went wrong? How did this happen?

This Report provides a thorough analysis of many aspects of this complex campaign but for those of us working as advocates and community representatives there was little hint of the journey and ultimate destination in the early days of the programme. There was hope, optimism and even enthusiasm as early involvement with MAF seemed to promise cooperation, partnership and participation in 'doing our bit for the country'. But as those first calls from residents turned into a flurry, and then a flood as the sprays went on and the months went past, the extent of the gap between what people were experiencing and reporting to us and what the authorities were communicating, became undeniable - and very worrying.

As everyone struggled to cope, the gulf between the people and the authorities turned into a chasm. There was disbelief, dismay and ultimately anger as all attempts to bridge the communication gap by providing ever more detailed evidence of the health problems and social disconnects within the community, were seemingly being dismissed or ignored. Reports, papers, petitions and appeals all went the same way. The lack of government response was disturbing. Even strengthening support from some scientists and doctors failed to shift the direction and tenor of the eradication campaign.

Throughout this time the question that arose again and again was "who is listening to the people in all this?" Who is acknowledging their difficulties and working for them at government level? Because it seemed that in spite of all our efforts, and the reports and studies produced over the years[1] no-one was responding. All requests to the government for participation in an official review or inquiry that would allow people to be heard were denied. After the rejection of the *Report to the Prime Minister* (Blackmore 2004) in which we called for six actions, the most urgent being the setting up of both a full Public Inquiry and an independent body to review, mediate and settle all

[1] See Appendix 1

compensation claims arising from the programme, we finally actioned the setting up of our own community inquiry.

Two years earlier the PAM Community Network, which was a coalition of nine community organisations, had set up a small sub-committee to investigate the holding of a community inquiry if all other avenues failed. Now we had to hold good on that promise.

It was seen very early on that a crucial flaw in all official reviews or Government inquiries is that the terms of reference are set by the initiator of the inquiry. Very rarely is this open for discussion or public input. Therefore the direction (or misdirection) of an inquiry can be set in stone even before it hears a single word. Participation and submissions can also be restricted, both by inviting only so-called stakeholders to participate, or restricting speaking rights to them - once again disenfranchising the public. How many of us have tried to get a situation aired or a problem heard only to have to sit and contain ourselves while our representative, Councillor, Member of Parliament or whomever, gets it wrong or misunderstands the situation. How much better that people should be free to speak for themselves, to present their own case or story direct without a middleman interpreting for them.

As this was the first time an Inquiry of this scope and nature would be held anywhere in the world, there was no template for doing it except what the Steering Committee saw as this fundamental guiding principle of allowing the people themselves to have their say, and to be heard on a matter of huge significance and consequence for them. Everything else was subject to change and development as we went along.

By May 2005 an Interim Steering Committee had been established from the Network members, and a draft Terms of Reference (TOR) had been developed. These were presented to the community at a well-attended public meeting in July where they were unanimously adopted. The Steering Committee membership and five proposed commissioners were also endorsed at this meeting.[2] The choice of commissioners with the expertise and background necessary to understand the impacts of the eradication programme on the community was considered as vital as setting our own terms of reference.

Registrations and submissions opened at the July 2005 public meeting with options for people to write a submission and/or appear at one of the hearings to give oral testimony in front of the Commissioners. The public hearings took place in the Council Chambers of Waitakere City Council at the end of March 2006, and by close on the fifth day of hearings over 70 people had appeared to give evidence. In total 125 people had put in submissions (both oral and/or written) and although final tallies have yet to be carried out - oral testimony has not yet been transcribed - these submissions represent at least 163 people. [3]

What those simple statistics cannot convey is the huge task the Commissioners took on in bringing all this together and synthesizing it into this report and recommendations. They have considered over 100,000 words of written submissions and hundreds of pages of accompanying documents, reports and secondary material. There will be gaps. There will be areas and issues that people may feel have not been covered, but there were limitations on what could be addressed or included and what we could reasonably expect our commissioners to do. We acknowledge this and we cannot thank them enough for what has been eighteen months of incredible hard work and dedication.

[2] Moana Jackson, Director of the Maori Legal Service and a judge on the International Tribunal of Indigenous Rights had to withdraw in the final weeks leading up to the Inquiry for family reasons

[3] Where consent has been given, the written submissions are being published as a companion appendix, and will be posted on the People's Inquiry website. Testimony recorded at the five days of hearings will be published as soon as funding has been found by the Society to transcribe them

A limitation of the report and of the inquiry itself is the relative lack of attention to Treaty of Waitangi issues and issues specific to tangata whenua, which reflects the lack of representation of Maori among the oral and written submissions. The lack of attention paid to these issues in the report and its recommendations should not be taken to mean that no changes should be made in the way that Biosecurity NZ and other agencies interact with Maori; rather it is a product of the fact that it was through testimony offered to the inquiry that the commissioners identified the issues to be addressed. [4]

We were also asked many times in the months leading up to the Inquiry, why we were not including testimony from MAF or Public Health or anyone else who might be able to answer questions that so many people had. There are two important things to be acknowledged here. The first is that the Government had all the time, funds and resources to present their 'side' of the story. And they did - as the huge PR and advertising campaign throughout the spraying demonstrated. The People's Inquiry on the other hand was limited in what it could do and the time it could take because it received no funding from any government body. The voice of the community was able to be heard only because of the donations of the people themselves and friends from across the country and around the world.

Secondly the People's Inquiry was not a trial. No-one was being prosecuted. As the commissioners acknowledge, their purpose has been to enhance understanding of the *community's* perspective. So if the wealth of practical recommendations detailed in this Report lead to a positive and constructive dialogue that can bring about real change in the way biosecurity is conducted in this country, it will be welcomed. To paraphrase George Santayana - those who fail to learn from experience are condemned to repeat it.

In the end the experience and stories of the hundreds of people affected by the eradication campaign is what we will remember and keep alive. This was their Inquiry, their chance to speak for themselves, to tell their stories as they saw it. And to reclaim their identity. For while they remained categorised simply as victims they were just an anonymous class with no more individuality than the pine trees they were 'standing in for' under the pesticide spray.

But people are *not* pine trees, was the rallying call of one of the members on MAF'S early advisory group, and so it proved. The faceless numbers became personalities with names and history, family and status. To every one of the people whom we have got to know and care about over the years, and especially during that week in March 2006, thank you for your courage in coming forward, in speaking out and in sharing your life with us. Each of you is a unique individual who *cannot* and will not be forgotten.

Of course, there is never enough room for thanks, but there are some special people who should be mentioned. To all the truly remarkable people who have formed the team that brought this People's Inquiry to fruition: To Alan, Stephanie, Meriel and Meredith; Sue, Glenys & Lynda, Chris, Ray and Catherine. Thanks. You did a fantastic job with passion, dedication, humour and goodwill. But even we could not have come this far without the support of our families and the help and inspiration of all the voluntary members past and present of the extended PAM Community Network, who helped carry the baton along the way. Their hard work and stubborn persistence over the past six years on behalf of the community has been inspirational. To Jane, Rachel, Helen and Terry, John, Kubi, Sally, and Zelda to name but a few – thank you.

To the dozens of individuals, private trusts and organizations whose donations made all this possible, many, many thanks. In particular, we thank *Pesticide Action Network Asia Pacific* for their support and the valuable sponsorship of Professor Quijano's costs; the *Society Targeting*

[4] See Virginia Baker's (2004) Focus Group Study (and recommendations) for the only account and testimony of the Maori community's experiences of the PAM spraying that we know about.

Overuse of Pesticides NZ, *Stop Aerial Spraying* and the *Association for Improvements in Maternity Services NZ* which donated their residual funds to the Inquiry; and to the *Clean Green Car Company* which provided a much appreciated hybrid car for the Commissioners' use during the Inquiry. We are especially indebted to Waitakere City Council for the generous free use of their Council Chambers for the hearings, and to Mayor Bob Harvey and Councillor Penny Hulse, who could not have been better hosts. Thanks are also due to their staff, who were always welcoming and helpful - and to Warahi Paki and Fred Holloway who ensured a safe and supportive atmosphere during the Inquiry.

Finally – huge thanks must go to our Commissioners, Joanna Goven, Tom Kerns, Romy Quijano and Dell Wihongi. Not only have they given generously of their valuable time over the last eighteen months, but their dedication, effort and professionalism in going that extra mile for the people of Auckland has been hugely appreciated. It is doubtful if any of them realised the extent of their involvement when they accepted our invitation and joined us in this venture. We hope they have enjoyed it.

It has been a long journey.

People's Inquiry Steering Committee
Hana Blackmore, Convenor
Alan Samuels
Stephanie McKee
Meriel Watts
Sue Berman
Meredith Youngson
Glenys Bean
Catherine Delahunty

October 2007

TERMS OF REFERENCE of the People's Inquiry

Objectives of the People's Inquiry
(to include but not be limited to)

1. The empowerment of the community through having their experiences heard and taken seriously, and the opportunity to positively influence future biosecurity programmes and research directions.
2. An accurate report and preliminary analysis of the health, social, human rights and ecological impacts (including pets) of urban aerial spraying programmes from a community perspective.
3. An analysis of the government processes and actions from a community perspective.
4. Recommendations for dealing with the Inquiry-identified health, social, human rights and ecological impacts (including pets) resulting from the aerial spraying.
5. Recommendations for future action to include but not be limited to:
   - mitigation of adverse effects
   - research directions and projects
   - further in-depth analysis of information reported to the Inquiry
   - models for community participation/partnerships with government and science in future projects that directly impact the community
   - improved methods of managing biosecurity issues in an urban setting, using a sustainable people-centred approach.
   - changes to government policy and legislation that involve biosecurity issues and the use of hazardous substances.

Scope of the People's Inquiry
(to include but not be limited to)

1. The Inquiry will consider information presented to it by members of the affected community, and community heath workers and advocates who have been involved in the painted apple moth programme.
2. By agreement of the Steering Committee, the Inquiry may consider information presented to it by members of the affected communities involved in the White spotted Tussock Moth, and Asian gypsy Moth programmes.
3. It will consider information presented to it by scientists and medical personnel who contributed to the community perspective, by agreement of the Steering Committee.
4. Every attempt shall be made to ensure that each person who wishes to present information has the opportunity to do so in a way that is appropriate for their needs. Information can be presented in written, audio, video, and or oral form. People will be encouraged to provide as much as possible in written form (especially electronically), and then if desired speak to their evidence.
5. The Inquiry will last for 5-6 days, possibly comprising 4 working days and 2 weekend days and/or evenings as required to accommodate all needs.
6. The information will be presented to 5 commissioners with expertise in the effects of chemicals on human health, human rights, social and ecological impacts, and a community-based perspective.
7. The commissioners will be a mixture of respected national and overseas leaders of a calibre that will lend mana to the *Inquiry*, and be gender and ethnicity-balanced.
8. The Commissioners will have the mandate to ask for relevant documents from other agencies.
9. Evidence presented to the People's Inquiry will be recorded and analysed, with the Commissioners producing the final Report and recommendations.

CONTENTS

INTRODUCTION

Executive summary

The majority of testimony had one major theme in common: the way in which members of the community were treated when they sought assistance in dealing with the effects of the spray. Based on the testimony we received, it is our opinion that: there was extensive disruption of some people's work, education, family and social lives caused by their need to avoid the spray; there were significant deficiencies in the health support service; and many affected community members struggled to access medical assistance and practical support to cope with the effects of the spray programme.

Based on the evidence presented to us, it is our opinion that: MAF did not take up the opportunity to build upon the experience of the 1996/97 White-Spotted Tussock Moth programme regarding relations with the community; and that MAF did not permit the Community Advisory Group to represent community interests in any meaningful way.

Based on the testimony we have related in the report, it is our view that: unsubstantiated claims about the threat represented by the PAM may have damaged the credibility of Biosecurity New Zealand; and that the impact on the community of the spray programme was exacerbated by inadequate provision of information, particularly with regard to particular spray operations and the pesticide aerially sprayed, Foray48B. For many of those whose health was affected by the spray, not being able to find out what they were being exposed to understandably provoked anxiety and anger.

Testimony strongly indicated not only that the authorities' lack of acknowledgement of the affected community's experience itself had a considerable impact on people, but also that the treatment received by many who sought assistance generated hurt, anger, mistrust and alienation that has outlasted the PAM programme and can be expected to influence residents' orientation toward "the national interest" in the future.

In our view it is inappropriate that an agency (MAF) primarily committed to the protection of primary production and trade should have responsibility for managing the human-health impacts of an incursion response. In our view, it is doubtful that any community expected to bear the health risks of an incursion response will have confidence in MAF to properly consider health impacts when primary-production sector interests are at stake.

Health studies that, in our view, should have been carried out prior to, during, and after the spray programme, were not carried out. The Health Risk Assessment that was carried out was based on assumptions that differed significantly from the actual conditions of the spray programme.

Based on the testimony we heard it is our view that the protection of what should be independent research from political interference is insufficiently robust.

The Biosecurity Act is insufficiently protective of public health and should be amended.

It must be recognised that many biosecurity decisions are not technical in nature, but fundamentally political. They concern whose interests will be protected and to what degree, who will pay the cost of that protection, and who will bear the risks. It cannot and should not be expected that biosecurity authorities' answers to these questions will simply be accepted by the public at large as being in "the national interest." The process of answering these questions, of setting priorities and making decisions, must be transparent, and must take into account a wider

range of interests, views and knowledge than was the case in the PAM programme. There must, therefore, be genuine opportunities for potentially affected communities to be involved in biosecurity planning and decision-making.

Part Two: Upon reviewing the available evidence, Dr Romeo Quijano concludes that the aerial spraying of Foray 48B resulted in adverse health effects on the people exposed to the spraying. He notes: When an a priori belief (the spray is "safe;" it does not make people sick) comes up against a contradictory empirical claim (this spray is making me sick), the empirical claim deserves to be given more epistemological weight than the a priori belief.

Part Three: Having examined the evidence in the light of relevant national and international human rights instruments and conventions, Dr Tom Kerns concludes that in the prosecution of the PAM aerial spray programme, the evidence shows a number of human rights standards were not met and that the New Zealand government failed to meet the basic responsibility of a government to protect its citizens from physical harm. As a result of these failures, actions knowingly undertaken by agents of the government resulted in the infliction of serious physical, social and economic injury on a significant number of West Auckland citizens.

Recommendations

Recommendations from Part 1:

R1. The government should issue a formal apology to the affected community for the impacts of the PAM spray programme on people's health, employment and education and for the inadequate support provided to those affected.

R2. The government should establish a compensation fund, to be administered by a third party acceptable to representatives of the affected community, to reimburse major expenses and losses incurred by the affected community as a result of the PAM programme. The fund should be financed by central government and the forestry industry.

R3. The data collected by the Aeraqua PAM Health Service should not be assumed to be a reliable measure of the health impacts of the PAM programme and should not form part of the evidence base for any future health risk assessments of Foray48B or similar products.

R4 Whenever and wherever an incursion or an incursion response has the potential to affect a community, the community or its representatives should be, from the initial stages, actively involved in the analysis of the situation, decision-making as to the response, and planning of any response.

R5. The Health Select Committee and the Primary Production Select Committee should review the decision processes and priorities that led to a decision to spray a residential area with a pesticide in order, in part, to spare the forestry industry the costs of spraying their forests with that pesticide.

R6. The acceptability of agreements that result in the involuntary exposure of people to a product whose ingredients cannot be revealed to them should be reviewed by the Human Rights Commission and by the Health and the Justice and Electoral Select Committees.

R7. The Official Information Act should be amended to prevent the charging of fees that block access to information for those without extensive financial resources.

R8. The recommendations made by the reviewer of the Blackmore (2003) health monitoring interim report should be acted upon.

R9. All those involved in assessing the risks of incursions and incursion responses should be required to understand, consider and acknowledge the limitations of conventional risk-assessment methods.

R10. Assessment of and advice on health impacts of incursions and incursion responses should not be sought from those having financial or reputational interests, or the appearance of such interests, in the outcome of the assessment.

R11. All health-related aspects of biosecurity, including the health impacts of future incursion responses and research on those impacts, should be the responsibility of the Ministry of Health. They should be neither funded by nor delegated to MAF or Biosecurity New Zealand.

R12. Sections 7 and 114 of the Biosecurity Act should be reviewed by the Health Select Committee, the Primary Production Select Committee and/or the Local Government and Environment Select Committee, which should consider the proposed amendments contained in Submission 34, Appendix A, to limit the powers currently granted to the "chief technical officer" and the Minister of Biosecurity, in view of the fact that actions taken to protect the primary production sector from pest incursions have the potential to impact adversely on human health and the environment.

R13. Should it be necessary in the future to expose a population to a potentially harmful substance in the interests of biosecurity, independent research must be funded and undertaken to: 1/ establish baseline levels and patterns of health and illness; 2/ determine actual exposures experienced by members of the community in a variety of relevant circumstances; and 3/ carry out follow-up studies of exposed populations.

R14. The attribution of health effects reported by the community to psychosomatic processes should be given no credence in future risk assessments unless and until such a diagnosis can be supported with empirical, medical evidence.

R15. Symptoms should not be dismissed as psychosomatic simply because their nature and pattern does not fit what the assessor expected based on past risk assessments, particularly where the level of exposure is unusual (e.g., long-term, repeated exposure of an urban population to Foray48B).

R16. All requests for publicly funded research should be publicly notified and open to all bidders.

R17. The process of awarding public research funds should be transparent.

R18. The State Services Commission should develop processes and prohibitions adequate 1/ to ensure that publicly funded research that produces results inconvenient to government agencies is neither interfered with nor kept from the public; and 2/ to protect researchers who produce results at odds with the interests of the government or its agencies from denial of opportunities to obtain public research funding and interference with other legitimate research and business activity of the researcher.

R19. The research recommended by the Wellington School of Medicine Report (Hales et al. 2004) should be carried out, if this is still technically feasible.

R20. Section 162 of the Biosecurity Act should be amended to account for the impacts of biosecurity programmes on urban populations, including changes to the provisions for compensation to recognise the full array of harms that can be inflicted by biosecurity measures.

R21. The Biosecurity Act should be reviewed by the Human Rights Commissioner and the Justice and Electoral Select Committee in order to ascertain whether it is compatible with an acceptable level of protection of the rights of New Zealanders.

R22. The shortcomings of conventional risk-assessment methods in relation to health and environmental impacts should be acknowledged and efforts made to develop and implement methods that are better able to consider these impacts.

R23. Biosecurity decision-making should be recognised as being political rather than solely technical, in the sense that it involves decisions regarding whose interests will be protected and to what degree, who will pay the cost of that protection, and who will bear the risks. Biosecurity decision processes should thus be made transparent to the public and should take into account a wider range of interests, views and knowledge than has been the case until now.

<u>Recommendations from Part 3 (by Dr Tom Kerns):</u>

R24: All ingredients in any pesticide formulation that will be deployed in or near any vicinity where human beings are likely to be exposed to direct spray, spray drift or spray residues should be fully and publicly disclosed. If full disclosure is not possible, then the pesticide should not be deployed in any location where humans will be exposed. "Fully disclose or don't expose" should be a key operating principle in MAF's pesticide policy. The Ministry of Health, whose primary responsibility is to the health of New Zealand citizens, has an even stricter duty than MAF to insist on full disclosure.

R25: The government should make Foray 48B labels (indeed all pesticide labels) readily available to the public. The public has a right to know 1/ precisely what is on the pesticide's label; 2/ whether the New Zealand label for Foray 48B is less restrictive and cautionary than labels for the same product in other countries; 3/ if it is less restrictive, why it is so and how it did it come to be so; and 4/ how pesticide labeling is determined, and what negotiations about labeling, if any, occur between the New Zealand government and a pesticide's manufacturer.

R26: In keeping with the mandates of recently legislated new "primary functions" for the Human Rights Commission (under the Human Rights Amendment Act 2001)

- to advocate and promote respect for and appreciation of human rights in New Zealand society...
- to advocate and promote, by education and publicity, respect for, and observance of, human rights;
- to make public statements promoting an understanding of, and compliance with, the New Zealand Bill of Rights Act 1990; …
- to promote, by research, education and discussion, a better understanding of the human rights dimensions of the Treaty of Waitangi and their relationship with domestic and international human rights law

the Human Rights Commission should establish a procedure for hearing PAM-related complaints publicly and should disseminate their concerns widely. It should work with the Waitangi Tribunal to explore possible violations of the spirit, intent and letter of the Treaty of Waitangi.

R27: The government should make public assurances to the community that what happened in West Auckland will not happen again anywhere in New Zealand. In support of those assurances it should take action to reform the Biosecurity Act as outlined in R12, R20 and R21 above.

Summary of events: PAM incursion, MAF response and community response

i. Painted Apple Moth incursion and MAF response

We consider that an account of the painted apple moth incursion and response is necessary to understand and interpret both the testimony and our findings. This account has been constructed primarily from a range of publicly available documents, including reports from the Office of the Controller and Auditor General (OAG), the Parliamentary Commissioner for the Environment (PCE), Auckland Public Health Service, and the Ministry of Agriculture and Forestry (MAF). While our account is consistent with the account given in the Auditor General's case study of MAF's response to the painted apple moth, it also includes some additional detail not included in the report and extends beyond the period covered by the OAG. Although, again like the Auditor General's report, it is critical of MAF, our purpose here is not simply to reiterate those criticisms, but rather to enhance understanding of the community's perspective. Many of those who were affected by the spray, as well as those who were working with the affected community, were or became aware of issues around MAF's handling of the incursion; indeed, many were active in trying to persuade MAF to change its strategy.

The Painted Apple Moth (PAM) (*Teia anartoides*) is native to Australia. It was unintentionally introduced into New Zealand, probably on a shipping container. According to the Auditor General's report:

> The PAM was detected in the Auckland suburb of Glendene on 15 April 1999 and [formally] identified on 5 May 1999. Five months later, the PAM was detected in the Mount Wellington/Panmure area, some 15 kilometres from Glendene... Shipping containers and pallets were present in the vicinity of both sites, and it is thought likely that this was the pathway by which the PAM entered New Zealand.

As the report also notes, in both Glendene and Mount Wellington/Panmure, it was a member of the public who noticed the moth and reported it to MAF. This initial infestation occurred over a relatively small area, perhaps 1-2 hectares, in an industrial zone.

The OAG is highly critical of MAF's handling of the incursion during approximately the first two years after the discovery of the PAM.[5] For reasons that have never been adequately explained, MAF declined immediate and repeated offers of assistance from those best placed to carry out key tasks in evaluating the PAM threat and implementing an eradication programme. Forest Research offered to undertake the rearing of a breeding colony and host feeding trials in its new, state-of-the-art quarantine facility free of charge, but was declined. John Clearwater, upon hearing of the discovery of the moth in April 1999 from the New Zealand Herald, immediately phoned and wrote to MAF's then Director of Forest Biosecurity to offer assistance from himself and Professor Gerhard Gries in developing a pheromone for the PAM. The team of Clearwater and Gries were the developers of the pheromone successfully used in the white-spotted tussock

[5] The OAG limited itself to examining MAF's actions in the period before MAF Biosecurity, in response to criticism of MAF's response, commissioned an independent review. The OAG's report is considerably more critical than that review. While the review noted that personal conflicts had been permitted to compromise the effectiveness of the response, it concluded that "overall the PAM eradication strategy appears to have been appropriate". The OAG disagreed with this assessment, arguing instead that "the response contained flaws and errors of judgement made by senior MAF staff. The elements of MAF's response to the PAM about which we have the most concerns are: insufficient resources dedicated to the response; MAF's rejection of offers of assistance from experts; poor standards of documentation; lack of management oversight and control by senior MAF management over the response; and the timing of community consultation about proposed action to eradicate the PAM." (OAG p 65)

moth (WSTM) programme[6] and "arguably the most experienced in the world for lymantriid moths" (Gordon Hosking, submission 41). Neither his phone message nor his letter received a response.

Four months later, in August 1999, a different team of scientists was contracted to rear moths and develop a pheromone. Overall, there was a significant delay in the development of the breeding colony and in all of the activities dependent upon it, particularly the development of the pheromone. During this time the PAM spread beyond the original infestation sites. No adequate explanation of the delay has been given. According to the OAG, had the original offers of assistance been accepted, "there is a strong likelihood that the response to the PAM would have been different." (OAG p 69)

In October 1999, the Forest Biosecurity Advisory Committee, which reported directly to the Minister for Biosecurity (then John Luxton), unanimously passed the following two resolutions:

> That this Committee draws to the Minister's attention its serious concern and disappointment at MAF's total lack of response to its questions concerning the painted apple moth eradication programme.
>
> That this Committee, responding to concerns both from the forestry sector and the scientific community, urges the Minister to commission an independent review of the painted apple moth eradication attempt. (Gordon Hosking, submission 41)

The FBAC was disbanded the following year by then Minister of Biosecurity, Marian Hobbs. The reasons for this are unclear.[7] An independent review of the PAM response was commissioned approximately two years later.

For the first two years after the discovery of the PAM, MAF responded with visual searches of plant material for the moth, ground spraying with chlorpyrifos and deltamethrin, and removal of some known host plants. The strategy was not effective and the moth continued to spread. There was criticism of MAF's conduct of the response; this encompassed, among other things, its refusal to make use of scientific expertise from the successful WSTM programme, its failure to establish a vegetation movement restriction zone, and errors in its approach to determining the extent of the PAM spread. As noted, MAF Biosecurity commissioned an independent review of the PAM response in 2001. The review recommended both that a breeding colony be established at the Forest Research facility as soon as possible and that the Clearwater/Gries team be contracted to carry out pheromone research. These recommendations came more than two years after the moth was discovered and the initial offers of assistance were made. By the time of the reviewers' report, in response to the now significant spread of the moth, a plan had been developed for "targeted" aerial spraying of West Auckland.

A Technical Advisory Group (TAG) was convened by MAF some time in 1999. The OAG is critical of the lack of documentation associated with meetings of this group, noting that this is particularly important as MAF defended its actions by arguing they were supported by TAG. According to the OAG,

> Proceedings of the first two TAG meetings were not minuted, terms of reference for the TAG were not agreed until after the group had met five times, and the response had been

[6] The white-spotted tussock moth was found in Auckland's eastern suburbs in April 1996, and a campaign to eradicate it was carried out in 1996-1997. It was the first NZ eradication campaign that included aerial spraying of an urban population and is discussed further below.

[7] It appears to have been replaced by the Forest Biosecurity Consultative Committee, which is convened by MAF.

under way for more than two-and-a-half years before an operational plan was produced. Decisions taken by the TAG, such as to target-spray as opposed to blanket-spray, were not clearly documented.

In February 2001, the TAG recommended that "plans for aerial spraying be progressed" (OAG). Six months later, in August 2001, MAF convened a public meeting to form a community advisory group. MAF presented a list of names and organisations they had selected for the group. The meeting participants insisted that they be permitted to nominate those they wanted in the group and to vote on the membership of the group. The resulting Community Advisory Group (CAG) met for the first time in September 2001. The OAG criticized the delay in establishing CAG, noting that "when [aerial spraying] is likely to be necessary, and certainly where a response has the potential to affect a community (as in the case of the PAM), a group should be set up as early as possible."

The terms of reference of the CAG were: to represent affected residents/stakeholders' interests; to communicate community concerns and suggest possible solutions to MAF; to advise how interested parties can be provided with information on the PAM; and to provide feedback on proposals presented at the meeting (MAF media release, 18 Sept 2001). In October 2001, Cabinet approved MAF's plan for targeted aerial spraying of up to 600 hectares. The CAG opposed the MAF strategy, arguing that targeted aerial spraying was unlikely to work because there had been no determination that the pest was confined to this area. In November 2001, it put to MAF an alternative strategy that involved use of a number of alternative ground-based strategies as well as more comprehensive preparation for health impacts of blanket spraying, in case that should prove necessary. It also expressed deep concern that delays in research and development of the pheromone and failures such as lack of implementation of adequate vegetation controls would result in the need for blanket spraying.

In December MAF announced the spray would go ahead as planned, but over a larger area, due to increased moth finds on the periphery of the intended spray zone. It also announced that "a plan has been developed so local residents can easily access free medical advice if they have any worries about the spray or its effects on their health" (MAF media release 17.12.01; this health service is discussed in detail in Part I).

Targeted aerial spraying began in January 2002. At the time, MAF announced that it expected six to eight sprayings to be sufficient. In the event, approximately 50 spray operations, including 71 days of spraying, over a much larger area were carried out over a period of two and a half years. [8]

The insecticide used in the spraying was Foray48B, a product of Valent Biosciences. The active ingredient (in terms of lethality to the PAM) in Foray48B is *Bacillus thuringiensis var kurstaki* (Btk), which is contained in a chemical mixture formulated to enhance functions such as the spreadability, durability, and "stickability" of the spray. Despite repeated requests, MAF refused to disclose these "inert" ingredients, either to concerned residents or to their GPs. MAF cited commercial confidentiality of the proprietary mixture as the reason for the refusal.

CAG continued to work on an alternative plan in preparation for a Cabinet decision on the future of the programme. The CAG plan, submitted to MAF for inclusion in its presentation to Cabinet, advocated: replacing the TAG with a new Operational Science Group that would draw upon the expertise from Operation Evergreen (i.e., the WSTM programme) and have a more open relationship with the community; systematic re-analysis of all raw data and review of the scientific and operational knowledge base; urgent attention to delimiting the infestation area through an increase in trapping and a redeployment of traps and surveyors to peripheral areas;

[8] There are conflicting accounts of numbers and dates of spray operations, documented by Blackmore. See Appendix 2 for MAF records and tables in DiMarco and AerAqua Reports".

urgent increased attention to pheromone development and production, and to the development of an accurate host list; and rebuilding relations with the community through greater transparency and consultation.

In May 2002, the head of the PAM programme resigned. From June 2002, MAF refused any further meetings with CAG. In July 2002, MAF advised Cabinet that targeted aerial spraying would not achieve eradication.[9] A "containment" strategy increasing the spray zone to 900 hectares was approved, pending Cabinet's decision on the future of the programme. At the same time, MAF advised Cabinet of its intention "to review the existing advisory groups for the project in light of the possible expansion of the project" (MAF Terms of Reference for the CLG, January 2003). This review

> took the form of a needs assessment whose aim was to determine the future advisory needs of the project within the context of a cabinet decision to attempt eradication of the PAM over an enlarged area. That approach was adopted in preference to review of the historical functioning of the existing advisory groups as it was seen as better informing future planning. (MAF Terms of Reference for the CLG, January 2003)

In September 2002, Cabinet approved the funds ($90 million) for a programme to eradicate the PAM through "blanket" aerial spraying over a potential spray zone of 12,000 hectares.

The spray operation was contracted to Agriquality (a state-owned enterprise spun off from MAF in 1998). Agriquality sought from the Crown, and was granted, indemnity against losses as the result of any claims arising in respect of adverse effects of the spray on people's health or on the environment.[10]

Also in September 2002, MAF circulated the first draft of its proposed terms of reference for a new Community Liaison Group "supporting the Painted Apple Moth project during 2002-2005" (MAF Terms of Reference for the CLG, January 2003). In November 2002, MAF declared the CAG disbanded.[11]

The CLG was officially convened in January 2003. Its members were selected by MAF, and it was chaired by the General Manager of PAM Operations. Its official purpose was

- To provide a forum for identified stakeholder groups in the community to communicate to the PAM Project their views on the impact of the project on local people;
- To provide another avenue for the PAM project team to communicate to the community:
    - Up-to-date information on the progress of the project
    - How MAF will address the concerns and support needs of the community
    - The concerns and issues MAF has regarding areas of the project affecting the community
    - Key information regarding project operations that is not otherwise communicated by wider reaching communication processes such as television, radio, print advertising, and public notice.

[9] MAF Brief 02/486, dated 24 February, released under the Official Information Act.
[10] MAF Brief 02/102, dated 10 September 2002, released under the Official Information Act.
[11] In the view of CAG members, MAF did not have the authority to disband it, as its members had been elected by the community. CAG continued to meet, and the Waitakere City Council continued to work with and support CAG as the community's representative.

The CLG met only four times, between 27th Feb and 3rd May 2003. One member of CLG stated that she was the only person to turn up to the last CLG meeting (or at least the last of which she was notified). From her experience with CLG this member was of the view that many of the people appointed were not particularly interested in the task, and the group appeared to have dissolved from lack of interest.

The aerial spray campaign continued for 29 months, from January 2002 until May 2004, with approximately 50 spray operations during that period. The total spray area encompassed approximately 200,000 residents and an unknown additional number of people who worked in, studied in, commuted through, or otherwise came into the spray area. It was the most prolonged and intensive residential aerial spraying with Foray48B ever carried out. The moth was declared eradicated in March 2006.

ii. Community response

The People's Inquiry is one in a series of community actions taken in response to MAF's response to the PAM incursion. In addition to the Community Advisory Group established through MAF, at least six new community organisations came into existence in response to the PAM aerial spray programme:

- CC-PAM, Painted Apple Moth Community Coalition, established 2001
- WASP, West Aucklanders Against Aerial Spraying, established 2001
- Sprayfree Coalition, established 2002
- SAS, Stop Aerial Spraying, established 2002
- GASP, Group Against Spraying People, established 2002
- TASK, Teachers Against Spraying Kids, established 2003

In addition, the New Zealand national chapter of an international organisation that deals with pesticide-related issues PAN-ANZ, Pesticide Action Network Aotearoa New Zealand became actively involved, as well as STOP, Society Targeting Overuse of Pesticides formed in 1997 in response to the WSTM incursion. These groups worked with the West Auckland community to address what they considered to be MAF's unwillingness to take the community's concerns seriously.

These groups explored a number of avenues to express their concerns and bring about changes in the PAM programme. They appealed to the Waitakere City Council to take action under the Health Act; researched legal avenues for contesting MAF's strategy; filed a complaint with the Ombudsman regarding MAF's refusal to disclose spray ingredients; kept records of health effects reported by community members; supported individuals in their complaints to the Human Rights Commission and the Health and Disability Commissioner; submitted Official Information Act Requests for information about Foray48B, about the scope and impacts of the programme, and about affected community members; located and publicised the NZ label and the Material Safety Data Sheet for Foray48B; developed informational websites; formed support groups; wrote media releases; petitioned parliament and individual select committees, and organised protest meetings and demonstrations.

They also produced, commissioned and published twelve reports, papers and studies culminating in the 2004 Report to the Prime Minister asking for a public inquiry into the eradication programme.[12] The rejection of this final appeal resulted in the setting up of the People's Inquiry, as detailed by the Steering Committee in the Foreword to this report.

[12] Appendix 1

FINDINGS

Introduction

Part 1 represents the views of all four commissioners and constitutes the main findings of the Inquiry with regard to the treatment of the affected community, research-related aspects of the PAM programme, and issues of legislation and decision-making. Part 2 presents Professor Romeo Quijano's findings regarding the health effects of the PAM programme on the affected community. Part 3 presents Dr Tom Kerns's analysis of the PAM programme from an ethics and human rights perspective.

Our findings focus on significant aspects of the community's experience of the PAM programme as derived from the evidence presented to us, thus fulfilling our brief to provide an analysis of the programme and its impacts from a community perspective. Our aim is to increase understanding of that experience and of the need to rethink and revise the approach used in this instance. While themes have emerged from the testimony we received, they are contextualised and developed with reference to the available documentary evidence.

FINDINGS: PART 1

1.0 Treatment of the affected community

1.1. Health support: MAF/Aeraqua

The majority of testimony, diverse in many other respects, had one major theme in common: the way in which members of the community were treated when they sought assistance in dealing with the effects of the spray.

Before the spraying began, MAF assured the public that "no special health precautions need to be taken." In a MAF media release the head of the PAM programme was quoted as saying, "There's been a lot of attention and hype about health risks of Btk and this has caused unnecessary concern among residents." The only health risk of the spray was said to be the possibility of "minor respiratory irritations" (MAF media release 14.01.02). MAF media releases repeatedly claimed that, according to "an independent risk assessment" by the Public Health Service of the Auckland District Health Board, "after 35 years of use, Foray 48B has never been implicated in human infection or any other significant health conditions"(MAF media release 14.12.02). (In fact, the risk assessment made this claim not about Foray48B, but about the "active" ingredient, Btk.)

MAF media releases emphasised community concerns rather than actual health risks. "Generally, no special care needs to be taken to protect health. However, we accept some people are sensitive to sprats [*sic*; sprays] and are concerned. If you are in the direct spray zone and want to take a more cautious approach, stay inside with windows and doors shut and cover open fireplaces with newspaper during the spraying operation. Stay inside for at least half an hour afterwards. If you come into contact with the spray - wash if [*sic;* it] off with water." (15.01.02)

Health support and monitoring services were contracted by MAF to Aeraqua Medical Services, run by Dr Francesca Kelly, who was described as MAF's independent medical advisor (MAF media release 17.12.01). MAF media releases implied that the health service was a response to community perceptions rather than an indication of the health effects of the spray: "Although most people are not at any risk from the spray, MAF responded to *community concerns* from people with respiratory or allergic conditions who *feel* vulnerable with a health monitoring and support programme….[S]ome people *may prefer* to be cautious if they are sensitive to sprays" (MAF media release 14.01.02, emphasis added).

It would be reasonable to conclude from this (as did many who spoke to us) that residents need not take any precautions against exposure to the spray.

For those "with specific allergies or health concerns," Aeraqua set up a medical register "accessed through MAF's free phone line" (MAF media releases 17.12.01, 14.01.02). It was announced that those registered would be "phoned before spray days so they can make alternative arrangements if they want to" (MAF media release 17.12.01).

In a MAF media release in December 2001, Dr Kelly described the services to be provided through Aeraqua (known as the PAM Health Service):

> "We'll have a team of health professionals available at several different health clinics close to spray zone. They will offer local people free consultations with more choice and

more access as well as on the spot medical back up if they need it," she says. (MAF media release 17.12.01)

A 2005 report by Aeraqua describes the services it provided in more detail. We quote here extensively from the report and then from testimony describing individuals' experiences with the health service. We highlight below with italics two apparently contradictory statements in the 2005 report about the purpose of this service. Was it a health service providing free health support (as claimed above) or was it a "screening process"? The difference is significant, and testimony suggests that while the former was promised, the latter was delivered.

> MAF established a call centre free-phone 0800 number which was available 24 hours per day 7 days a week. This call centre referred some householders to the PAM Health Service, according to their criteria of need for health advice. Householders could record their contact details with a brief description of their concerns faxed through to the health team….
>
> *The PAM Health Service was set up in December 2001 as an independent medical service to provide free health support for residents in West Auckland in conjunction with the Painted Apple Moth spray program. …* The PAM Health Service offered an initial telephone discussion, usually with a nurse, and where necessary offered a medical assessment either by a family doctor or specialist consultant. Follow up with householders consisted of phone calls, review consultations and home or site visits from a nurse or doctor. A health support co-ordinator who liaised with both the health team and householders was available for any general concerns about the practicality of accessing services. Individual health risk assessments and plans were made where necessary.
>
> *The aim of the health service was to provide a screening process for householders exposed to Foray 48B and who were concerned about any possible health effects.*
>
> Householders presenting with health concerns were given advice by experienced registered nurses at the time of initial telephone call management….Where necessary, an appointment with a PAM Health Service doctor was arranged based on medical, psychological or social need. Typical examples of referral were householders with: a food allergy in particular to soy, corn or fish; respiratory problems; skin problems; anxiety; also in the event of uncertainty an appointment would be offered. Once assessed by the PAM doctor it was at times necessary to refer to a specialist …
> …
> A direct number to the health service was available from 08:00 to 17:00 Mondays to Fridays and was widely advertised…. Householders who contacted the Health Service with an acute emergency were referred to their own GP or A&M clinic, with subsequent follow-up by the Health Service. Where a householder consulted their usual GP about a matter that the householder considered related to spraying, there was a possibility for the householder to receive reimbursement for that consultation provided medical notes from that consultation were available to the health service and they subsequently became a registered householder of the health service.
>
> Medical assessments were free of charge and were generally made available within one week of the first telephone call from the householder. … Saturday and evening options were tried but discontinued due to lack of attendance. Transport assistance was made available where essential for medical assessment. (Aeraqua 2005)

The testimony we heard presented a very different picture. Despite the promise quoted above of "free consultations with more choice and more access as well as on the spot medical back up if

they need it", the testimony indicates that many struggled to access services, that the services received by those who managed to access them were often inadequate, and that the experience of dealing with Aeraqua itself may have in some cases exacerbated the detrimental impacts of the programme.

The struggle for health support appears to have affected every stage of the process. Although the public description of the medical register implied that registration was at the community members' discretion, we received testimony that getting onto the register was not so straightforward. One person testified that she had believed the reassurances about the safety of the spray and took no special precautions to avoid the first spray; nor had she requested to be put on the medical register. After a bad reaction to the first spray, she sought to be put on the register and was told that it was "too late" to do so. In another case, when a person with a history of reactions to chemical sprays sought to be put on the medical register, she was told she "had nothing to worry about" and that in any case she was not in the spray zone. (In fact she lived close to one of the original moth finds and in what turned out to be one of the most intensely sprayed areas.) She was allowed on the register ten months into the spraying programme, during which time she'd been taken to hospital after becoming ill after an unannounced spray (according to her testimony, MAF had announced cancellation of the spray but had then sprayed when weather conditions improved). We also heard testimony from a woman who was told that she did not qualify for the register or for assistance because she had asthma before the spraying programme began and therefore her symptoms could not have anything to do with the spray.

We heard many more accounts of frustrated attempts to obtain medical support from the Health Service. They encompassed both those who attempted to access the service through the MAF freephone number and by those who contacted the Health Service directly. It was not clear to many that the MAF freephone was answered by call centre personnel with no medical expertise. Testimony suggested that, despite this lack of expertise, the call centre personnel decided who would be referred to the Health Service. We have not been able to ascertain the "criteria of need for health advice" used by the call centre to determine who would receive health support.

Attempts to access health support directly through the Health Service phone line proved distressing for many of those who provided testimony. We heard repeatedly of people being told during these telephone conversations with Aeraqua nurses (that is, with no physical examination) that their symptoms, including skin rashes and blistered skin, nose ulcers, and respiratory difficulties, could not possibly be caused by the spray. Even more distressing for the callers, other explanations were offered for the symptoms, without any examination or evidence. Examples we heard included menopause (for symptoms of allergy), heredity (for nose ulcer), and hysteria or psychosomatic reaction (for a wide range of symptoms). These dismissals meant the caller could not access the promised services:

> After ringing the 'hotline' they put me through to a medical person who assured me that this [a child's vomiting after playing in spray-soaked dirt] was nothing to do with the spray and must just be a coincidence that it happened the night after he was playing on spray soaked ground. … I asked if we could be put in the group that had a place to go to on the outskirts of the city, but they wouldn't let us. (Submission 37)

We also had reports of inadequate care from those who were able to get appointments with Health Service doctors. (A number of General Practitioners were contracted by Aeraqua to their PAM Health Service. They were generally known by the community as MAF doctors or Aeraqua doctors.) These reports indicated that the determination to attribute symptoms to any cause but the spray continued here, and that often there seemed to be a refusal to consider the possibility that the spray may be aggravating a pre-existing condition (such as asthma). People with respiratory difficulties were told that the fact that they had asthma before the spraying began

meant that their current difficulties could have nothing to do with the spray. Those giving testimony also described dismissal of symptoms without physical examination, and some related experiences of ridicule and degrading treatment.

People also reported being inconvenienced and distressed by failures to provide what was promised. There were multiple reports of people being told they had appointments only to turn up at the doctor's office to discover no appointment had been made. In some cases, this involved people who had relocated themselves out of Auckland because of their reactions to the spray: "we travelled from Thames in the Coromandel to Auckland for the appointment to be told by the receptionist that no such appointment was on record."

Other problems involved the handling of medical files. In some cases, information that was supposed to be forwarded to specialists was not. In one case, we were told, an Aeraqua doctor would not give a resident an appointment, but asked for his medical records for the past five years. Having made the effort to collect these from several doctors, the resident waited for two months for a response, then contacted Aeraqua. He was told they had lost the records and asked to supply them again. At this point, the resident gave up: "they seemed not to want to know". Others were unwilling, due to the mistrust generated by their and others' interactions with Aeraqua, to give Aeraqua consent to access their medical records. This removed them from any possibility of assistance.

We heard that people struggled to obtain referrals to specialists. We also heard testimony from those who did obtain such referrals that specialists' recommendations were ignored or overturned by Aeraqua.

BOX 1: Testimony concerning experiences of the health service

The response from the official medical officers doctors and nurses employed by Aer Aqua was one of scepticism and refusal to validate that any of the symptoms were spray related, even though they must have had hundreds of reports. One nurse used the post- modern language of subjectivism (... everybody has their own reality.) (people "believe" they have these problems...) Sub 21

At the time MAF was offering free consultations with doctors chosen by them for people who claimed to be affected by the spray. I went to one of these doctors, who told me my symptoms were not related to the effects of the spray. I did not accept this and went to the doctor I normally consult…. He confirmed my suspicions that the symptoms were due to spray exposure and issued me with a certificate which specified that I should be evacuated from the area when spraying was due to take place. The symptoms have not recurred at any time since. Sub 42

The MAF doctor was no charge I recall, but it was a very unsatisfactory visit as she was trying to convince me that the reaction [irritated, inflamed eyes coinciding with spray events] was caused by other things, and that the spray was safe and couldn't possibly have this effect. Sub 23

I was sent to see two [Aeraqua doctors] and they said it wasn't the spray that caused my illness it was my age. I gave both of them permission to get my medical files from my Dr but they did not do so. Sub 30

The MAF medical [service] tried to convince me that the face rash was caused by coming into contact with the Painted Apple Moth. Sub 47

If I did not to stay away for several days after the spray, the same effects would appear within ½ hour of coming back home. Severe asthma attacks with difficulty breathing, wheezing and persistent barking cough. Skin rash on all exposed skin, (diagnosed by a specialist as airborne eczematous, contact dermatitis, (photos are available). When Aeraqua was rung regarding this, I was told by Dr F Kelly (without seeing the rash) it would wash off in a shower or I could obtain a saline solution to apply to the rash. Sub 12

We advised MAF of our concerns and were referred to a doctor working for Aeraqua. From the very first visit with her she made us feel that because one person felt sick we were all becoming psychological and creating the symptoms we all felt in our heads. I would like to ask how a child of 3 years and 8 years old could be called psychological with the physical symptoms they were having? … Sometimes we were advised we would be given the chance to go to one of their medical practitioners but would have to wait for days or weeks or months to be seen – not while the symptoms were at their worst. Sub 48

My main concern is the way the government has totally disregarded my complaint and every one else's complaints with their health. I was told I had "mass hysteria" by the Government [Aeraqua] Doctor and then the powers that be wondered why I never went back!...On the 3rd visit to [the allergy specialist] doctor I was informed I was allergic to colophony, a substance in cosmetics. He probably felt safe saying cosmetics! Unbeknown to him I'm one of the population's only women who does not put cosmetics on her face!! As I'd told him I was helping paint a house, he then said it was in the paint. Problem being I wear a face mask. And my sinus problem started in March 2002 not Feb 2004 Sub 13

Aeraqua administered not only the access to medical care but also eligibility for practical support to avoid exposure to the spray.

> Where appropriate a Practical Support Plan (PSP) was recommended by the PAM [Health Service] GP in consultation with the householder. The PSP was authorised by the Medical Director [Dr Kelly]…. The primary nurse would contact the householder to discuss and confirm practical support activities. (Aeraqua 2005, p 39)

Whether or not residents would be notified and assisted to leave the area during spray days depended on Aeraqua personnel accepting that they were suffering ill effects from the spray. Thus, particularly for those with limited resources (and the spray zone included lower socio-economic decile areas), a considerable amount was at stake in these "screening" interactions.

According to Aeraqua,

> [f]or those who received a PSP a precautionary and flexible approach was used to determine which avoidance measures would be relevant and practical. Relocation included the Day Retreat, Motel options and financial assistance to relocate to family or friends outside the spray area. Transport assistance was offered to leave the spray area, i.e. petrol vouchers as an alternative to relocation. (Aeraqua 2005, p 41)

(However, this support was not provided for "hotspot" sprays. We have not been able to find an explanation for this.)

Much of the testimony we heard concerned the struggle to have one's need for relocation recognised by Aeraqua. We heard from and about many who gave up trying to access services through Aeraqua and relocated themselves at their own expense—many of whom could barely afford it. Some were unable to do so.

> I notified MAF and was told they would phone me on spray days and to stay inside. I informed them I had 3 skylights in my unit that couldn't be closed off. … I had to be confined to my bedroom but my unit was not free of spray. MAF were useless. I wasn't [relocated] by them and being a solo pensioner had nowhere to go. (Submission 15)

We heard many reports of people not being informed of services in theory available to them (such as petrol vouchers for self-relocation), and of others being told that they would be provided with something (such as a telephone allowance while away from home), but they should not mention it

to others lest they request it as well. We also heard accounts of promised support simply not materialising, e.g.:

> [A] man who lived near the Waikumete cemetery and needed to be evacuated for each spray … was a beneficiary and couldn't afford to transport himself to the motel or wherever he was going. The problems with getting funding to him at the appropriate time went on for months – they would say they were couriering him out vouchers or taxi chits and they wouldn't arrive, they tried to get him to borrow the money from his aged mother, they would say that it had been deposited in his bank account and it hadn't. (Submission 38, community health worker)

Residents were only ever given a first name for their Aeraqua contact person. Some found it disturbing that they were expected to divulge personal information to, and plead with, a "faceless" person whose real identity they couldn't know.

The testimony suggests that Aeraqua's focus was indeed on "screening" [13]. But screening out or for what is unclear, as are the criteria used. The impact of these interactions on the affected community was profound and will be discussed below. We are not in a position to know the reasons or motivations for the focus on screening. However, a member of the community and health advisory groups set up by MAF during the PAM programme described what she saw as MAF's "paranoia" that people would "take advantage" of the services being offered. Apart from the consultations with medical personnel, the services included various forms of support for relocation away from the spray zone. We now turn to people's experiences with those services.

According to the testimony we heard, the process of evacuations would begin with a phone call at 4.00-4.30 a.m. That is, affected residents would not know until 4.00-4.30 of the morning of the spray whether or not they needed to evacuate. A taxi was then meant to arrive in time to remove them from the spray zone before the spraying began (at daybreak) and take them to whatever venue was being used at that time. These venues were described by Aeraqua as follows:

> A day retreat venue was situated outside the spray zone. The venue was managed by registered nurses and other support staff. Meals were provided throughout the day. Activities included reading materials, television and play–co-ordinators to help entertain the children. Private rooms were made available when necessary for householders to rest. Householders remained at the Day Retreat venue for two hours following spray completion. (Aeraqua 2005, p 41)

Those giving testimony, to whom the "day retreat" was known as a "breakfast venue", described the experience very differently. Taxis did not always arrive in time, and some affected residents were exposed to the spray as they were evacuated. This in itself generated intense anxiety. Venues were uncomfortable, provided no privacy, and were not set up to accommodate children. There could be 100 stressed people in a single room for 6-8 hours, including elderly people, students trying to keep up with their schoolwork, young children who became bored and restless after hours with nothing to do and nowhere to rest. The evacuees would not know in advance when they would be returning home, but would have to wait for reports that their grid had been sprayed or that the spraying had been called off for the day. While this would be a disruption and inconvenience to anyone, many of the people involved suffered from chronic illnesses that would have greatly intensified their discomfort. In the words of one such evacuee, "One could write a book on the breakfasts they arranged for us on spray days; they were a living hell."

[13] Not all personnel were content with this. We heard accounts of one nurse and one doctor who did not fit the pattern described above. The nurse did her best to secure appropriate support for affected residents, and the doctor was willing to accept that the spray might be responsible for symptoms presented. Both left Aeraqua midway through the programme.

Testimony from those relocated to a motel during spraying (i.e., those for whom it had been accepted that returning home within hours after the spray had ill effects) also described disruptive and negative experiences. When the early morning call came announcing spraying would happen that day, the residents would not know how many days they would be away from home, as spraying was often disrupted and delayed by the weather. They would often not know where they were going. Some found themselves in motels that they described as "grotty," "dirty" or "disgusting"; others in places that were noisy and uncomfortable. (We were told that one of the motels chosen by MAF for the evacuees was sandwiched between a major roading network and the main trunk rail line.)

Testimony presented to the inquiry describes extensive disruption of people's work, education, and social lives caused by their need to avoid the spray (see Box 2 for some examples). We heard from a number of residents who lost their businesses as a direct result of the spray programme. It appears that there has been neither acknowledgement of nor compensation for these impacts. In our view, this is deeply regrettable and should be rectified.

BOX 2: Testimony concerning impacts of spray programme

I do understand that the weather is dictating days and times of spraying, but then it takes 3 days for the spray to be done - and poor Kelston is always at the end of it. During the waiting time: we wait; cannot go shopping just in case; cannot work in the garden, just in case; keep all windows shut tight, just in case; and we wait. At times another helicopter passes over and we panic; we phone MAF; no, 'not ours' they say. We plan to leave the house for a while: WHERE TO GO?? Many old people live alone, some have no car. Where do you want them to go? And when? Everyday, go 'somewhere' just in case?? … MAF on the phone say they don't know if Kelston will be sprayed today, Waikumete Cemetery is being 'done' at the moment. Phone again, they say. Meantime I live in a tightly shut house, getting claustrophobic by the minute. The drift from the Waikumete spraying came early here…. I phone a friend. 'get out', she says. OK. IF I GET OUT, and they don't spray, do I do the same again, and again, until they spray? Is this my life? I am nearly 85 years old. I would love to spend my last years as a human being, not a hunted animal. Sub 27

I could no longer work. My life revolved around the spray days, living in and out of motels, baches (even tents and on stormy days), and only being able to live in my home for approximately one week out of every month. My house became more and more contaminated each and every time they sprayed; my home was no longer 'home' in any sense. Lack of finances meant I could not afford to move house permanently as others have been able to do, and my medical expenses are up into the thousands, plus other costs for which I have never been reimbursed (phone charges from motels, petrol costs etc). The disruption to my life has been total - health, socially and otherwise. My relationship with my partner became exceptionally rocky as he always said I was never home for him as most times he would have to stay at home for the animals. We have now separated. Sub 12

I had to go to motels all over the city at very little notice and sometimes be stuck there for days as the spraying didn't go ahead as planned. I have never been so lonely and miserable in my life, as in a state of health whereby I could only really lie around reading alone all day in some always dark motel room with many difficulties, while not being able to visit or check on my 92 year old father who was ill and needing me and lived in the spray zone, go to my own doctor also in the zone and never knowing when I'd get home again. Sub 32

[My husband] continued to work over the year so he didn't stop work but it was extremely hard. Our customers become frustrated because they would arrange with their work to drop their cars off – you know all the things that come into it and then we'd have to ring up and say "look we can't do it – we've had to leave … come next week" "sorry we can't do it" … in the end we lost our business… it just seemed a hopeless situation. Oral testimony 118

The whole physical scenario for the family at that time in terms of evacuation from the house to the motel was intensely stressful because there was, taking a four-year-old and a small baby, the amount of packing that has to happen from nappies through to food because you don't know what the food is being provided for you in the, in your

relocation place. And added to that of course there was the continuation of the running of the business which actually I was involved in at that time, too, on the office administration side, so that it involved a whole sort of circle of things happening each time the evacuation took place and as my daughter has said, sometimes it actually -- because of the delay [due to] the weather -- was reduced in some instances to only, like, two weeks maybe, when you had to start the regime all over again. Oral testimony 31

My partner and I also had a couple of businesses that we were running in the local area - actually in one of the hotspots. And I did all the office support from home – so that I could be a fulltime mother to our young child. And we actually strategically planned our lifestyle to set it up that way. And the whole spray – well I mean, it's changed everything. And consequently – today – we no longer own our businesses and have had to – we've sort of at a certain point we've made a completely different strategy with our lifetime choices which was a direct result of the spray. Which obviously had a huge economic impact on our lives as well….I've spent many, many months, you know, getting help to struggle with the mental wellbeing side of the constant relocation, the constant stresses and the constant juggling of being a good mother, a good business person, a good, you know, a good partner, and just trying to just do this absolutely impossible juggle, and trying to seek support from Aeraqua and MAF around how I'm supposed to make this work, and getting brick wall after brick wall after brick wall. And … looking back at the whole thing, that was probably the overwhelming thing for me is how, you know, that MAF does not take into account – aside from the physical side of things – just the huge struggle that places on people's life and the long term consequence on that other level, on the spiritual and the mental wellbeing and the impact that it has on people's lives as well. And although I look around at other people who have been through it and I feel like on one level that I have got off lightly, physically – I hope (because part of you doesn't really know that) – I certainly know that I didn't get off lightly on other levels as well. Oral testimony 61

Testimony indicates that provision of services worsened later in the spray programme. People whose symptoms had previously been accepted as requiring practical support to avoid the spray report being suddenly told, without further examination, that "there is nothing wrong with you, it's all in your head". Support items promised, such as petrol vouchers or food vouchers, did not arrive. Callers to the Health Service report being told they could not obtain support because "the money's run out". From a resident who suffered a severe skin reaction to the spray we heard:

> [T]owards the end of the campaign (the final few months), the medical staff were claiming I suffered from psychological symptoms and that I am no longer going to be evacuated. I still do not think that this hypothesis is valid since my symptoms started without me being aware that the spraying was taking place in my area. Also I do not have a phobia for low flying aeroplanes (as the medical staff suggested). From that point onwards the medical staff were so uncooperative that it seemed like they were deliberately making it difficult for me to be evacuated. In one incident me being informed that I used one of my taxi-vouchers outside the spray-dates and that I am to reimburse them for that taxi fare. Even though this was entirely untrue and after informing them that the late date was due to a repeatedly postponed aerial spraying they withdrew their claim…. In general the behaviour of the medical/MAF staff that I had to deal with was increasingly rude and belittling as time progressed. (Submission 24)

Meredith Youngson, who had extensive community contact during the spray programme as she was coordinator for Waitakere Health Link (as well as a member of the CAG and the CLG), summarised the experience of the community as she knew it:

> There was a health care service set up with Aeraqua that everyone had to go through if they wanted to get their care free of charge. This service was located in Parnell and the system did not work well. There were many complaints from the community about the hoops they had to go through to get treatment, the rudeness of the personnel, and the apparent attitude that there was always some other cause for your illness, it wasn't the spray. Many people just gave up. Others persevered as they had no choice but over the

> period of the spraying it became an intolerable ordeal. … One problem that kept growing as time went on was that people who had been affected by the spray were so stressed and frustrated by the situation and the difficulties that seemed continually put before them that they got upset and angry. This created huge tensions between them and the front line staff who seemed to be extremely unsympathetic and lacking in compassion, and simply totally ill-equipped to deal with this situation. It seemed that they were making it as hard as possible for people. (Submission 38)

We heard testimony that Aeraqua (as well as MAF) personnel were quick to interpret such expressions of frustration as personal threats, and to bring threats of police power to bear against already traumatised people.

Testimony described the experience of interacting with Aeraqua as adding a burden of significant additional stress to an already stressful situation. Below is one of many examples:

> During the last nineteen months of spraying I have not only had to suffer the health consequences of the spray, but have been subjected to continuous harassment, lies and the ongoing debilitating battle with Aeraqua to keep myself safe - and quite frankly - sane. This has at times caused me great distress and fear. Whilst I have always been evacuated from the spray zone on all 'blanket' aerial sprays, I was not initially allowed relocation when MAF started doing additional weekly targeted hotspot sprays in my area at the end of 2002. Unfortunately I found out pretty rapidly that I experienced the same severe exacerbation of my condition after targeted sprays….I requested relocation during these targeted sprays, but after prolonged arguments about whether I was inside or outside their arbitrary and unmeasured target 'drift' zones, I was finally informed by Aeraqua that they had to refuse my request anyway as they *'could not afford it'*. … The continued harassment of having to attend further Aeraqua 'reassessments' of my condition, (Dr F Kelly overriding my GP and their appointed Specialist's decisions…) and the continuing arguments (*and inspections,)* over my choice of relocation facilities, … also the monthly battles with Aeraqua staff over mistakes in the duration of my relocation, had reduced me to a state of total exhaustion and despair. (Submission 12)

According to testimony received, difficulties with Aeraqua extended beyond its relationship with affected residents. A lack of cooperation with others involved in various aspects of community health work or research was reported to us. When Meredith Youngson (Waitakere HealthLink) requested a single contact person at Aeraqua so that there would be continuity in her efforts to liaise between Aeraqua and the community for which she was responsible, Aeraqua initially refused. Perhaps more disturbingly, we were informed that when the researchers contracted by the Ministry of Health to carry out a health impacts study repeatedly requested data from Aeraqua, the data were not supplied.

Based on the testimony we received, it is our opinion both that there were deficiencies in the health support service and that these may have been compounded by contracting Aeraqua to provide health monitoring services as well. The primary basis for the monitoring report was the statistical data accumulated by the Aeraqua health support service. In other words, an overly restrictive screening process would have distorted the reporting of health impacts: if Aeraqua personnel did not accept the symptoms as spray-related, they did not show up in the data. We also heard from many, including a local GP, that most affected residents did not go to Aeraqua, either because they did not associate their symptoms with the spray or because they had heard of others' bad experiences.

It is possible that these reports will become part of the basis for future assessments of the risks of aerially spraying of Foray48B or other Btk sprays. In our view, this would be inappropriate. This is discussed further in the section on PAM Research, below.

R1. The government should issue a formal apology to the affected community for the impacts of the PAM spray programme on people's health, employment and education and for the inadequate support provided to those affected.

R2. The government should establish a compensation fund, to be administered by a third party acceptable to representatives of the affected community, to reimburse major expenses and losses incurred by the affected community as a result of the PAM programme. The fund should be financed by central government and the forestry industry (see section 1.3.1).

R3. The data collected by the Aeraqua PAM Health Service should not be assumed to be a reliable measure of the health impacts of the PAM programme and should not form part of the evidence base for any future health risk assessments of Foray48B or similar products.

1.2 Community consultation: MAF

As noted above, MAF did not set up a Community Advisory Group until two years into the incursion response, after the decision had been made to move to aerial spraying. According to a MAF media release:

> The formation of the Community Advisory Group by MAF ensures there is a vehicle for the community's views to be heard. In turn, the advice received can be taken into account when advising the Government on possible options for the future management of painted apple moth.

CAG was not resourced by MAF; community members served at their own expense.

Minutes of CAG meetings show concerns over: lack of adequate signage and other measures to restrict the movement of vegetation out of the infested zone; refusals to remove host vegetation; refusals to permit CAG to send an observer to TAG or health advisory group meetings and persistent difficulties in obtaining information about those meetings; failure to provide an operational plan; failure to provide promised information, such as trap-catch data; failure to provide details of spray-drift studies; refusal to switch to a Btk-based insecticide for ground spraying, despite both health and effectiveness concerns about the spray being used instead; failure to involve those involved in the WSTM eradication; failure to mobilise resources to hasten the development of a pheromone; failure to provide clear information regarding health monitoring and support plans, or regarding progress of the health risk assessment. On 29 November 2001, the chair of CAG sent a letter to the MAF's head of the PAM programme reiterating these concerns. No reply was received.

In December 2001, CAG called for the resignation of the head of the PAM programme on the grounds of:

- failure to make information available to CAG;
- failure to implement agreed actions (e.g., proper signage and information regarding moving vegetation);
- and neglect of available scientific competence (in relation to breeding a captive moth population and pheromone development and to gathering data on location and spread for developing strategy and predictive modeling).

CAG was criticised by MAF for misunderstanding its role ("We have a 23 member group of technical experts to advise on the programme. We have a community advisory group of some 20 or so local people to advise on community concerns as opposed to technical issues"). CAG was accused of trespassing beyond its competence, yet a number of its criticisms, including its "technical" criticisms of failing to utilize the appropriate scientific competence, were echoed later in the Auditor General's report. CAG's prediction that "targeted" aerial spraying would not be effective also proved to be correct.

We heard testimony from members of the group that MAF's expectations of CAG in practice differed significantly from those implied by the terms of reference and the media release:

> [The establishment of CAG] seemed a positive step and I looked forward to working with MAF and community leaders in a positive way. This was not to be. Sadly it became apparent that MAF wanted to feed us information, but did not want to hear the community perspective. Meetings were confrontational, and defensive on both sides. A good example of the dysfunction of the relationship is when the various options around managing the problem, of which blanket aerial spraying was just one, were being developed and discussed. PAMCAG in consultation with various science professionals developed an option based on using a number of approaches. We had a meeting with MAF officials to present our ideas to them. It was truly awful. They sneered and ridiculed their way through the presentation, challenging every idea in a very antagonistic manner. I was absolutely shocked by the sheer rudeness and lack of any sort of interest in our ideas. Before they had even heard us they had made up their mind they weren't going to give an inch no matter what we said. If they had said something like -"I can see what you are getting at here but we believe this wouldn't be effective unless we did .... as well. Let's get our scientific advisers to look at it and see what they come up with" – it wouldn't have been so bad. But it was more like "Give us the facts and figures on this approach – it's rubbish and would never work. You have no idea what you're talking about." I left that meeting totally devastated and drained. I finally realised and accepted that we were never going to have a collaborative relationship, because they actually didn't WANT any community involvement. (Submission 38)
>
> When they did finally establish the CAG, it rapidly became evident that MAF had no intention of working in partnership with the community, or even of paying any heed whatsoever to what the community through its CAG was advising them. For example, despite many pleas to stop using Decis (deltamethrin) as a ground spray and to use the Foray 48B instead, as had been successfully done in the WSTM programme – and at one stage a promise that they would – they did not. MAF's agenda appeared to be to use the CAG to tell the community what it, MAF, wanted the community told. The CAG refused to function as a conduit for MAF, as testimony from other members of the CAG will no doubt reveal, and as a result the relationship between MAF and the community became acrimonious and non-productive. .. MAF persisted in the view that because the CAG was 'community' it had no expertise and therefore nothing worthwhile to contribute – even though using its own definitions of expert there were several on the CAG, including Dr Peter Maddison the entomologist who original[ly] found the painted apple moth. (Submission 75)
>
> It quickly became clear, however, that MAF's intention was that we should be a conduit for them to the community and that they were not really interested in any ideas coming the other way. We had an excellent model for a Community-based approach in Operation Forest Save in which the Regional Council backed up their own programme of pest eradication by working with local groups. (Submission 104)

We were told that following the change of PAM programme management in 2002 "all pretence of working cooperatively was abandoned" (Submission 104). In November 2002, MAF declared CAG disbanded. Minister of Biosecurity Jim Sutton portrayed the CAG as irrational anti-spray fanatics.

> [A]s for the community advisory group, let me say that if we were doing this again, we would do it a little differently…. We would be more careful to make sure that the community advisory group understood that its role was to communicate between the people who are trying to eradicate the pest, and the public, to make sure that everyone understood each other, instead of being an avenue for protesting against spraying in general. Frankly, a lot of the complaints about the spraying of Bacillus thuringiensis kurstaki would apply if we sprayed distilled water.

Based on the evidence presented to us, it is our opinion that, despite its terms of reference for the CAG, MAF did not permit the CAG to represent community interests in any meaningful way. The testimony suggests that the CAG's attempts to provide feedback and to "suggest possible solutions" were treated with contempt. From the community participants' perspectives, this treatment was a kind of brutalisation. It should not be forgotten that some of the community's critical feedback, dismissed by MAF at the time, was supported by the OAG report.

The treatment experienced by those selected by MAF for the Community Liaison Group (after CAG was declared disbanded) was significantly different. As noted above, the CLG was explicitly created to be an information channel for MAF/Agriquality. A member of the CLG noted both the improvements and the limitations of the new group.

> It was a very controlled environment. We were treated with friendliness and courtesy, some even got travel expenses. We were given up to date information and asked for feedback from the community that we served. The staff did try hard to deal with any issues that arose and the communication to communities did improve significantly. As long as no one challenged the programme or how it was being run, it all went smoothly. However its use as a vehicle for community concerns was limited and the meetings were not very well attended a lot of the time. Most health service concerns went straight to Aeraqua – Agriquality would not get involved. (Submission 38)

In our view, the experience of 1996/97 White-Spotted Tussock Moth programme should have provided MAF with guidance regarding relations with the community, but testimony indicated that that experience was either ignored or rejected. In the words of Dr Gordon Hosking (leader of the science team for the WSTM programme and subsequently Chief Forestry Officer, MAF, and chair of the Forest Biosecurity Advisory Committee):

> One of the strongest recommendations emerging from a review of the WSTM programme was that the affected community should be involved in analysis and decision making from day 1. Community participation and support was seen as the single most critical factor in the success of any such future operations. MAF retreated from the less than perfect WSTM position to a bureaucratic fortress mentality. (Submission 41)

Another aspect of MAF's approach to the affected community during the PAM programme is suggested by an email inadvertently sent to a resident of Hamilton involved in community opposition to the 2003 aerial spraying of Foray48B against the Asian Gypsy Moth there. The Hamilton resident had forwarded to her networks an email received about an informal gathering in Auckland of people from a number of community groups opposing the spray programme. In some way this email reached MAF's Communications Advisor. The Hamilton resident was sent,

presumably unintentionally, the following email from the Communications Advisor that appears to be in response to a request from a third party to obtain more information about this gathering:

> no can do straigh[t] away. will have to wait for them to post more info on email. asking may blow my cover… but it is likely they will post more details later today or early tomorrow. They have the date wrong, but i suspect it is Sunday. Cathy Bell[14] has also alerted others who are interested. [ellipsis in original]

This is noteworthy not only for what it reveals about MAF's attitude toward the community, but also for the impact it would have had on community members already experiencing the range of unsympathetic and even hostile treatment reported above. The organiser of the gathering has said:

> I remember at the time being quite disturbed and concerned that an ordinary citizen such as myself could be "spied" on by MAF. What was meant to be an informal pot luck meal amongst a group of activists who had been working together, had become a "meeting" that MAF had taken an interest in, and may have planned to attend…. I sent out an email cancelling the "meeting" and later a few people came to my place for a shared meal as originally planned. (Oral testimony 108)

Ultimately, biosecurity itself can be compromised by the orientation to the community described above. As the 2003 Biosecurity Strategy emphasises, public support is crucial to the attainment of biosecurity goals. Adequate responses to pest incursions depend upon local knowledge and community participation, e.g., the discovery of new pests (the vast majority of pests have been discovered by members of the community outside the biosecurity agencies), sightings of existing pests, and pest control activities (such as trapping). Local knowledge of micro-climates, micro-habitats, and social practices can be essential to designing effective control/eradication strategies, monitoring their effects and minimising their harmful impacts. With the PAM programme, testimony indicates that MAF ignored and then destroyed an important opportunity to cultivate community involvement in protecting New Zealand's biosecurity. Waitakere City—the "Eco-city"—contained many groups and individuals committed to protecting New Zealand's native biodiversity. As the chair of the CAG noted, the community had experience in working with regional authorities for biosecurity goals; and as a local community board member told us, "it would have been so easy to get people on board here." New Zealand's future biosecurity depends significantly on harnessing this commitment, not alienating those who embody it.

R4 Whenever and wherever an incursion or an incursion response has the potential to affect a community, the community or its representatives should be, from the initial stages, actively involved in the analysis of the situation, decision-making as to the response, and planning of any response.

1.3 Public information: MAF

Based on the testimony we have related above and below, it is our view that the impact on the community of the spray programme was exacerbated by inadequate provision of information. Areas deserving specific mention are: the characterisation of the threat posed by the PAM; information on the pesticide aerially sprayed, Foray48B; and information about particular spray operations.

[14] Cathie Bell was press secretary to Biosecurity Minister Jim Sutton.

1.3.1. Characterisation of the threat

In Australia, the PAM "causes low-level defoliation of pine trees and is considered to be a minor pest on apple trees" (OAG). The threat posed to New Zealand by the moth is a matter of contention, fueled by the delay in the establishment of a PAM breeding colony with which to conduct host feeding trials. Communication with the public during the spray campaign emphasised the threat to native bush, particularly in the Waitakere ranges.

We are not aware of any studies substantiating the claim of risk to native bush. MAF has been criticised by other agencies for a lack of effort to determine the risk to the conservation estate. The failure to give priority to the establishment of a breeding colony for host testing has already been noted. According to Gordon Hosking, attempts to persuade MAF of the importance of host testing was met with a reply from the [then] Director of Forest Biosecurity that "host testing was unnecessary because we already had a host list from Australia, the insect's native range" (Submission 41). A host list from Australia would not include plants endemic to New Zealand.

The Parliamentary Commissioner for the Environment notes:

> The decision not to undertake host feeding trials on indigenous plant species concerned DoC and MoRST, but despite their recommendation to Cabinet that provision be made from Votes: Biosecurity funds for host feeding trials to be included in the operational plan, this was not allowed for in Cabinet's approval of extra funding in August 1999. MAF stated that there was no need for host testing on indigenous species to be undertaken at that stage in order to identify what is at risk, as it had already been established that there was a risk to indigenous flora. (96)

(The PCE also notes that no one from the Department of Conservation was invited to attend the meetings of the PAM Technical Advisory Group until over a year into the incursion response.)

The economic assessment conducted by MAF in 2000 concluded: "if, in the absence of government intervention, the painted apple moth were to spread throughout New Zealand, the costs to plantation forestry and private and public amenity would amount to $24.2 million per annum in the medium term. Reduced growth rates in plantation forestry represent 57 per cent of these costs." MAF carried out a reassessment in May 2002, which estimated the impacts on urban, plantation forestry and horticultural sectors over the 20-year period 2002/03 to 2021/22 as ranging from $58 million to $356 million (present value in 2001/02), depending on the incidence of significantly damaged plantation pine trees of susceptible age. The vast majority (over three quarters) of these estimated impacts consist of costs to the plantation forestry industry, in the form of production losses or spraying costs. As these figures were cited as costs "to New Zealand" of not eradicating the PAM, it appears from this that the costs to the industry of spraying their plantations with Foray48B (or another Btk formulation) formed part of the argument for spraying the residents of West Auckland with Foray48B. This was not conveyed to the public.

According to the 2002 MAF assessment, the impacts on the conservation sector of not eradicating the PAM "are too uncertain at this time to quantify and value", while the effects on human health are "thought likely to be relatively small". The 2000 economic assessment report also notes reasons to doubt that the PAM poses a significant threat to native bush: the moth may be unlikely to defoliate individual trees to such an extent as to cause them to die, given the availability of alternative food sources. It quotes a 1997 Ministry for the Environment report: "Native insects, such as the moth Proteodes carnifex, and the beech leafroller moth ('Epichorista' emphanes) can cause periodic defoliation of mountain beech stands but this does not cause lasting damage. No introduced insects have yet caused serious problems to indigenous forests."

A significantly different message was communicated to the public. The many uncertainties underlying the impact assessment, which were acknowledged by the authors of the assessment, were not apparent in messages to the public, and often only the "worst case scenario" cost estimate was presented. It was also not made clear that the vast majority of the costs to the "country" were costs to the plantation forestry industry (much of which is foreign-owned). Typical is the FAQ on the MAF website (http://www.biosecurity.govt.nz/faq/term/911) :

> The moth is a minor pest in Australia but poses a serious threat to our gardens, crops, forests, native bush, and the communities that depend on them…. If it isn't wiped out the moth could cost the country $350 million over the next 20 years.

Announcing his intervention to exempt the aerial spray programme from the requirements of the Resource Management Act and the Waitakere City Council's district plan in November 2001, Jim Sutton, then Minister of Biosecurity, emphasised the threat posed by the PAM to the native bush of the Waitakere ranges. Judith Tizard (Minister Assisting the Prime Minister with Auckland Issues), applauding Sutton's action, claimed: "The Painted Apple Moth represents a great concern to Auckland. If it spread, it could be catastrophic for Waitakere, for the Auckland region and for New Zealand." In December 2002, Sutton declared that the PAM "poses a major economic, a major environmental and a major public health risk and that's why we're trying to eradicate it."

It is not clear on what these claims were based. We are not aware of any publicly available studies substantiating these claims of major environmental and public health risk.

According to Waitakere City Councillor Penny Hulse, the Council's efforts to get clarification on the nature of the expected impacts of the PAM were unsuccessful:

> We never quite established who it is the PAM was going to hurt. There was this sort of large and looming body of "grown-ups" that seemed to be of national importance that we've never quite been able to put together. (Oral testimony 93)

New Zealand's biosecurity depends on public cooperation. Public cooperation depends on the credibility of the organisation requesting the cooperation. In our view, it is likely that these unsubstantiated claims about the threat represented by the PAM have damaged the credibility of Biosecurity New Zealand.

1.3.2 Foray48B

As mentioned above, the sprayed community was not permitted to know all of the ingredients of the spray. All requests for release of the information were denied. It was argued that the information was proprietary to the manufacturer and that the NZ government would be subject to legal action if it were to release the ingredient list without the consent of the manufacturer. According to an opinion prepared by Sir Geoffrey Palmer, commissioned by the community organisation Stop Aerial Spraying (with the financial assistance of Waitakere City Council):

> There are strong reasons in the public interest that favour disclosure of the ingredients of the spray, not only so 200,000 people can know what it is they are being exposed to, but also so that independent assessments of the health risks can be made. A strong argument can be made that the public interest in disclosure here outweighs the commercial protection. It would also be possible to structure an arrangement so that disclosure could be limited to medical experts and other advisers who may be involved in advising those adversely affected, thus not compromising commercial confidentiality values. … It seems quite unreasonable to keep secret the ingredients of a spray to which something of the

> order of two hundred thousand people are being exposed regularly on the grounds of commercial confidentiality. It means there is no transparency and that claims made by the authorities as to the health effects cannot be checked by independent reference to the medical literature. (Submission 34, Appendix B)

For many of those whose health was affected by the spray, not being able to find out what they were being exposed to understandably provoked anxiety and anger.

Further, it appears to us that in its communication with the public, MAF misrepresented the research carried out on Foray48B. MAF repeatedly asserted that Foray48B had a "clean bill of health" and that "[a]n independent health risk assessment carried out by the Auckland District Health Board has concluded that after 35 years of use, Foray 48B has never been implicated in human infection or any other significant health conditions" (MAF media release 14.01.02). In fact, as noted above, this conclusion (whatever its robustness) was not drawn about Foray48B but about the "active" ingredient, *Bacillus thuringiensis var kurstaki*. If, as many of those concerned about the spray suspected, illnesses were being caused by the "inert" ingredients of the spray, this was a significant misrepresentation.

1.3.3 Operational information

Spray operations were carried out under conditions that differed significantly from those announced to the public at the start of the programme (and factored into the ADHB health risk assessment referred to above). According to MAF media releases:

- "Six to seven sprays are anticipated in total" (14.01.02)
- "To ensure only the targeted areas are sprayed and spray drift is minimised, low-flying helicopters [BK-117] will be used with state-of-the-art imported spray equipment." (26.11.01)
- "MAF will use Global Positioning Systems (GPS) technology to programme the helicopters to ensure only those properties in the targeted zone are sprayed and that properties are only sprayed once during each operation." (18.01.02)
- "The helicopter will not spray in winds greater than 12kph. This is to minimise spray drift. In a worse-case scenario (i.e. winds of 12 kph) spray drift is expected be about 200 metres." (18.01.02)
- "Once the entire area is completed three weeks' notice will be given before the next targeted aerial spray begins." (18.01.02)

As noted above, the number of sprays was far greater than announced, and the gaps between sprays were smaller. Successive discoveries of the PAM at or beyond the periphery of the designated spray zone led to repeated increases in the size of the zone, and eventually to a change in strategy from "target" spraying to "blanket" spraying. The repeated extensions of the spray programme were particularly frustrating for residents whose lives were severely disrupted by each spray and who had made arrangements on the assumption that they would have to implement them 6-7 times, not 50 times.

Each operation was expected to last three days, but, due to the weather, these were often not consecutive days. MAF did not keep to its promised three-week intervals between operations; by 29 January 2002 (after only one operation) it had revised that earlier promise: "There will always be a minimum of three weeks between the first spray day of each operation and the start of the next" (MAF media release 29.01.02). Given the delays in completing operations, this was compatible with considerably briefer periods between operations. Spray operations on occasion took 13-15 days to complete; thus blanket sprays could resume after one week's respite in these

cases and still comply with the revised parameter. "Hotspots" were sprayed even more frequently and more than once during the same operation.

While it was announced that "twin-engine BK 117 helicopters equipped with Micronair spray equipment" would be used in order to maximise accuracy, as the moth spread these were supplemented by fixed-wing aircraft. As far as we can ascertain, no compromise in accuracy of spray application was acknowledged.

The maximum allowable wind speed was raised from 12kph to 19kph. The stipulation that each house (and school) would be sprayed only once during each operation appears also to have been relaxed without acknowledgement; residents' own observations and record-keeping (including official weather data) indicate that these conditions were not always observed.

Residents also found the ongoing operational information provided by MAF to be unreliable.

> Each time we rang the hotline we were given conflicting information by the staff, many of whom had no idea what they were talking about. They would tell us the spraying had stopped and five minutes later the plane would do a low pass over our house. (Submission 78)

> Some days MAF would ring in the afternoon and say spray had finished and I wasn't informed they had started. [Couldn't hear planes as partially deaf]. (Submission 15)

We heard from those living in homes overlooking the spray area that they would call MAF and be told that spraying had ended for the day when they could see the spraying was still occurring. These reports made a distinction between the mere presence of the aircraft and the release of spray, and testified that they were seeing the release of spray. We heard from many that "it was easy to get caught out in the spray" even if you were trying to avoid it. This could be because a cancellation would be reversed if the weather improved or because the same area would be sprayed twice on the same day. This included schools, where, we were told, children were caught outside in spraying that occurred outside the notified period.

R5. The Health Select Committee and the Primary Production Select Committee should review the decision processes and priorities that led to a decision to spray a residential area with a pesticide in order, in part, to spare the forestry industry the costs of spraying their forests with that pesticide.

R6. The acceptability of agreements that result in the involuntary exposure of people to a product whose ingredients cannot be revealed to them should be reviewed by the Human Rights Commission and by the Health and the Justice and Electoral Select Committees.

1.4 Community experience: long-term impacts

We heard much testimony indicating that the impact of the PAM programme, and specifically the way in which the affected community was treated during the programme, may be wide-ranging and long-lasting. It is difficult, but important, to convey the experience of the situation some affected residents found themselves in. The quotations below summarise the experience from the perspective of, first, one of many affected residents, and second, a community health worker who attempted to assist residents.

> I'm not very good at putting my feelings into words but the spray campaign for myself was a nightmare. Lack of consistency of information from the 'hotline' - one minute you're told one thing, the next you're told they don't know, then you ring back and get told something else. My child being sick. My concerns not listened to. The fact the spray campaign was so mismanaged that so many people got sprayed that didn't need to if it was handled properly…. I still worry, even now, about what effect the spray might have on my children in future. What chances of compensation do we have? What studies are being done on the effects of people experiencing this spray campaign? Are people important in this country? (Submission 37)
>
> I have been appalled at the way some people have been subjected to a devastating experience which has damaged their health, their relationships and their quality of life, and have then been treated with contempt and callousness by those who are supposed to be looking after and supporting them. I believe that the way to deal with this sort of situation (i.e. a biosecurity incursion) is to work with the community to find solutions and to honour those who have to make sacrifices for the common good. I have seen exactly the opposite happen here. (Submission 38)

Many testified to feeling a deep sense of helplessness, or, as one person put it, "a crushing sense of powerlessness". This was related to people's lack of participation in the decision to spray and their inability to get assistance or remedy for themselves or others.

> Who has been on the side of the people who've been sprayed? Who's been on the side of the people whose health has been affected? Under normal circumstances you'd say – well, it would have to be public health. This is their job. But if you complained to public health they'd refer your complaint to Aeraqua, because they were MAF's people employed to take care of the health of the people of West Auckland. But you had an even worse situation in that the Public Health did the health risk assessment for MAF. <u>They</u> did the HRA that basically said "It's all ok. It's perfectly harmless". They were employed by MAF to do this. So when we go to them and say "No, people are getting sick" they can't very well turn around and say "oh, we got it all wrong". Aeraqua was in same situation, because Francesca Kelly (Aeraqua Director) had [earlier] declared the spray safe for the WSTM programme. (Oral testimony 64)
>
> The most scaring thing was there was no-one you could go to. Doctors did not want to know and the Health Department did not investigate. We were told it was all in our minds. (Submission 17)
>
> I think one of the frightening things about all this was that over the time, something was put in place in my lovely little New Zealand, west Auckland, that I've grown up [in] and thought that I was hugely safe, everything, all these big things that were way out there and uncontrollable were another country…. All of a sudden it seemed to happen to us, but there was nobody to go to…… one day I drove down the motorway and I came into this building and I thought this is so wrong … our families and us, we've paid tax for years, we've done the right thing we've input into the community, this is so wrong. We're isolated now and where is anybody? There is no-one. Except a phone call with "[first name of Aeraqua contact person]". (Oral testimony 118)
>
> … It felt like a huge injustice had been done to people of West Auckland and a huge denial by MAF. (Oral testimony 76)
>
> There are hundreds of us. No one wanted to listen to us. (Oral testimony 12)

> I was told by [a MAF doctor], that it doesn't matter what you get wrong with you, or how ill you get, they'll never stop the spraying …I still can't believe they deliberately did it; and [then] turn around and say it's all in your mind. (Oral testimony 17)

Residents concerned about the spray explored a number of legal avenues to get their concerns heard and acted upon. The Official Information Act was used to try to obtain information that could be used in these attempts; that experience highlights a weakness in the act. According to those involved:

> Well, SAS [Stop the Aerial Spraying] essentially looked at exploring the legal options. I wrote furiously, endless Official Information requests which at first were very forthcoming …. We ended up getting boxes arriving on my doorstep, and it would take us time to trawl through and understand and make sense of … But it dried up. As soon as the officials realised that actually we could really understand the process and utilise this documentation, the source became very difficult. They said no, we weren't entitled to request any more documentation without paying enormous – hundreds and hundreds of dollars, because the photocopying fees, of course, were completely ridiculous. So we kind of used other people's names and we kept on working that way for a while. But again I just put in an Official Information Act request about two months ago for an update on information to see where the programme was at and have been denied access to that information without paying. [Oral testimony 82]

Testimony strongly indicated not only that the authorities' lack of acknowledgement of the affected community's experience itself had a considerable impact on people, but also that the treatment received by many who sought assistance generated hurt, anger, mistrust and alienation that has outlasted the PAM programme and can be expected to influence residents' orientation toward "the national interest" in the future.

> That's really why I'm here, because I just think this is disgusting. People's lives, people can be hurt and harmed so much and be ignored. If at any time they'd said "look we understand", "Yes this has affected you", "We're sorry this has happened". You know, some sort of acknowledgement. But to be constantly, over a year and a half to be hearing pretty much "look I know you think it's the spray, but don't you think your husband being a mechanic, it could be this, this other thing?" Whatever. You know. Just, no. No. (Oral testimony 118)

> Even after all this is over, and I look better and I am better in myself …Emotionally – this is something unfortunately I don't think we'll ever get over because we never got acknowledged. We were made out that we were making it all up. And if they'd ever just kindly said we are very sorry. But to have the cheek to say on top of it all you did it all to yourself to me was the cruellest thing they ever could have done to people. (Oral testimony 107)

> [T]o be treated by MAF and Aeraqua as if I was some irritating nuisance that was simply getting in the way of them doing their job when things went wrong, instead of some compassion for circumstances beyond my control, this has destroyed any faith I had that anyone cared. I am one of many that have paid and are still paying the price for this eradication. (Submission 12)

> I move around the community, and I still hear the same things about the hurt it created…It's the methods, the heavy-handed "we're going to do it this way"…And it's the side-effects to it, we're all talking about the physical effects, but it's the emotional effects that are hard to quantify …It's the effects that my kids have towards being told

that their health is being put at risk and this is the way we're going to do it anyway, so it doesn't really matter what you say and do, we're going to do it this way… I would say now that people would be very hesitant to even help in any way at all…I would say this has created a lot of bad feeling and it's not likely to go away in a hurry. … It's sad because there was a chance here to work with people …It [would have been] just so easy to get the people on board here. It could have been a big win for the government and for MAF. (Oral testimony 88)

I still don't even know what [painted apple moths] look like but if I ever found one MAF would be the last person I would call! If they had done their job correctly in the first place this never would have taken place. (Submission 78)

See R1 and R2 above.

R7. The Official Information Act should be amended to prevent the charging of fees that block access to information for those without extensive financial resources.

See R22 and R24 below.

1.5 Treatment of the community: potentially contributing factors

What were the reasons for the treatment described by many to us? A number of aspects of the PAM programme and of the agencies involved could have contributed to the situation—and could do so again in the future. In the interest of preventing a recurrence of the kind of treatment recorded here, potentially contributing factors are identified below.

1.5.1 Epistemological confusion

MAF appears to have mistaken both the superiority of its own knowledge and decisions (relative to other experts and to information that could be supplied by the community, including CAG) and the nature of that knowledge.

MAF appeared to see itself as having a monopoly on relevant knowledge and to be unwilling to consider seriously any information or proposals from the community that did not conform to its views. Examples include the CAG recommendations concerning choice of ground spray, breeding colonies, pheromone development, and vegetation control; the Blackmore (2003) health monitoring interim report; and the Watts (2003) review of the 2002 health risk assessment for Foray48B. The Blackmore and Watts reports were submitted by MAF/MoH to peer reviewers of their choice. The reviewers either substantially confirmed the report (Blackmore) or confirmed some significant elements (Watts; the reviewer of the Watts report was—rather bizarrely—not provided with a copy of the 2002 health risk assessment that Watts was addressing, thus significantly limiting the scope of the review). Despite positive feedback from its own peer-review system, MAF appears not to have permitted this information to influence its approach to PAM and the spray programme or its communication to the public. The reviewer of the Blackmore report concluded by recommending:

> Whatever the outcome of further investigations, action is urgently needed to ameliorate the current level of disquiet and distrust, if this is not to become a chronic problem. Specifically there is a need to:
>
> a. Develop an acceptable framework for dialogue with the community to resolve existing problems and enable future dialogue.
> b. Review public information campaigns, and mechanisms used to communicate with individuals registering concern, particularly regarding the timeliness, content and comprehensibility of the information.

c. Understand, including model, the nature and extent of exposure and possible mechanisms of this exposure.
d. Understand the basis for the construction of the Health Risk Assessment.
e. Consider the use of epidemiological studies, both case control and cohort, in tandem with support to a community based monitoring system.
f. Understand the nature and distribution of adverse effects, with particular regard to exposure, geographic, demographic and other features including the possible contribution of pre-morbid and/or environmental conditions.
g. Consider individual exposure studies to clarify the nature of the allergic skin and conjunctival reactions.

With the possible exception of point b, it appears that none of these recommendations was taken up.

MAF's own knowledge-base, and the conclusions drawn from it, received insufficient self-scrutiny. This led, in our view, to an unnecessarily hostile relationship with the CAG and to a failure to consider the contributions of both local community knowledge and alternative scientific perspectives.

The conclusions reached about the safety of Foray48B deserve special mention here. That "Foray48B is safe" appears to have become an article of faith, difficult to dislodge by empirical evidence to the contrary. This would go some way to explain the treatment reported to us by people who presented to the health service with symptoms. If the spray is safe, then the symptoms must be caused by something else. If the symptoms are caused by something else, then the presenting resident is trying to access "benefits" they are not entitled to.

According to Waitakere City Councillor Penny Hulse, neither Aeraqua nor MAF were inclined to believe that the reported health effects were "real":

> [P]robably the thing that took most of our time and my time in particular was meeting with MAF officials and Aeraqua officials to try and get a humane recognition that the health effects were real. And that no matter how the scientific and medical community might think that they were hysterical or psychosomatic or whatever, the fact is without the spraying some of those health effects would not have happened to those members of our community. And I think … that was probably our biggest failure, in that it seemed to take so long to get that message through to MAF….
> [Penny Hulse oral testimony 93]

As noted above, the Health Risk Assessment carried out by Auckland Public Health assumed much less exposure to the spray over a much shorter period, involving a much smaller number of people. The assessment itself emphasises the relevance of such details to exposure assessment; for example:

> The area to be sprayed was visited and assessed to ensure that information on the ground was consistent with information obtained from databases and to ensure a detailed understanding of key features of the local environment. Local authorities were consulted in order to identify any proposed activities or events planned for the next 12 months which might present a risk of unusual exposure to the pest management programme.

The report also acknowledged that its assessment contains uncertainties, is the product of particular individuals' interpretations and is unable to demonstrate the safety of the spray:

> Health risk assessment is a tool, which needs judgement to be used effectively, as there are always uncertainties and gaps in knowledge. Health risk assessment doesn't set out to prove that something is safe, only to assess known or likely effects.

Further, "the absence of some effect under particular exposure conditions does not prove safety" because, among other things, "there is an enormous number of other effects and exposure conditions which have not been tested"; thus it acknowledges that "not demonstrating an effect (e.g., at very low exposure) is not the same as proving there is no effect."

Regardless of whether these are the "normal" limitations of health risk assessments, they are rather shaky foundations for the claim that "the spray is safe" and for the involuntary exposure of 200,000 people to its potential effects. The claim of safety suggests that MAF misunderstood the nature of the evidence on the effects of the spray. The absence of evidence is not evidence of absence (of effect), particularly in an under-researched area. This was the first time a population had been subjected to repeated doses of Foray48B over such a long period. Under such conditions, MAF should have been alert to the possibility of unforeseen effects and should have had contingency plans in place to deal with them, both by assisting those affected and re-assessing the spray programme. The PAM Health Service, which seems to have based its work on the same misunderstanding of the evidence for safety, and thus to have worked largely to a pre-determined script describing what would be considered an effect of the spray, did not provide assistance for unforeseen effects.

1.5.2 Primary responsibility of biosecurity agency:

The primary responsibility of MAF has traditionally been to protect and promote the interests of the agriculture and forestry sectors. According to the PCE (2000):

> MAF's focus up to now on risks to primary production and trade has strongly influenced the direction of biosecurity... MAF Biosecurity Authority now needs to demonstrate that greater attention will be given to biosecurity impacts on indigenous biodiversity. (p 9)

The Biosecurity Strategy (Biosecurity Council, 2003) also acknowledges that MAF's focus has been on protection of primary production and trade, and that "management of pathways where the main risk is to our indigenous flora and fauna and people has not been acted on with the same degree of urgency" (p 16). While in both these cases, the concern is with MAF's effectiveness in preventing or responding to incursions that may threaten indigenous biodiversity and human health, we should be equally concerned with MAF's ability to properly consider and manage human-health impacts of incursion *responses*.

According to the information available to us, the health dimensions of the PAM programme remained under MAF's control. In addition to MAF's involvement in the health service through the contracting of Aeraqua, we heard testimony that all requests and complaints addressed to the Ministry of Health (MoH) regarding the PAM programme were sent to MAF or to the Minister for Biosecurity for response. It appears that all health research as well as health services connected with the PAM programme were contracted and paid for by MAF. We heard testimony that MAF was involved in the peer-review process for the health impacts research published in 2004.

While recognising that "MAF needs to develop systems capable of protecting the wider interests in biosecurity and improve its connections with the aquatic, environmental and health sectors," the Biosecurity Strategy recommends that MAF be the lead biosecurity agency "with a mandate for end-to-end biosecurity management" and for "ensuring the full range of biosecurity activities are delivered effectively and efficiently". In our view the PAM programme suggests that, in

making this recommendation, the Biosecurity Council may not have given sufficient attention to the question of whether MAF is the appropriate agency to be responsible for weighing up and managing the health (or, possibly, the environmental) impacts of incursion responses.

In our view it is inappropriate that an agency (MAF) primarily committed to the protection of primary production and trade should have responsibility for managing the human-health impacts of an incursion response. In our view, it is doubtful that any community expected to bear the health risks of an incursion response will have confidence in MAF to properly consider health impacts when primary-production sector interests are at stake.

1.5.3 Conflicts of interest:

The agencies involved in looking after the public's health in connection to the PAM programme were seen by some as compromised for those roles by their other activities. The Director of Aeraqua was also employed as MAF's independent medical advisor and had earlier advised MoH and the Ministry of Forestry that Foray48B spray was safe to use in connection with the white spotted tussock moth programme.[15] Auckland Public Health Services, whose role includes investigating health hazards and health complaints for the people of Auckland, had also carried out the 2002 Health Risk Assessment much cited by MAF. Many in the community felt that these involvements in vetting Foray48B would make these agencies reluctant to recognise unforeseen health impacts of the spray—in other words, that they represented a conflict of interest. This is not an unreasonable concern.

1.5.4 The Biosecurity Act:

The Biosecurity Act currently confers extensive powers on both the Minister for Biosecurity and Chief Technical Officers (effectively, MAF).

Section 114A (s1-s2) of the Act states that:

> (1) A chief technical officer or principal officer may, by notice in writing, give approval for a specified person or any specified class of persons to apply any article or substance to any place from the airspace above that place for the purposes of—
>
> (a) Eradicating or managing any pest or unwanted organism; or
>
> (b) Ascertaining the presence or absence of any pest or unwanted organism.
>
> (2) An approval given under subsection (1) may be given subject to any conditions that the chief technical officer or principal officer thinks fit.

While such powers may have seemed justifiable when considering pest incursions into rural and bush environments, in relation to operations over densely populated urban areas they are insufficiently protective of public health. The powers of biosecurity agencies increase further if a biosecurity emergency is declared. According to section 145 of the Act:

> The Minister may, in the area or areas in which a declaration of biosecurity emergency is in force, take such measures, and do all such acts and things and give all such directions, and require all such acts to be done or not to be done, as the Minister believes on

[15] Jenner Consultants Ltd., *Health risk assessment of Btk spraying in Auckland's Eastern Suburbs to eradicate White-Spotted Tussock Moth (Orgyia thyellina),* Report to the Ministry of Health and the Ministry of Forestry commissioned by the Northern Regional Health Authority, 4th September 1996; Jenner Consultants Ltd., *Clarification of Issues raised in "Our Case Against Moth Spraying".* Report to the Ministry of Forestry, January 1998; Aeraqua® Medicine Ltd (formerly Jenner Consultants Ltd*). Health Surveillance following Operation Ever Green: A programme to eradicate the white-spotted tussock moth from eastern suburbs of Auckland*. May 2001.

> reasonable grounds to be necessary or desirable for the purpose of … managing, or eradicating the organism in respect of which the emergency has been declared.

Section 144 of the Act gives the conditions under which a biosecurity emergency can be declared:

> (1)On the recommendation of [a Minister], the Governor-General may, by Proclamation, declare a biosecurity emergency if satisfied on reasonable grounds after having regard to all available information that—
>
> (a)It is likely that—
>
> (i)There has been an outbreak or occurrence in New Zealand of an organism (being an organism not previously known to be established in New Zealand) that has the potential to cause significant economic loss, significant environmental loss, or both, if it becomes established in New Zealand; or
>
> (ii)There is established in part of New Zealand an organism (being an organism not previously known to be established in New Zealand) that has the potential to cause significant economic loss, significant environmental loss, or both, if it becomes established in other parts of New Zealand; or
>
> (iii)An organism previously thought to be of restricted distribution or abundance (or both) in New Zealand is becoming or has become so distributed and abundant in New Zealand or any part of New Zealand that it has the potential to cause significant economic loss, significant environmental loss, or both; or
>
> (iv)A pest is, or threatens to be, beyond control by the application of the national pest management strategy for that pest; and
>
> (b)It is in the public interest that action be taken immediately to … manage, or eradicate the organism and sufficient powers are not otherwise available to enable the organism to be effectively … managed, or eradicated.

It is our view that the provisions of the Act related above confer excessive powers on biosecurity officials. It would not be surprising if these provisions were to fuel a belief that biosecurity officials need not seriously consider the objections of the public to their actions. From this perspective, the PAM health service and its "practical support plans" could be regarded as gifts generously bestowed (and therefore revocable), rather than obligations owed to those affected.

Further, we heard testimony that these provisions of the Act discouraged other parties, specifically the Waitakere City Council, from pursuing its legal avenues on behalf of residents. Councillor Hulse testified that the Council's decisions were influenced by the fact that even had the Council prevailed in the courts, "the government held the ace card of the Biosecurity Act, which we knew would trump anything we tried to do." The Councillors believed their ratepayers would not accept the expenditure of significant sums for what could only be a Pyrrhic victory.

We note that in its submission drafted by the legal firm Chen Palmer & Partners on the Draft Biosecurity Strategy (2003), Stop Aerial Spraying proposed two amendments to Section 7 of the Biosecurity Act (Submission 34, Appendix A). The aim of the proposed change to Section 7A of the Act is to restrict and clarify the conditions under which the Resource Management Act, and thus the ordinary protection of the law, can be overridden by the Minister for Biosecurity.

> **7A. Relationship with Resource Management Act 1991—** (1) Where any action taken in accordance with any provision in **Part VII** of this Act in an attempt to eradicate any organism would be in breach of the provisions of Part III of the Resource Management Act 1991, the responsible Minister may exempt the actions taken in relation to that organism from the

provisions of Part III of the Resource Management Act 1991 for up to 20 working days **only** if that Minister is satisfied that [ ]—

(a) The organism is not established in New Zealand, the organism is not known to be established in New Zealand, or the organism is established in New Zealand but is restricted to certain parts of New Zealand; and

(b) The organism **is likely** to cause all or any of significant economic loss, significant adverse effects on human health, or significant environmental loss if it becomes established in New Zealand or if it becomes established throughout New Zealand; and

(c) It is in the public interest that action be taken immediately in an attempt to eradicate the organism.

(2) Before making a decision under subsection (1), the responsible Minister must consult the relevant consent authority **and such other persons** as the responsible Minister considers are representative of the persons likely to be affected by the eradication attempt.

(3) After making a decision under subsection (1), the responsible Minister must give public notice of the Minister's decision in such a manner as the Minister thinks fit.

(4) The public notice must specify—

(a) The organism to be eradicated; and

(b) The principal actions that may be taken in the attempt to eradicate the organism; and

(c) The areas affected by the action;

(5) Repealed.

(6) Where any action has been exempted from Part III of the Resource Management Act 1991 under subsection (1) and the responsible Minister considers that it is necessary to continue action beyond the duration of the exemption to attempt to eradicate the organism, that Minister may recommend that regulations be made continuing the exemption and the Governor-General may from time to time, by Order in Council, make regulations for that purpose.

(7) Regulations made under this section come into force on the date of notification in the Gazette, or at the time specified in the regulations, whichever is the later, and continue in force until revoked or until a date not later than the day **6 months** after the regulations came into force when the regulations expire and are deemed to have been revoked.

(8) Where an exemption is granted under subsection (1) or by regulations made under subsection (6), the provisions of Part III of the Resource Management Act 1991 do not apply to the actions taken to eradicate the organism while the exemption is in force.

(9) Where an exemption from the provisions of the Resource Management Act 1991 has been granted under subsection (1) or by regulations made under subsection (6) and that exemption has ended (either by the expiry of the exemption under subsection (1) or by the revocation of the regulations, as the case may be), the provisions of the Resource Management Act 1991 then apply and the responsible Minister must remedy or mitigate the adverse effects of any actions taken under Part VI and to which the provisions of the Resource Management Act 1991, but for the exemption under this section, would otherwise have applied.

(10) For the purposes of this section, ``consent authority'' has the same meaning as in section 2(1) of the Resource Management Act 1991.

The second proposed change is a new subsection to the Act that creates statutory provisions for dealing with human health issues arising from eradication programmes. Its aim is to establish clear accountabilities for health impacts of biosecurity responses in such a way that "the effects on human health of any biosecurity measures are taken into account by a Ministry that is properly equipped to deal with such matters." This agency, which clearly cannot be MAF and should be the Ministry of Health, would also "provide an independent component to the decision making process." The proposed new subsection reads:

7B Human Health Monitoring—

(1) Where the exercise of any of the powers under this Act is likely to result in the application of any substance to an area greater than 500 square meters, the Minister shall inform the Minister of Health, and no such substance shall be applied unless the Minister is in receipt of the certification referred to in subsection (3)(a) of this section.

(2) If the Minister of Health receives advice in accordance with subsection (1) of this section, the Minister of Health shall request a report from an independent toxicologist on the potential effects on human health of the application of that substance, in the quantities specified.

(3) Upon receipt of the report referred to in subsection (2) of this section, the Minister of Health shall either:

(a) Certify that, after taking into account the findings of the report, he is satisfied that the application of the substance in the quantities specified should proceed; or
(b) Advise the Minister that—
(i) He is not satisfied, after taking into account the findings of the report, that the application of the substance in the quantities specified should proceed; or
(ii) He requires more information to make a final decision regarding certification that the application should proceed.

.

R8. The recommendations made by the reviewer of the Blackmore (2003) health monitoring interim report should be acted upon.

R9. All those involved in assessing the risks of incursions and incursion responses should be required to understand, consider and acknowledge the limitations of conventional risk-assessment methods.

R10. Assessment of and advice on health impacts of incursions and incursion responses should not be sought from those having financial or reputational interests, or the appearance of such interests, in the outcome of the assessment.

R11. All health-related aspects of biosecurity, including the health impacts of future incursion responses and research on those impacts, should be the responsibility of the Ministry of Health. They should be neither funded by nor delegated to MAF or Biosecurity New Zealand.

R12. Sections 7 and 114 of the Biosecurity Act should be reviewed by the Health Select Committee, the Primary Production Select Committee and/or the Local Government and Environment Select Committee, which should consider the proposed amendments contained in Submission 34, Appendix A, to limit the powers currently granted to the "chief technical officer" and the Minister of Biosecurity, in view of the fact that actions taken to protect the primary production sector from pest incursions have the potential to impact adversely on human health and the environment.

2.0 PAM programme research

We have already noted in our summary of the incursion response the OAG's findings that MAF did not avail itself of the appropriate scientific expertise to address the PAM incursion (even when the expertise was offered free of charge) and that, had they done so, "there is a strong likelihood that the response to the PAM would have been different." We have also noted failings with regard to research establishing the nature of the threat, as well as a gap between the available evidence and the way the threat was characterised for the public. Here we would like to comment on other research not done, as well as a number of practices characterising the research processes associated with the PAM response.

2.1 Health research

2.1.1 On research not carried out

According to a MAF media release of 23 October 2001,

> Prior to spraying commencing for painted apple moth the Ministry of Agriculture and Forestry (MAF) proposes to carry out a health monitoring study under the guidance of a health monitoring advisory group.

According to official minutes of the CAG meeting of 23 October 2001, the health monitoring programme would include an empirical study of persistence of the spray ingredients in homes and gardens, and a (before-during-after) study in selected GP practices of "prevalence of presentations to GPs of adverse outcomes, i.e., asthma, eyes, skin, severe anaphylaxis and allergy".

As far as we can ascertain, no such studies were done[16]. Instead, Aeraqua provided an analysis of the data collected by its own health service (see below).

We heard testimony that explicit requests to Auckland Public Health and MAF to carry out baseline health studies before the aerial spraying began, and exposure studies during the spray programme, were rejected on the grounds that "it would be difficult for us to justify spending substantial government funds in this area when we are being told by the health experts we have commissioned …that there [are no effects]."

This is surprising, as all assessments of health risk as well as epidemiological studies of effects need accurate information regarding exposure. We have already seen that the Auckland Public Health risk assessment of 2002 was based on what turned out to be inaccurate assumptions regarding likely exposure. Given the volume of health complaints arising, it is difficult to understand why no attempt was made to measure actual human exposures during the two-and-a-half years of the spray programme.

Minutes of meetings of the PAM Health Advisory Group (HAG) in 2003 and 2004 show that the group composed and prioritised a list of health monitoring proposals, which included research into evaluation of health surveillance activities; research into possible links between miscarriages and the spray; research into precipitation and exacerbation of asthma; evaluation of health information and services provided; research on effects utilising GP records; and a community symptoms study. It appears that this research was never undertaken, or, if it has been undertaken, was not made public. Neither the Wellington School of Medicine report (Hales et al., 2004), which was already in process and known to the HAG, nor the Aeraqua health monitoring project (Aeraqua, 2005), which was contracted independently of this group and its work, carried out the work prioritised by the HAG. The group was also working on a plan for health services and support for future incursion responses when meetings were halted.

2.1.2 On research carried out

The health risk assessment commissioned by MAF from the Public Health Service of the Auckland District Health Board (also known as A+) was completed in March 2002—that is, approximately two months after the commencement of spraying. According to its terms of reference, it was to "assess the health risks of aerial spray programme in the painted apple moth eradication programme for MAF as follows:

> • Aerial spraying one day per week, every three to four weeks, for six to eight sprays using Btk in the formulation Foray 48B at five litres per hectare. Spraying is to commence early 2002 and continue for up to 15 sprays in order to obtain a minimum of six effective spray applications.
> • The use of twin-engine BK 117 helicopters equipped with Micronair spray equipment to deliver the aerial spraying programme."

[16] A study (the ESR study discussed below) was later commissioned that examined hospital-discharge (not GP-visit) statistics before, during and after spraying.

Within these parameters, the authors of the risk assessment stated: "We do not expect toxic effects or infection from Foray 48B spray though if directly exposed to the spray or substantial spray deposits some people may complain of minor skin, eye and upper respiratory tract irritation, or aggravation of existing asthma or allergies." However, the actual spray programme, and thus the conditions experienced by the residents of West Auckland, differed significantly from those assumed by the risk assessment. As noted above, this report was frequently and rather misleadingly cited by MAF as giving Foray48B "a clean bill of health".

Also as noted above, according to the data produced by the PAM Health Service, the spray programme did not result in any new-onset illnesses or any exacerbations of existing illnesses. We heard many reports providing prima facie evidence to the contrary, particularly in terms of the nature and timing of symptoms. We also heard from a local GP about a marked increase in patients reporting with certain sorts of symptoms or exacerbations of chronic illnesses during the spray period, many of whom made no association between the symptoms and the spray (thus challenging the psychosomatic explanation, discussed below). We have not seen any evidence for dismissing these cases as unrelated to the spray.

The 2005 Aeraqua health monitoring report (Aeraqua 2005) supports the conclusions of the 2002 Health Risk Assessment (which in turn supported the previous work of Aeraqua and its earlier incarnation, Jenner Consultants) that the use of Foray48B was "generally safe for the public" and instead attributes reported health effects primarily to psychological factors. These factors include "attitudes and opinions", the stress stemming from the incorrect belief that they have been exposed to something harmful, and personality types high in "negative affectivity" (pp 123-124). Stress and anxiety are seen as particularly relevant (pp127-128) and are said to be likely to have been caused by "disinformation", or "extensive reporting by the media of the protest movement, promoting the view of detrimental effects of ground and aerial spraying in pest control." In relation to future spray programmes, it is argued that

> Stressors and anxiety could be anticipated as influenced by:
> - Low flying aircraft, both fixed wing and helicopter
> - Health concerns related to existing conditions, in particular pregnancy, respiratory, allergy related or psychological disorders
> - Misinterpretation and dissemination of incomplete or incorrect information in regard to the contents of the spray and risk of exposure to the spray
> - Differences in perception and psychosomatic responses attributable to individual and community beliefs or negative affect, for example, the sensory perception of unpleasant odour. (p 128)

While references are made to literature that discusses in general some posited connections between "perceptions" and health, there is no empirical evidence offered to support the conclusion that the experienced health impacts in this case were a result of psychosomatic responses.

The DiMarco report (DiMarco 2006) assessing the health effects of aerially spraying Foray48B has used the Aeraqua report as the basis for some of its conclusions. The report states: "Health studies undertaken in New Zealand suggest that while the spraying programmes are associated with increased community concerns about their health, the evidence does not support a causative link between Foray48B and the reported health effects." (p 17) The health studies referred to are those by Aeraqua (pp.15-16). The DiMarco report again relies on Aeraqua when it concludes that reported health concerns "appear to be more closely related to the application method used, ie, aerial spraying, and associated adverse media publicity rather than the Foray48B itself"(p 28); and when it warns that providing support for those who think they have been affected may

worsen their perceived health. Giving individuals or groups at increased risk the opportunity to minimise or avoid exposure to the spray, DiMarco warns, should be "balanced against" the "apparently negative impacts" of providing support (p 28). It would be ironic, to say the least, if the concerns raised by the community (which resulted in the commissioning of the DiMarco report) were to result in even less support for affected communities.

R13. Should it be necessary in the future to expose a population to a potentially harmful substance in the interests of biosecurity, independent research must be funded and undertaken to: 1/ establish baseline levels and patterns of health and illness; 2/ determine actual exposures experienced by members of the community in a variety of relevant circumstances; and 3/ carry out follow-up studies of exposed populations.

R14. The attribution of health effects reported by the community to psychosomatic processes should be given no credence in future risk assessments unless and until such a diagnosis can be supported with empirical, medical evidence.

R15. Symptoms should not be dismissed as psychosomatic simply because their nature and pattern does not fit what the assessor expected based on past risk assessments, particularly where the level of exposure is unusual (e.g., long-term, repeated exposure of an urban population to Foray48B).

2.2 Can the public have confidence in the biosecurity research base?

Sound research is essential to effective and competent biosecurity management. If researchers do not feel able to come to conclusions contrary to the preferences of their funders, the robustness of the research is compromised. The Inquiry received testimony that raised doubts about the independence of biosecurity research in New Zealand. It was not within the scope of the Inquiry to investigate whether *all* biosecurity research is characterised by the problems discussed below, and we have no evidence to suggest that it is. We certainly do not wish to cast aspersions on or raise suspicions about biosecurity researchers and their work. The discussion below reports on what the Inquiry heard about a number of PAM-related research projects and processes in order to highlight the potential for political interference in biosecurity research and the need to implement or strengthen safeguards against it.

2.2.1 Research commissioning processes

The refusals of assistance from Clearwater/Gries and Forest Research highlight wider problems with the process of commissioning scientific research. We were told by both a pheromone specialist and an epidemiologist that it is not unusual for MAF and MoH to restrict requests for proposals to selected individuals, rather than making them public. From the pheromone specialist, we heard:

> I was notified by [a scientist] that MAF had issued a request for research on the pheromone of PAM. … I had not been sent the PAM request though I had for some time been on the mailing list. This request was a restricted distribution request and was not present on the MAF web-site.

Whatever the reasons for this practice, it is vulnerable to abuse. It is certainly odd that one of the foremost pheromone researchers in New Zealand was apparently actively excluded from the notification list for the request for research into the PAM pheromone. It also seems difficult to justify not publicising the research request in the normal way. Such targeting of the research community can result from, but also exacerbate, the problem of over-confidence in one's

knowledge and existing strategy by excluding those with different perspectives who are more likely to come up with findings that may challenge current strategy. It should be of concern to the biosecurity sector, and the wider research community, for a number of reasons:

- The potential to compromise the competence of biosecurity responses;
- The disbursement of public money in ways that are not transparent or properly accountable;
- The potential to erode public confidence in, and willingness to cooperate with, biosecurity responses; and
- The potential to compromise the independence and reliability of research.

2.2.3 Interference in research

In response to the level of health complaints and community dissatisfaction with existing health research, in mid 2003 the Ministry of Health commissioned from the Wellington School of Medicine a study of the potential health impacts of the PAM spraying. According to the terms of reference, the researchers were to

> …receive, collect, and summarise reports from the public, community groups, territorial authorities, Aeraqua and the Auckland Regional Public Health Service (as well as other stakeholders, community groups, Organizations and individuals) on the health concerns, symptoms and effects associated with the Foray 48B aerial spraying programme … review existing scientific knowledge relevant to these health concerns symptoms and effects, and recommend (but not carry out) scientifically robust methods of further study. (Hales et al 2004 p6)

The researchers were not asked to assess whether or not the spray was safe.

Correspondence released under the Official Information Act shows that MoH and MAF Biosecurity were in frequent contact concerning the study, and that MAF and others involved in the PAM programme attempted to influence the terms of reference, ethics approval process, peer review process, and release of the study. MoH was dependent on MAF for the funding of the study.

The process agreed between the authors and MoH, and reaffirmed in emails from MoH, called for the draft study to be sent out to external peer reviewers and revised accordingly; the revised report to be sent to the Director of Public Health for comment; and the report to be finalised and provided to the Director of Public Health. The draft report was sent for external peer review in late December. It was not until 5 February 2004 that all reviewers' comments were received. A letter to MoH from MAF's Director of the Painted Apple Moth Programme dated 19 February 2004 indicated receipt of the draft report and sought confirmation of the outcomes of its discussion with MoH concerning the content of the report. While acknowledging that MAF "is not in a position to peer review a report covering aspects of one of our incursion response programmes", the letter goes on to evaluate the draft report. The letter terms the report "substandard" and declares:

> MAF would be reluctant to purchase a report that is of questionable quality and therefore dubious value.
>
> The report can be improved by drawing to the attention of the authors the expressed concerns and then subjecting the report to [extensive further internal and external peer review and revision].

On 23 February, the authors informed MoH that the final revised report would be submitted in several days' time. MoH responded by relaying MAF's criticisms to the authors, telling them

"we will need to undertake an external peer review of the redrafted report when we receive it to address MAF's concerns."

This fell outside the terms agreed between MoH and the authors. On 25 February they responded:

> We have decided that, for several reasons, we do not consider it appropriate to participate in a further round of peer review of our report. Accordingly we will shortly submit what we consider the final version of the report to you.
>
> You are, of course, free to obtain further review comment. Although we do not intend to redraft the report in the light of such comments, we would welcome an opportunity to respond informally.

Reasons for declining participation in further peer review processes included: the fact that the authors had fully followed the peer review process set out by MoH in their agreement; the incorporation of reviewers' input into the revised report; support from the reviewers for the report's recommendations for further study (which were criticised by MAF); the fact that MAF's criticism's came several weeks after the review period closed; and finally, that "as scientists, we do not wish to become involved in an essentially political discussion between Government officials about the validity, interpretation and significance of our findings."

The revised report was submitted to MoH on 26 February 2004. (See Box 3 next page)

On 2 March 2004, MoH sent the report to a variety of government agencies and actors associated with the PAM programme. On 4 March, MoH noted suggesting a number of options to MAF: refusing to accept the report; "release the report with a Ministry of Health analysis and critique as part of a communications strategy"; undertaking an additional full round of peer review (and in addition "providing an opportunity for the original peer reviewers to reconsider the report"); or give the raw data to another researcher to produce a different report.

The authors heard nothing from MoH until 30 March, at which point the authors were told, in effect, that additional review was encompassed by the agreement's provision for comment by the Director of Public Health, and that "we are … considering how best to advance the recommendations in the report to make sure we continue to progress the important issues you have identified and how to release the report to make sure it receives good coverage and people are aware it is available." However "a key meeting to finalise our comments is not able to take place until late in April…"

On 18 April, parts of the report were leaked to the media. Biosecurity Minister Jim Sutton, who had not read the report, described it as "so flawed and so unsound that it needs to be completely reworked" and said that "there's a stand-off as to whether the report is worth the paper it's written on" and that it might never be publicly released.[17] On 19 April the Biosecurity Minister's office claimed that

> [P]eer reviewers are not happy with the report, which is part of why there has been a delay getting it through. We are not involved in the peer review process.[18]

The Deputy Director General of Public Health was quoted in the same story as saying that the report was undergoing another round of external peer review, and that their comments would be taken into account by the authors "in the drafting of the final report." The authors contacted the Deputy Director General seeking clarification. They pointed out that their contract with MoH did

[17] "Moth spray can harm: secret study", *Sunday Star Times*, 18 April 2004
[18] "Govt defends itself against spray cover up claims", www.aucklandstuff.co.nz 19 April 2004.

BOX 3: Wellington School of Medicine Report

The Wellington School of Medicine report (Hales et al., 2004) raised the following concerns (as summarised in testimony by the lead author [Submission 65]):

- Aerial spraying of Foray 48B produces fine particles of biological matter (bioaerosols) that may be inhaled.
- Many of the symptoms, which members of the community attributed to exposure to the spray, are consistent with the well established short term irritant effects of bioaerosols.
- The level of human exposure caused by aerial spraying of Foray 48B is not well known and has not been measured in New Zealand.
- By analogy with exposure to bioaerosols in the workplace, insecticides based on bacteria or bacterial products could cause chronic health effects, especially respiratory diseases.
- The dose response relationships for these chronic health effects are not well known.
- Studies of exposed workers and communities up to the end of 2004 have not shown serious health effects, BUT these studies have methodological weaknesses.
- Studies of workers and human cells in the laboratory have shown that the active ingredients of Foray 48B have measurable physiological effects, particularly on the immune system.
- The ERMA approval of a closely related biological insecticide was based, in part, on incorrect assumptions.

The report also recommended that a number of epidemiological studies be carried out, including:

- Studies of symptom prevalence in a representative sample children and adults in Auckland census areas. Symptoms to be considered include those relevant to respiratory health, asthma and allergies, gastrointestinal and skin diseases. Previous studies with relevant data on respiratory health, asthma and allergies have been published and may well be worth repeating.
- Time series studies of routinely collected mortality and morbidity data for Auckland CAUs, 2000-2003. (eg mortality, hospital admissions, prescription data, GP data where available).
- Long term follow up of exposed communities for chronic respiratory diseases.

(Hales et al, 2004, p52)

not call for two rounds of peer review and noted that

> [W]e have already indicated that we are not prepared to get dragged in to a political process by participating in a further review and redrafting. It is clear that the pressure for a further round of peer review came from MAF. The existing review comments have been addressed…

The report was finally officially released on 27 April 2004. MoH had sent the report back to two of the earlier peer reviewers. Their comments were released together with the report. These reviews had not been seen by the authors, and their purpose is unclear. The correspondence between MoH and MAF noted above, and the fact that the re-reviews were released together with the report (approximately two months after the submission of the report), raise the possibility that they formed part of the "communications strategy" proposed by MoH to MAF.

The implication that the first round of peer review was somehow inadequate and the insistence of MoH (apparently at the behest of MAF) on an additional round of peer review was particularly odd, and understandably frustrating to the authors, given the initial peer-review process insisted upon by MoH. It was agreed with MoH that potential peer-reviewers would be identified with a range of competencies to enable community groups to have confidence in the process. Once the

set of potential peer-reviewers had been agreed upon, it was the authors' preference (and assumption) that MoH, not the authors, would contact the peer-reviewers and receive their reports. MoH insisted that the authors administer this process themselves, noting this was necessary "to reduce the risk of the Ministry being seen to have inappropriate influence." In light of the actions taken after submission of the draft report, this fastidiousness seems rather ironic.

These exchanges suggest a scope for interference by MAF in commissioned, "independent" research that could undermine public confidence in that research and consequently in related biosecurity programmes.

Internal MoH correspondence also points to other attempts at interference by those involved in health aspects of the PAM programme. A series of emails suggests that one or more persons involved in the official PAM health assessment or health support attempted to exercise inappropriate influence over the Wellington School of Medicine study, particularly its terms of reference, writing in one email to MoH: "we wished to make contact with you prior to any contract being signed with the Ministry as the current proposals seem to raise a number of potential pitfalls in the overall management of the PAM health issues." (email of 08/05/03)

A later email from within MoH discusses a phone call along the same lines from the same or another source:

> This follows a call from [deleted] last night. She seems very annoyed that they were not consulted in regards to the contract we have put in place with the Wgtn SoM. [Deleted] seems to be of the opinion that they and MAF have things under control and our handling of it will play into the hands of the STOP group…The conversation increased my feelings that A+ [Auckland Regional Public Health Service] and [deleted] have got too close to this and may not be seen by the wider public to be totally impartial… at some stage someone is going to have to be up front with [deleted] and explain to her that we have concerns on perception of conflict of interest….I think that some of the issues are more appropriately addressed doctor to doctor as the conflict of interest perception is in many respects a professional issue. (email of 09/05/03)

Two months later the same MoH writer notes:

> We are going to have to manage [deleted]. It is very interesting that [deleted] is on the Ethics Committee [to which the WSM research proposal was submitted]—which would appear to be another potential conflict of interest.

While the person within MoH who flagged these problems is to be commended for doing so, the public should not have to rely on the ethics of individual staff for this to happen. Rather there should be institutionalised safeguards against such interference.

MoH partly implemented one of the recommendations of the report when it commissioned a study from ESR "to examine hospital discharge rates for respiratory conditions among the exposed population compared to local and national rates before and during the spray period" (Gallagher et al 2005 p1). The terms of reference did not include the recommended time-series study; nonetheless, the authors reported, among other findings, that their comparison of hospital discharge rates for those residing in areas inside and just outside the spray zones showed that

> there was an increase in asthma admissions in residents inside the spray zone, but a decrease in asthma admissions in residents just outside the spray zone. These trends were statistically significant. (Gallagher et al 2005 p18)

MoH, announcing the completion of the study, reported:

> [T]here is nothing to suggest a significant adverse impact on the incidence of respiratory diseases for the West Auckland population. It is pleasing to be able to report this to the community as we know some people have been concerned about the effects that this eradication programme may have had on health. (MoH media release, 8 November 2005)

One of the authors of the report, Simon Hales, described the findings to the Inquiry rather differently: "there were increases in asthma hospital visits that could plausibly be related to the aerial spray operations."

Dr Hales also described his efforts to avoid involvement in this study, as he feared his earlier role in the WSM study could cause difficulties for ESR's relationship with the Ministry of Health. Despite these efforts, due to the departure of relevant personnel, Dr Hales was asked to join the research team. He reported to the Inquiry that there was pressure to downplay the findings of the ESR study and that he subsequently resigned as a result.

2.2.3 Treatment of dissenting scientists

We also heard detailed testimony from Dr John Clearwater that gave a disturbing picture of treatment accorded those who disagree with current policy. As noted earlier, the OAG was critical of MAF for not availing itself of Clearwater's expertise, despite many opportunities. Here Clearwater describes one such opportunity:

> The scientist and I bid jointly for the work [PAM pheromone]. Our initial work provided us with all the information to make a first-class bid. Our proposal was greatly less expensive than the HortResearch bid that was awarded all the work. A further supplementary request for a literature survey of "trap-out" of remnant populations was also applied for. A senior member of the PAM Project (MAF) explained that there were "bad feelings" about my involvement and this project was denied also. We met with him. He described examples of incompetence and corruption from his country and said that we should not be upset as it was not so bad in NZ. (Submission 40)

We heard that difficulties between Dr Clearwater and MAF were not restricted to his bids for PAM research.

> An employee of the MAF Christchurch had purchased lures and traps for the Gypsy Moth from my company. He had been given permission to begin trapping for the Gypsy moth just shortly before he was due to start trapping. I supplied the product in very short order. He expressed his very great appreciation for the speed of our delivery. … The following year I was asked to supply safety information which was duly supplied. I then received a call from the employee saying that he had been directed not to purchase from us....the Commission may consider whether it was a coincidence that I was then expressing my concerns to the MAF re the PAM program. (Submission 40)

> When I heard of the arrival of the Varroa mite, I offered a superior trap to (MAF)…. An independent test commissioned by MAF … confirmed the superiority of our product… "The Clearwater sticky boards collected significantly more mites than the other two types of board" [etc]… We supplied a number of variations of the grid to HortResearch. My calls and e-mails to follow up on this success were ignored ... the Commission may consider whether it was a coincidence that I was then expressing my concerns to the MAF re the PAM program. (Submission 40)

The kinds of actions related above can have effects well beyond the individual targeted (and the loss to New Zealand's biosecurity efforts of that individual's competence); they can also reach the wider science community:

> I was called by many of my friends in Forest Biosecurity. They said that they agreed with my conclusions but dared not join me in speaking out publicly for fear that their funding from MAF would be cut. … A friend at a conference about to give a paper on a MAF response to an incursion informed me that she was unable to give a truthful account of events lest MAF funding be withdrawn. (Submission 40)

New Zealand is a small country, and there are limited funding opportunities for research scientists. This can easily create situations of financial dependency on government agencies (or, in some cases, commercial corporations). Independent research is crucial to building and maintaining public confidence in biosecurity management. The testimony related above describes retribution and fear of retribution among researchers. Fear of retribution can compromise the independence of research, which can in turn jeopardise both the competence and the public credibility of biosecurity policy. It is of great importance that researchers who produce "inconvenient" findings do not suffer retribution and that the findings themselves receive proper consideration.

R16. All requests for publicly funded research should be publicly notified and open to all bidders.

R17. The process of awarding public research funds should be transparent.

R18. The State Services Commission should develop processes and prohibitions adequate 1/ to ensure that publicly funded research that produces results inconvenient to government agencies is neither interfered with nor kept from the public; and 2/ to protect researchers who produce results at odds with the interests of the government or its agencies from denial of opportunities to obtain public research funding and interference with other legitimate research and business activity of the researcher.

R19. The research recommended by the Wellington School of Medicine Report (Hales et al. 2004) should be carried out, if this is still technically feasible. See also R8.

3.0 Legislation and decision-making

3.1 The Biosecurity Act

The need to amend the powers granted under several sections of the Biosecurity Act has already been addressed above. There may also be a need to review the Biosecurity Act more broadly. The Act appears to be premised on the assumption that biosecurity measures primarily impact upon the primary-production sector and importers. There appears to be insufficient consideration both of the role of biosecurity in the protection of human health and the impacts of incursion responses on urban populations.

In particular, compensation under the Act can be made only for "damage to or destruction of a person's property" or "restrictions…on the movement or disposal of a person's goods" (s162A). While this may seem justified when biosecurity measures are seen as primarily affecting farmers,

forestry owners and importers, it is clearly inadequate to address a situation where those bearing the primary burden of a biosecurity response are urban residents. We heard testimony from residents who incurred very significant costs for medical care, self-evacuation, missed days at work, loss of employment and loss of self-owned businesses. They have been told that these costs cannot be reimbursed because it is not permitted to reimburse such costs under the Biosecurity Act. Nor is it permitted to compensate people for damage to their health.

More generally, the lack of recourse experienced by the community affected by the PAM programme highlights the dangers of the powers granted by the Biosecurity Act in the New Zealand political context. The New Zealand political system is unusual among democratic systems for its lack of checks on the executive. Its legislature is unicameral, not bicameral; its governmental is unitary, not federal. There is no constitutional court able to invalidate legislation. And the Bill of Rights is not binding on the government. In this context, the granting of powers as far-reaching as those granted under the Act to individuals not accountable to those who may be affected is unacceptably incautious and unprotective of the rights of New Zealanders.

R20. Section 162 of the Biosecurity Act should be amended to account for the impacts of biosecurity programmes on urban populations, including changes to the provisions for compensation to recognise the full array of harms that can be inflicted by biosecurity measures.

R21. The Biosecurity Act should be reviewed by the Human Rights Commissioner and the Justice and Electoral Select Committee in order to ascertain whether it is compatible with an acceptable level of protection of the rights of New Zealanders.

3.2 Biosecurity decision-making

It must be recognised that many biosecurity decisions are not technical in nature, but fundamentally political. That is, they concern whose interests will be protected and to what degree, who will pay the cost of that protection, and who will bear the risks. It cannot and should not be expected that biosecurity authorities' answers to these questions will simply be accepted by the public at large as being in "the national interest." The process of answering these questions, of setting priorities and making decisions, must be transparent, and must take into account a wider range of interests, views and knowledge than was the case in the PAM programme. There must therefore be genuine opportunities for potentially affected communities to be involved in biosecurity planning and decision-making. While this is not always easy, it is essential. There is considerable research that can be drawn upon when designing appropriate processes. For example, we heard testimony from Dr Richard Anstiss, (Sub 89) who has been involved in designing and implementing such processes (see Anstiss, 2007).[19]

3.2.1 A note on the precautionary approach

The need to employ a precautionary approach in biosecurity has been raised in two different respects. It was raised by those providing testimony in relation to the human-health impacts of incursion responses. For example:

> The precautionary principle should be applied to all aspects of an intended biosecurity programme. The precautionary principle is an internationally recognised method of

[19] In the interests of transparency, Dr Joanna Goven declares that she is involved in researching processes that can be used to enable wider participation in biosecurity decision-making.

dealing with uncertainty when scientific knowledge is incomplete – as it obviously was with the aerially spraying of Foray 48B. The principle states that:

> When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. (Submission 75)

Hales (2004b) applies the precautionary approach, from an epidemiological perspective, to the case of aerial spraying with Foray48B.

> In this example of aerial spraying of a biological insecticide, communities have been exposed to an agent that is believed to be safe, based on conventional risk assessments. The active ingredient is derived from a ubiquitous soil organism that is not known to be pathogenic, and quality control procedures prevent contamination by unwanted bacteria or toxins. Controlled epidemiological studies have not shown a significant increase in symptoms in exposed communities. The spray has not been shown to be unsafe, therefore it is [treated as] safe to continue spraying. Yet, as a consequence of allowing experts to determine the legitimate scientific issues for enquiry, regulatory agencies have dismissed a consistent pattern of self-reported symptoms across numerous studies.
>
> Alternatively, consider a precautionary approach. Communities complain of symptoms that are consistent with the effects of bioaerosol exposure. How do we reconcile this insight with the negative results of epidemiological studies? All of the published epidemiological studies have limitations, including subjective or potentially biased assessment of health effects, potential or actual exposure of control groups, and limited duration of follow-up. In particular, the largest of the community surveys included only 500 participants in "exposed" and "unexposed" groups. These studies have limited ability to detect effects that occur in a small proportion of exposed people. …
>
> The level of bioaerosol exposure that has been shown to cause occupational disease is higher than that typically experienced by communities exposed to Bt products in aerial spraying program. However, since the most sensitive individuals tend to avoid occupations that lead to bioaerosol exposure, dose-response relationships from studies of workers may not give a true picture of effects in communities. The community could be forgiven for concluding that the spray has not been shown to be safe, therefore it is unsafe to continue spraying.
>
> It would be prudent to avoid aerial spraying of biological insecticides over populated areas until the results of detailed follow-up of exposed populations are available….

The precautionary principle has also been raised by the Parliamentary Commissioner for the Environment (PCE) in relation to the management of threats to ecosystems.

> A precautionary approach to biosecurity risk management is needed in relation to potential risks to indigenous flora and fauna and marine ecosystems where the information needed to make informed decisions is limited, uncertain or does not exist. (p 11)

The precautionary approach is explained within the PCE report as follows:

> The precautionary approach, in the context of environmental protection, is an approach to decision-making that adopts a conservative approach when the relevant information needed to make an informed decision is limited. A widely accepted definition is: 'where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation' (*United Nations Conference on*

> *Environment and Development, Rio De Janeiro, Brazil, June 1992 [Agenda 21]).* (p 40)

The PCE also notes the limitations of the risk-assessment approach used by MAF:

> MAF's risk analysis, based on internationally agreed methodologies and a scientific approach to justify its risk assessments, is suitable for assessing risks to primary production and export market access but is not adequate for assessing risks to ecosystems, including indigenous flora and fauna. This is particularly so where host testing has not been carried out on indigenous species and the impacts, including potentially irreversible ones, are uncertain. In such situations the precautionary approach (as defined in Agenda 21) is more appropriate, and involvement by DoC in the assessment and decision-making processes is essential. (p 40)

It is important to note here that there is potentially a conflict, or at least a tension, between applying the precautionary principle to health impacts of incursion responses and applying the precautionary principle to decisions regarding responses to threats to the environment, particularly indigenous flora and fauna. However, this tension cannot be resolved by assigning the decision to MAF. Rather, the discussion above highlights two points:

- The conventional risk-assessment approach used by MAF is not suitable for informing decisions involving health and environmental concerns; and
- The complex array of needs and interests involved in biosecurity decisions requires that a diverse set of "stakeholders", including representatives of potentially affected communities, have meaningful input into decision processes.

R22. The shortcomings of conventional risk-assessment methods in relation to health and environmental impacts should be acknowledged and efforts made to develop and implement methods that are better able to consider these impacts. See also R9.

R23. Biosecurity decision-making should be recognised as being political rather than solely technical, in the sense that it involves decisions regarding whose interests will be protected and to what degree, who will pay the cost of that protection, and who will bear the risks. Biosecurity decision processes should thus be made transparent to the public and should take into account a wider range of interests, views and knowledge than has been the case until now. See also R4.

FINDINGS
PART 2 *by Prof. Romeo Quijano* [20]

Health Effects of the Foray 48B Aerial Spraying in New Zealand

A major question that needs to be answered by the Inquiry is whether or not the aerial spraying of Foray 48B resulted in adverse health effects on the people exposed to the spraying.

To answer this major question, several other questions need to be considered - (ten guide questions in establishing the association between the exposure to the aerial spraying and the occurrence of adverse health effects).

1. Did the adverse effects indeed occur?
2. Were the people who exhibited adverse effect/s exposed to Foray 48B?
3. Can the adverse effect/s be reasonably expected from the known characteristics of the sprayed formulation?
4. Is there temporal congruence between the exposure and the adverse effect/s?
5. Is there a correlation between the amount/frequency of exposure to the severity, duration and frequency of illness episodes/adverse effect/s?
6. Is there consistency in the reports of occurrences of adverse effects and exposure?
7. Is there any specific finding among the exposed people that is attributable to a specific chemical in the sprayed formulation?
8. Are there no other causes or explanations for the observed adverse effects that would make it unlikely for the suspected formulation to be the culprit?
9. Are the sources of information on the question of adverse effects and exposure credible?
10. Is the association between the exposure and adverse effect/s strong enough to make a conclusion?

The following findings and discussion are based mainly on the written and oral testimonies of 163 individuals who claimed to have suffered adverse health effects as a result of the aerial spraying. There were a total of 72 persons who appeared before the commissioners during the People's Inquiry and were thus available for questioning and appraisal of the credibility of their testimonies. Other sources of information and evidence, however, included various written reports relevant to the aerial spraying issue, published scientific information on the identified ingredients in the Foray 48B spray formulation, other sources of information such as relevant official reports and documents available on the internet after a critical appraisal of their relevance and usefulness, interviews with key informants and informal discussions with relevant groups and individuals.

The above sub-questions will now be examined individually.

4.1 Did the adverse effects indeed occur?

4.1.1 Testimonial evidence

The best proof of occurrence of adverse health effect is the verbal testimony of the affected person himself/herself. This is the most direct way of establishing whether an adverse effect happened or not. In clinical medicine, this is the most important evidence which is often

[20] Professor, Dept of Pharmacology and Toxicology College of Medicine, Univ of the Philippines. Member of the National Research Council of the Philippines and the Philippine Soc of Clinical & Occupational Toxicology. .

sufficient for the physician to establish a diagnosis and institute a medical intervention. Except on relatively rare occasions and unless there is a strong reason to believe otherwise, the patient is presumed to be telling the truth in so far as his feeling of ill health is concerned. The most competent, credible and reliable source of information pertaining to what actually happened to a person is the affected person himself or herself; no one else could better describe the signs and symptoms, illness, or the adverse effects. It is for this reason that, in clinical medicine, the physician gives primary importance to what the patient says about his illness, sometimes even overriding laboratory examinations.

For example, when a person comes in for consultation and complains of episodes of "difficulty of breathing", the physician cannot just dismiss the complaint as "psychological" when a chest x-ray or a lung function test turns out to be normal. The physician should always be on a lookout for plausible abnormality that may be undetected by laboratory examination. Even in cases where complaints may be considered "psychological" in nature, very often these cases may reflect behavioural manifestations of an underlying biological abnormality or illness. The person giving the testimony, however, must be deemed competent. The following criteria need to be fulfilled for a witness to be competent.

The witness must indicate that the testimony was done voluntarily and truthfully. There should be no coercion or duress in whatever form nor should there be any undue enticement or promise of reward to elicit desired information. The witness should be made to affirm that his/her statements are truthful and are in accordance with what he/she actually felt, experienced, observed, or perceived to the best of his/her recollection of events. The witness must have personal knowledge about what he/she is talking about, having perceived something with his senses that is relevant to the subject of his/her testimony. The witness must have a recollection of what he/she perceived, and lastly, the witness should be able to communicate what he/she perceived.

Aside from the direct verbal testimony of the affected person, the indirect testimony of another person who is able to describe what happened to the victim is also important. Indirect testimonial evidence can be obtained from the spouse, parents, or anybody close to the victim and who has personal knowledge of what happened to the victim. This witness now expresses what the victim had experienced, felt, thought, or perceived and his/her appreciation of facts or events. Indirect testimonial evidence can be obtained to corroborate direct testimonial evidence. There was a great deal of indirect testimonial evidence gathered during the hearings, mostly from immediate relatives of the affected persons. In addition, the testimonies of expert witnesses, including a Physician in the community, corroborated the testimonies of the patients and believed that the patients' complaints were largely due to the aerial spraying.

All the witnesses who came forward and provided direct and indirect testimonies at the Peoples Inquiry were all competent witnesses, having fulfilled all the criteria mentioned above. There was no reason to doubt that they were telling the truth. They were spontaneous, coherent, consistent, and sufficiently knowledgeable about the details of their symptoms/illnesses. Their behaviour, including their expressions of emotions, during the hearings were consistent with what is medically expected. There were no indications of exaggeration or fabricated symptomatology.

Most of the signs and symptoms described by the testimonies (see Appendix: 3 Table of Health Effects) were respiratory in nature, which is what is to be expected from the inhalation exposure to the aerially sprayed Foray 48B pesticide formulation. Of the respiratory complaints, the most common were asthmatic symptoms, consistent with the intrinsic hazard associated with the Bt (Bacillus thuringiensis) insecticidal crystal proteins, vegetative cells and spores in suspension known to be present in the Foray 48B spray formulation.

The next most common adverse health effects were neurological (mainly headaches, memory loss and dizziness) and skin reactions (mainly skin rashes). Again, these symptoms and signs, though non specific, are to be expected from exposure to the known ingredients of the Foray 48B pesticide formulation (see Appendix 4).

Illustrative examples can be found in oral and written testimonies submitted to the Inquiry.

While these testimonies are not, by themselves, sufficient to establish a cause and effect relationship between the occurrence of the adverse health incidents and the exposure to the aerial spraying, they provide a strong basis for concluding that the aerial spraying is a major causative factor if the other pieces of evidence are taken into consideration (i.e., a positive answer to most of the ten guide questions posed earlier in establishing the association between the exposure to the aerial spraying and the occurrence of adverse health effects).

4.1.2 Physical evidence

Physical evidence can corroborate the testimony of the affected person and can establish that an illness or adverse effect indeed occurred. The presence of the victim himself is, of course, physical evidence. A photograph or video footage of the patient showing signs and symptoms or skin lesions known to be caused by pesticides is also physical evidence.

All those who came forward to testify in the hearings were the victims themselves and their immediate relatives or close friends who had direct knowledge of the adverse incidents. Some photographs and video footages were presented to support the occurrences of illnesses.

4.1.3 Documentary evidence

Documentary evidence consists of written documents (relevant to establishing the occurrence of illness or adverse effects) such as statements, affidavits, scientific/technical reports, publications, notes, medical, laboratory and other records. A signed, written testimony of the victim himself is the best documentary evidence. A medical record of the victim (who gave testimonial evidence that he was poisoned by pesticide) showing a diagnosis of pesticide poisoning by the attending physician, especially if there is laboratory confirmation or corroboration of the physician's diagnosis is a particularly strong type of evidence.

A consultation record of the victim at a primary health care center describing his signs and symptoms but without the benefit of being diagnosed by a physician or any laboratory analysis is also physical evidence that the adverse effect/s occurred. Another example might be a school record of a child showing consistently poor performance and absenteeism due to illness. Documentary evidence is real evidence, the existence or characteristics of which are relevant and are likely to affect the determination of a matter or issue in question. To be useful, documents must be relevant, material, and competent.

For example, a written and sworn testimony of the victim upon which a complaint against the pesticide user is based is real evidence both to prove its terms and that it was executed by the victim. There may be a question as to whether particular photographs are only demonstrative in nature or whether they have evidentiary value by themselves. This issue may be particularly important when there is no witness who could confirm what the photograph shows.

Several types of documentary evidence were submitted to the Commissioners of the People's Inquiry. There were signed testimonies, video documentation and photographs of skin lesions and

other signs and symptoms, medical records and other documentary evidence corroborating claims of adverse health effects related to the spraying of Foray 48B.

4.1.4 Laboratory evidence

Results from the medical laboratory such as x-rays, pulmonary function tests, blood and urine tests, and other laboratory procedures that tend to provide confirmation of the occurrence of illness or adverse effects were shown to the Commissioners by the complainants. However, there was no laboratory evidence that showed a definitive cause and effect relationship between the exposure and the illness episodes. No laboratory test to determine the presence of antibodies to BT toxin in the serum of the complainants was done. Neither was any biological nor environmental sample tested for the presence of toxic chemicals suspected to have been responsible for the adverse effects observed. Nevertheless, the laboratory evidence presented supported the other types of evidence showing real illness episodes that are most likely associated with exposure to the spraying of Foray 48B. The overall evidence showing the association of illness episodes and exposure to pesticides may be sufficient without such laboratory tests.

4.1.5 Geographic consistency

Geographic consistency refers to the congruence of the observed illness episodes and the pesticide exposure area. It may happen that an individual describing an acute illness episode may have actually been outside the area of pesticide use during the time of occurrence of acute symptoms attributed to pesticide exposure. It is not uncommon that some residents within the pesticide exposure area actually work far away from their community and their illness episode may be explained by some other toxicants or causative factors.

Our investigation shows that the illness episodes were occurring within the pesticide exposure areas and there was consistency in the reports of adverse effects with the geographic location of scheduled sprays and spray drift areas. Even when the illness described was of chronic nature, geographic consistency was evident.

4.2 Were the people who exhibited adverse effect/s exposed to Foray48B?

The elements constituting proof of exposure are essentially the same as in proof of illness/adverse effects, except that the focus of these elements is exposure to the chemicals, rather than the illness or adverse effects.

Those who have seen, felt, or experienced through their senses the spraying of pesticides in their areas provided direct testimonial evidence to prove pesticide exposure. People in the pesticide exposure areas knew they were being exposed to pesticides and were in fact informed by MAF that they will be subjected to pesticide exposure, although they may not know exactly what pesticides are being used and were told that the exposure would not cause any adverse health effects. They saw with their own eyes the helicopter/airplane passing over the roofs of their houses emitting a mist of pesticide which caused coughing and difficulty of breathing and itchiness or stinging sensation in their eyes and on their skin. They recognized the bad smell of the sprayed substance, sometimes causing them to feel dizzy, nauseous or even to vomit. All these constituted direct testimonial evidence of pesticide exposure, which is sufficient to prove beyond reasonable doubt that, indeed, people were exposed to Foray 48B.

There is no need for further discussion on the matter of exposure since there is no dispute to the fact that people were exposed to Foray 48B.

4.3 Can the adverse effect/s be reasonably expected from the ingredients and characteristics of the sprayed formulation?

4.3.1 Biologic plausibility, mechanism of toxicity and hazard characteristics

Biologic plausibility refers to the reasonable likelihood that a pesticide/substance will cause harm to a human being due to the inherent characteristics of the substance/pesticide and the overall experience of adverse effects from exposure to it or to closely related chemicals. In other words, the adverse effects can be expected from whatever information is known about the pesticide. Most of the information necessary to evaluate this type of evidence comes from scientific and other types of publications.

For many chemicals, knowledge of the chemical structure and metabolic pathways give an indication of the potential toxicity. Several biologic structures, receptors, processes, etc, are known to be susceptible to certain chemical configurations or structural elements. A certain reactive element in the chemical structure maybe a known binder of certain types of receptors or of critical endogenous transmitters of biologic information such as hormones.

Hazard characteristic is the inherent capacity to cause harm. Pesticides are inherently hazardous since they were purposely introduced to kill biologic organisms. The numerous, interconnected and complex biologic structures, processes, and units that are remarkably similar among all living organisms, even among seemingly very different kinds, make it absurd to claim "selective toxicity" in one organism and innocuousness in another. For some chemicals, there is available scientific data to allow characterization of the degree of potential to cause harm, a hazard classification. For example, the WHO classifies pesticides into Class I (Extremely/highly hazardous), Class II (Moderately hazardous), Class III (Slightly hazardous), and Class IV (Not considered hazardous under recommended conditions of use). This classification, however, refers only to acute toxicity. This is a severe limitation since the potential to cause harm is greater with respect to chronic toxicity compared to acute toxicity and there is no pesticide that is not hazardous. It is only the degree, extent and the probability of harm that needs to be the subject of inquiry, not whether the pesticide is hazardous or not.

For many pesticides, the claim of safety is often based on the fact that no adequate toxicologic studies and hazard assessments have been done. Nevertheless, given the voluminous scientific and empirical data on the hazardous nature of pesticides that have been introduced for the past several years, any newly introduced pesticide and any old pesticide with little or no toxicologic information should be considered likely to cause harm until proven otherwise. Even in the absence of prior scientific data on a particular pesticide, if it belongs to the class of pesticides with known adverse effects, then that particular pesticide can be reasonably presumed to act in a similar manner as the other pesticides belonging to same class. For a pesticide, the biologic plausibility to cause harm is always present. What needs to be done is to grade the degree of biologic plausibility to cause harm, e.g., high, moderate, and low. It must be noted that the grading here does not necessarily refer to the extent or seriousness of harm but only to the plausibility or likelihood of harm.

The ingredients examined below are reliably identified as part of the Foray 48B formulation in documents released by the Government under OIA. See Appendix 4 and Submission 75. Note:

Benzisothiazolin-3-one (BIT) was identified as a new ingredient in the Foray 48B formulation substituted in the second year of the programme.

4.3.1.a Bacillus thuringiensis var Kurstaki

The active ingredient of the pesticide formulation, Foray 48B, used in the aerial spraying for the Painted Apple Moth is the soil bacterium Bacillus thuringiensis var kurstaki in the form of insecticidal crystal proteins (ICP also called delta endotoxin or Bt toxin), vegetative cells and spores which are in liquid 'suspension'. The ICP is activated and binds to the caterpillar's gut lining, leading to its death. Presumably, this mechanism of toxicity is not present in mammals, including humans. This is the main basis for the argument that Bt is 'safe' for humans. This argument does not, however, negate the biologic plausibility of Bt toxicity to humans. There is no real 'selective toxicity' for toxins since there are numerous plausible mechanisms of toxicity, aside from the known main mechanism. Recent scientific evidence, for example, shows that the Bt toxin can also bind to mammalian gut receptors and that Bt toxin expressed by genetically modified crops can damage the intestinal mucosa and other organs in mammals (Vasquez et al. 2000; 1999a; 1999b;)

Additionally, Bt toxin being protein in nature, has the intrinsic capability of inducing immunologic response. In fact, the characteristic of the Foray 48B formulation itself gives an indication that it may induce allergic reactions since it contains the fermentation solids and solubles which are the residues of the medium in which the Btk is grown. Furthermore, it has been noted that Bacillus thuringiensis, like other bacteria, may produce during the vegetative growth and sporulation stages "an assortment of antibiotics, enzymes, metabolites and toxins that are biologically active and may have effects on both target and non-target organisms." For example, Damgaard (1996) reported that vegetative cells grown from spores of commercial Bt products excreted a diarrhoeal enterotoxin and Tayabali & Seligy (2000) found that vegetative Bt obtained from commercial products caused extensive damage to cultivated insect cells. Shinagawa (1990) investigated a number of Bacillus cereus (Bc) and Bt isolates with an immunological assay and concluded that 43% of the Bt isolates had the same level of enterotoxins as enterotoxic Bc. Bacillus cereus is often implicated in enterotoxic disease outbreaks and the close association between Bt and Bc does not discount the plausibility that Bc like effects might occur with exposure to Bt.

4.3.1.b Benzoates (Benzoic acid and methyl paraben)

Benzoic acid and methyl paraben have been identified among the "other ingredients" in Foray 48B. Although the exact concentrations were 'blanked out' in the OIA document (see Appendix 4), it is most likely in the same magnitude as what is usually used when these chemicals are used as preservatives (0.5% and 0.8%, respectively). Being an organic acid, benzoic acid can be expected to cause direct irritation to the skin and other tissues, especially, the eye, respiratory tract and mucous membranes. A low pH, in fact, is required to maintain its efficacy as a preservative. Although there is a wide range of results from mostly non-standardized tests using various scoring systems, it can be concluded that benzoic acid is slightly irritating to the skin and irritating to the eyes (INCHEM 2000).

Methyl paraben, being a member of the same benzoate group of chemicals as benzoic acid, shares many of the toxicological properties of benzoic acid, although parabens are less acutely toxic compared to benzoic acid. Benzoate-sensitive individuals may also react to parabens because their metabolism mimics that of benzoates – a type of cross-reactivity. Parabens can cause skin irritation and contact dermatitis in individuals with a paraben allergy (Nagel et al 1997).

One scientific study has identified parabens in samples of breast tumors, leading to a tentative, but controversial, conclusion that parabens in underarm deodorants may influence breast cancer risk (Darbre et al. 2004). Animal experiments, showing that parabens display weakly oestrogenic activity, however, provide some support for this argument (Byford et al. 2002).

4.3.1.c Benzisothiazolin-3-one (BIT)

This is a relatively unknown compound which is used as an antimicrobial and antifungal additive. As a liquid, BIT is applied during the manufacturing process at a rate of 0.03-1.0% of the weight of the final product. However, the concentration of BIT as an additive in Foray 48B has not been disclosed. The acute health risks from exposure to BIT are potentially significant due primarily to its corrosive nature to the skin. The California Department of Pesticide Regulation evaluation of the acute toxicity of a formulation of BIT indicated that exposure to BIT can cause irreversible damage to the skin. "The product label bears a warning identifying the product as being corrosive to the skin and the 'signal word' is DANGER". The results from one of two chromosomal aberration studies on BIT indicate a possible adverse health effect. (CDPR. 2004). However, available mutagenicity tests were negative. (Riggen et al. 1983)

4.3.1.d Propylene glycol

Propylene glycol is used as an "inert" ingredient in many drug and pesticide formulations including Foray48B. Propylene glycol has an irritant effect on direct contact with eyes, mucous membranes and possibly after prolonged contact with skin. It can also cause skin sensitization. It is noted that Propylene glycol causes "CNS depression similar to that caused by ethanol but it is only one-third as potent. Cardiotoxic effects include arrhythmias and cardiac arrest" (INCHEM 1991).

4.3.2 Evidence of harm in other species

The plausibility of harm to humans is made more likely by evidence of harm in other species, especially in animals. For many pesticides, there is already a lot of scientific and popular information regarding the adverse effects in various kinds of animal species such as birds, fishes, rodents, frogs, reptiles, etc. Certain classes of pesticides are associated with particular types of adverse effects, such as reproductive abnormalities even at very low levels of exposure to organochlorines, nerve degeneration and fishkills with organophosphates, eggshell thinning with DDT, and many more. Documentation of similar adverse effects in animal species in the pesticide exposure area further strengthens the case against the pesticide/s.

Empirical data should also be considered. Testimonies of local residents knowledgeable about the changes in the environment as a result of exposure to pesticides should be given due attention. Effects on plants and other organisms should also be noted since these add on to the overall evidence of harm.

4.3.2.a Bacillus Thuringiensis var Kurstaki

Although most of the available studies in the scientific literature do not show significant toxicity of the Bt strain in the animals tested, there are some studies that indicate some potential adverse effects. For example, a study in which sheep were repeatedly treated with two commercial Btk formulations for 60 days, loose stools in sheep exposed to one Btk formulation was found. There was also microscopic evidence of moderate to marked lymphoid hyperplasia of the Peyer's patches in the cecum and colon of two of the six sheep

treated with one Btk formulation and in one of six sheep treated with the other Btk formulation (Hadley et al. 1987)

Data that indicated toxicity producing (in extreme cases) 100% mortality in mice following intraperitoneal injection of $\geq 10^8$ cfu of certain Bt subspecies, was summarized by McClintock et al (1995). As death generally occurred shortly after injection, an infectious process was not indicated. Even though the basis for the observed toxicity was not understood, these findings were not considered as evidence of a hazard associated with Bt products. Although the authors, for some reason, did not consider the above findings clinically significant, these findings indicate that exposure to Btk formulation can result in adverse effects in mammals.

In a review of studies of dermal exposure to Bt in rabbits, it was concluded that Bt was not toxic or pathogenic to rabbits. However, it was noted that mild irritation was observed in some cases. Mild ocular irritation was also observed. Another study showed that rabbits that received the laboratory culture of Bt experienced severe conjunctival congestion and discharge (Seigel et al. 1987). Although the authors attributed this to the physical nature of the inoculum, this does not rule out the plausibility that the adverse effects observed were real. Again, these findings indicate that dermal and ocular irritation can happen.

In another experiment (Seigel et al. 1987), mice were injected with 3.4×10^7 cfu of a washed commercial Bti formulation. Three immune compromised mice but none of the non-immune compromised mice died. However, the mortality was attributed to injury caused by injection. Bti was still recovered in the spleen of the 39 remaining mice 49 days after injection. In a companion experiment, 26 out of 42 athymic mice injected with the same dose of a washed commercial Bti formulation, died within 5 to 10 hours after injection. Autopsy did not reveal the cause of death. Bti was also recovered in the spleen of the surviving mice 49 days after injection. Again, the authors did not consider these findings clinically significant.

One could argue that many of the studies done presumably to assess the safety of the Bt formulations were inadequate and were not designed appropriately. Where some adverse effects were observed, these effects were either completely ignored or dismissed as clinically insignificant. The basis of such judgement, in most instances, was not clear.

4.3.2.b Benzoates

In an inhalation exposure study, an increased incidence of interstitial inflammatory cell infiltrate and interstitial fibrosis in the trachea and lungs of treated animals compared with controls was seen. "A concentration of $\geq$ 250 mg/m^3 resulted in upper respiratory tract irritation, as indicated by inflammatory exudates around the nares, and significantly decreased absolute kidney weights in females. In the highest dose group, one rat per sex died, and the body weight gain was significantly decreased in males and females compared with controls. In addition, a significant decrease in platelets (males and females), absolute/relative liver weights (males), and trachea/lung weights (females) was noted" (Velsicol Chemical Corp. 1981).

Two studies of rats given 1.5% benzoic acid via diet (approx 750mg/kg body weight per day), showed "a reduced weight gain with decreased feed intake after dosing over 18 months. In one of these studies, mortality was increased (15/50 rats of both sexes versus 3/25 in controls) (Marquardt P. 1960). Available *in vitro* studies with benzoic acid gave no indications for genotoxic effects, whereas *in vivo* studies were not identified." Sodium benzoate was also inactive in bacterial test systems, whereas tests with mammalian cells

gave consistently positive results. In addition, in an *in vivo* study with sodium benzoate (dominant lethal assay in rats), a positive result was obtained. As a result, a genotoxic activity of sodium benzoate cannot be ruled out entirely at present (INCHEM 2000).

In a study with rats, doses of 4% or 8% via diet (uptake of 1875 or 965 mg/kg body weight per day) induced severe maternal toxicity (no weight gain/loss in body weight, increased mortality) and were associated with embryotoxic and fetotoxic effects as well as malformations. However, the authors suggested that the effects on the dams and fetuses at $\geq$4% dietary levels were caused by reduced maternal feed intake, leading to malnutrition." (Onodera et al. 1978).

It is clear from the above discussion that exposure to benzoic acid (or its salt form, sodium benzoate), can cause various adverse effects in mammals and possible carcinogenic and teratogenic effects cannot be ruled out.

4.3.2.c Benzisothiazolin-3-one (BIT)

1,2-Benzisothiazolin-3-one has strong irritating or corrosive properties. A solution of 1% 1,2-benzisothiazolin-3-one has been reported to cause strong irritation of the guinea pig skin (Alomar et al. 1985). In the rabbit eye 12.5% 1,2-benzisothiazolin-3-one was a strong and severe irritant (DFG. 1989).

The sensitizing potential of 1,2-benzisothiazolin-3-one in animals was evaluated using the guinea pig maximization test of Magnusson and Kligman and was found to be a weak sensitizer. Three of 20 guinea pigs exhibited sensitization with 0.2% 1,2-benzisothiazolin-3-one in aqueous propylene glycol (Andersen & Hamann. 1984). Using the murine local lymph node assay 1,2-benzisothiazolin-3-one were able to induce a significant proliferative response at 10% (Botham et al. 1991).

4.3.2.d Propylene glycol

Renal and hepatic damage have been reported in animals (INCHEM 1991). In laboratory tests of animals exposed during pregnancy, propylene glycol has caused fetal toxicity and embryo death (Fisher Scientific 2000). In another study, it was found that exposure to propylene glycol resulted in non-neoplastic lesions of the kidney and may have increased renal tubular neoplasms in male rats. The study also showed that propylene glycol produced increases in hepatic tumors in male and female mice (Doi et al). In a subchronic nose-only inhalation study of propylene glycol in rats, Suber, RL et al (1989) found statistically significant differences between the treated and control groups in certain haematological parameters, serum enzyme activities, other serum chemistry parameters and organ weights although no clear dose-response relationships were demonstrated. The study also found that exposure to medium and high concentrations of propylene glycol caused nasal haemorrhage and ocular discharge in a high proportion of animals, possibly as a result of dehydration of the nares and eyes.

4.3.3 Evidence of harm in humans

4.3.3.a Bacillus thuringiensis var kurstaki

Although human health risks to pesticides containing Bacillus thuringiensis (Bt) have been apparently minimal according to usual "risk assessments" by official bodies such as the USEPA, exposure to Bt sprays may lead to allergic skin sensitization and induction of IgE and IgG antibodies (Bernstein et al. 1999).

In addition to the implication that skin sensitization to Bt in pesticides could be a precursor of clinical IgE-mediated diseases, several aspects of this investigation may be relevant to other current health issues: immediate hypersensitivity induced by bacteria and transgenic foods engineered to incorporate pesticidal genes in their genomes. Today, large acreage of US crops like soy, corn, canola and others are genetically engineered (GE) to contain Bt in every plant cell and USDA has failed to evaluate the adverse health effects of large-scale Btk spraying on a population where people are likely consuming GE food crops and may be developing skin sensitization and immune reactions to Bt. (Carman 2006). There should be consideration of possibilities of cross-allergenic epitopes in an unrelated species such as B. subtilis because this organism or its products may occur in both occupational and non-occupational environments (Johnson et al. 1980; Bernstein 1972)

Field data have corroborated the above findings. For example Carman (2006) noted that "more than 500 people reported a range of health reactions including acute toxicity in Oregon, Washington state and Canada due to the large-scale aerial spraying of Btk although USDA claimed no adverse health effects". Monitoring studies also show that exposed people report a variety of health problems that they believe to be associated with Bt exposure. For example, during the Vancouver spray program, almost 250 people reported health problems, mostly allergy-like or flu-like symptoms (Green et al. 1990). During a Washington gypsy moth spray program, over 250 people reported health problems and 6 were treated in emergency rooms for allergy or asthma problems (Washington State Dept. Health 1993).

Even "studies" claiming "safety" of the Btk spray formulation (Foray 48B) provide evidence of harm. During the Operation EverGreen programme in 1996-7 the spray Foray 48B was aerially applied over parts of East Auckland. A health surveillance programme was undertaken by Aeraqua and a report of the findings was then made to MAF. Despite the fact that health symptoms attributed to the aerial spraying were reported by 375 people, the report concluded that "no adverse health patterns were found, once patterns were examined at a population level", and "among those medically reviewed, no individual was identified as having a significant adverse outcome attributable to the Btk spraying". (Aeraqua 2001)

In her detailed findings of the health risk and effects of this spraying Dr Meriel Watts (Watts 2003) noted that "The conclusions of this report support the findings of the pre-spray Health Risk Assessment (Auckland Healthcare & Jenner Consultants 1996a) co-authored by the same author, Dr Francesca Jenner/Kelly of Aeraqua Medicine, formerly of Jenner consultants. It also confirms the second health risk assessment carried out during the programme (Auckland Healthcare 1997). This HRA acknowledges reports, during and after the 1996/97 spray programme, of "minor eye, throat and skin irritations and headaches", but concluded "we found no evidence of a causal association with Foray 48B spray"." This conclusion is evidently inconsistent with the available empirical and scientific evidence at hand.

Dr Watts further notes that "in this succession of reports, involving some of the same authors, there is a discernible tendency to confirm previous findings, rather than to question them in the face of contradictory community reports" and, it should be added, existing scientific evidence showing the plausibility of harm.

The report from Aeraqua did not state any possible or probable alternative cause of the symptoms reported by the 375 people that appeared to be associated with the spraying except to say that these complaints were largely "psychological", a diagnosis well known among medical experts as a "waste basket diagnosis".

What is clear, however, is that people were exposed to the pesticide formulation Foray 48B and that they have experienced adverse health effects which they attributed to the aerial spraying, which was the most likely cause given the existing empirical and scientific evidence.

In addition, published and unpublished reports of toxicity from exposure to genetically modified crops containing the Bt gene corroborate the above evidence (Bernstein et al. 1999 & Traavik & Heinemann. 2006)).

4.3.3.b Benzoates

Cases of urticaria, asthma, rhinitis, or anaphylactic shock have been reported following oral, dermal, or inhalation exposure to benzoic acid and sodium benzoate. The symptoms appear shortly after exposure and disappear within a few hours, even at low doses. Several studies (e.g., oral provocation tests or patch tests) are available, which have been performed with small groups of patients suffering from urticaria, dermatitis, asthma, and Melkersson-Rosenthal syndrome. In most of these studies, atopic individuals have demonstrated reactions to oral and dermal challenge with benzoic acid or sodium benzoate. In a study with 2045 patients of dermatological clinics, only 5 persons (approximately 0.2%) showed a positive reaction in patch tests (Brasch et al. 1993), while 34 of 5202 patients (approximately 0.7%) with contact urticaria reacted positively (Broeckx et al. 1987)

Some studies suggest asthma is an unusual clinical manifestation of benzoate sensitivity. A study (Freedman 1977) claimed that benzoate is a common precipitator of asthma episodes in asthmatics, while Rosenhall (1982), found 8% of benzoate challenges resulted in either asthma or rhinitis. There are conflicting estimates of the prevalence of asthma reactions to benzoates. Hannuksela (1987) estimated it to be 11.5%, while Weber (1993) documented the prevalence in patients with perennial asthma to be closer to 2%. A case reported by Balatsinou et al. (2004) demonstrated a worsening of asthma due to benzoate-containing anti-asthmatic drugs. The researchers discussed the fact that drug and food additives are known to induce pseudo-allergic reactions such as urticaria, eczema, asthma and rhinitis. These reactions are often under-diagnosed, above all in allergic patients treated with additive-containing drugs.

In a report on the evaluation of the safety of benzoic acid and related chemicals by the Cosmetic Ingredient Review Expert Panel, Washington, DC, it was stated that “clinical data indicated that these ingredients can produce nonimmunologic contact urticaria and nonimmunologic immediate contact reactions, characterized by the appearance of wheals, erythema, and pruritis. In one study, 5% benzyl alcohol elicited a reaction, and in another study, 2% benzoic acid did likewise. benzyl alcohol, however, was not a sensitizer at 10%, nor was benzoic acid a sensitizer at 2%. The available safety tests are not considered sufficient to support the safety of these ingredients in formulations where inhalation is a route of exposure (Nair 2001).

A double-blind placebo-controlled study (Pacor et al 2004) attempted to evaluate the prevalence of hypersensitivity to additives in a group of subjects affected by persistent rhinitis. There were 226 subjects (76 males, 150 females) between 12-60 years (mean age of 40.2 years). After a 1 month additive-free diet, subjects were placed on a 2-week additive-rich regimen, and daily symptoms were examined. It was found that 8.8% of patients reacted to sodium benzoate with typical symptoms of rhinitis and a 20% reduction in Nasal Peak Inspiratory Flow Rate. These patients also showed improvement of rhinitis with an additive-free diet, with 2.6% of them becoming symptom-free.

All the above information indicates that the benzoates in Foray 48B (especially benzoic acid) are likely causative or aggravating factors in the various hypersensitivity symptoms, including asthmatic attacks or exacerbations, observed in the population exposed to Foray 48B

4.3.3.c Benzisothiazolin-3-one (BIT)

In routine patch testing 1% 1,2-benzisothiazolin-3-one in alcohol gave weak irritant reaction in 30% of a total of 404 patients tested (Andersen & Hamann 1984). Concentrations from 0.1% 1,2-benzisothiazolin-3-one have been found irritating to the skin in clinical studies of 56 subjects (Chew & Maibach 1997). 1,2-Benzisothiazolin-3-one in 0.08 and 0.16% aqueous solutions produced some irritant responses when patch tested on a group of 25 healthy volunteers (Damstra et al. 1992).

There are numerous reports about humans being sensitized due to handling products containing small amounts of 1,2-benzisothiazolin-3-one. In several published case reports 1,2-benzisothiazolin-3-one has induced allergic dermatitis. The allergic effects appear from 0.01% 1,2-benzisothiazolin-3-one and have been confirmed in a series of patch test studies. The majority of cases are occupational exposure to 1,2-benzisothiazolin-3-one in cutting oils, paper, gum arabic, air fresheners, water softeners and paints (Freeman 1984; Alomar et al 1985; De Boer et al. 1989; Damstra et al 1992; Diaz et al. 1992; Sanz-Gallen et al. 1992; Cooper & Shaw 1998). According to Hopkins (1994), 1,2-benzisothiazolin-3-one possesses a fairly high sensitizing potential in man and it is significantly more active in the workplace than in the test laboratory in guinea pigs or mice. One case story from a detergent formulation factory has been reported on occupational asthma or rhinitis after exposure to 1,2-benzisothiazolin-3-one (Moscato et al. 1997).

4.3.3.d Propylene glycol

Several oral drug formulations contain propylene glycol as a solvent and may cause poisoning after repeated ingestion. When applied as a topical formulation it may occasionally irritate the skin and cause hypersensitivity reactions. Mild lactic acidosis has been reported in an infant treated topically with a cream for burns containing propylene glycol. Serum hyperosmolality occurred in patients with burns when large areas of damaged skin were covered with sulfadiazine cream containing propylene glycol. Eye irritation without further sequelae has also been reported. Generalized symptoms and signs of propylene glycol poisoning were reported after intramuscular or intravenous injections of drugs containing significant amounts of propylene glycol as a solvent (INCHEM 1991).

4.4 Is there temporal congruence between the exposure and the adverse effect/s?

During the Inquiry, particular attention was given to the sequence of events observed in the community. A description of the situation before the advent of aerial spraying of Foray 48B was elicited from the affected members of the community. They were able to give a fairly accurate and vivid description of what their community looked like at certain periods of time. They testified credibly that people were healthier before there was aerial spraying of Foray 48B in their area. Detailed description of the time relationship between the exposure to the pesticide and the appearance of illness/adverse event were elicited. However, since events have occurred for some time in the past, many witnesses had difficulties in precisely describing the time when the events occurred. Nevertheless, it was clear in all cases that the exposure to pesticides preceded the onset of symptoms of illness. Thus, the onset of illnesses/adverse events were congruent with the time of exposure to the aerial spraying.

The association between illness incidents/adverse effects and pesticide exposure was strengthened when information was elicited during the interviews that the withdrawal or reduction of the aerial spraying was followed by the reduction or disappearance of illness episodes/ adverse events and reintroduction of the aerial spraying was followed by a resurgence or recurrence of illness episodes or adverse effects. Several witnesses attested to this fact. This finding strongly indicates the cause and effect relationship between the illness episodes/adverse effects and exposure to aerial spraying of Foray 48B.

4.5 Is there a correlation between the amount/frequency of exposure to the severity, duration and frequency of illness episodes/adverse effect/s?

In general, for most chemicals, the greater the exposure, the greater would be the effect. It is therefore useful to determine, or at least have a reasonable estimate, of the amount and frequency of application of chemicals used in the exposure areas and the degree of exposure (duration, frequency and quantitative description of exposure) of individuals who developed illnesses or adverse effects. Similarly, there should also be a description of the severity, duration, and frequency of illnesses or adverse effects attributable to the pesticide exposure. Although in most exposure situations described, it was not possible to determine the actual amounts of chemicals used, it was possible to come up with reasonable estimates based on the interviews and available historical information and documentation.

Estimates of the severity of the illness episodes and adverse effects was done mainly through the interviews and a review of available documentation. The range of quantifiable illness/adverse effects matched with the range of estimates of exposure to the aerial spraying. The amount and duration of exposure correlated with the geographic distribution, incidence and severity of adverse events. This provides supporting evidence of the association between the observed illnesses and exposure to aerial spraying of Foray 48B.

It must be noted, however, that the demonstration of this correlation is not absolutely necessary to prove the association between illness and exposure to Foray 48B. The other types of evidence may be more than sufficient to indict Foray 48B as a cause of the observed illnesses and adverse effects. In addition, many illnesses and adverse effects (e.g., hypersensitivity reactions, cancer, endocrine disruption, reproductive toxicity) due to chemical exposure are not dose dependent and, therefore, a dose-response relationship may not be expected to be found.

4.6 Is there consistency in the reports of occurrences of adverse effects and exposure?

The occurrence of similar incidents in the past (occurring under similar exposure situations) provide additional evidence in pinpointing Foray 48B as the culprit. Earlier incidents related to Foray 48B and Bt exposure and historical data (from interviews, records, or reports) gave some elucidation of current observations. Past incidents which may have been casually dismissed due to lack of information that has only been available to the members of the community at the present time become clearer with the latest similar incidents of illnesses and adverse effects.

Similar occurrences of illnesses in other areas with similar exposure situations to pesticides have corroborative value. Data pertaining to similar occurrences in other countries is also available. For example, similar incidents of illnesses and adverse effects associated with aerial spraying of Bacillus thuringiensis formulation have also been observed in Canada and the US. The published reports regarding these incidents in other countries provide additional corroborative evidence to

the conclusion that the illnesses observed in the local communities in New Zealand are associated with the aerial spraying of Foray 48B.

Other corroborating evidence that adds to the consistency of association would include experimental evidence cited above showing similar mechanisms and profiles of toxicity that would explain the illnesses/adverse effects observed in humans. For example, experimental evidence of hypersensitivity reactions, skin, eye and mucosal irritation, and other toxicologic effects of the chemical ingredients in Foray 48B in animals and *in vitro* tests are consistent with field observations of increased incidence of cancer in pesticide exposed population.

4.7 Is there any specific finding among the exposed people that is attributable to a specific chemical in the sprayed formulation?

With some pesticides, it might be possible to demonstrate the presence of expected characteristic effects or the occurrence of unique abnormalities associated with exposure to particular chemicals. For example, paraquat is specifically associated with pulmonary fibrosis, a toxicologic effect not found with exposure to other kinds of pesticides. Similarly, organophosphates such as chlorpyrifos, dichlorvos, phosphamidon and mevinphos, are specifically associated with organophosphate induced delayed neuropathy. When such specific illnesses occur in the pesticide exposure areas, the particular pesticide or at least the class of pesticide responsible for such illnesses can be readily identified.

In the absence of specific illnesses identifiable with specific pesticides, the preponderance of effects expected of certain pesticides can indicate specificity of association. For example, in endosulfan sprayed community areas, the preponderance of neurotoxic effects, including cerebral palsy, convulsive disorders, and neurobehavioral effects found among the exposed population strongly indicate specific association with endosulfan exposure since these neurotoxic effects are expected from the known mechanism of toxicity of endosulfan and from previous scientific studies demonstrating such constellation of effects.

In the case of exposure to the aerial spraying of Foray 48B, all the symptoms and signs of toxicity observed among the exposed people were non-specific and cannot be specifically attributed to a single chemical. However, the preponderance of skin, eye and respiratory tract irritation and hypersensitivity indicate some specificity of association to the benzoates, BIT and the Bt toxin identified as ingredients in Foray 48B.

Specificity of association, however, is uncommon and is not necessary to be present to make a conclusion as to the association of adverse effects/illnesses and exposure to Foray 48B.

4.8 Are there other causes or explanations for the observed adverse effects that would make it unlikely for the suspected formulation to be the culprit?

The presence of other possible causes of the illnesses or adverse effects was investigated since the relative absence or weak presence of alternative explanations or causes would greatly strengthen the association of the illnesses/adverse effects observed with the exposure to the suspected culprit, Foray 48B. Alternative explanations and possible confounding factors were diligently sought from the witnesses during the People's Inquiry and no significant alternative causes or explanations were found. For example, information about smoking and drinking habits of the affected individuals did not show any significance. Furthermore, a diligent effort was exerted to determine the presence of and characterize possible other sources of toxic chemicals, such as household sprays and volatile chemicals, repair shops, dumpsites, burning of household

wastes, etc. and no significant confounding chemicals were found. The presence of industrial and other activities that are potential sources of pollutants and the likely exposure pathways that may bring the pollutants into the community was investigated and none was found. The absence of significant confounding causative factors strongly indicates that Foray 48B is the culprit.

4.9 Are the sources of information on the question of adverse effects and exposure credible?

There is no reason to believe that our sources of information were not credible. There were no indications that the witnesses were not telling the truth. The organizers and the people involved in the People's Inquiry were highly respected and credible individuals with no record of misdemeanor, and there were no questions as to the authenticity of the documents appraised.

4.10 Is the association between the exposure and adverse effect/s strong enough to make a conclusion?

Yes, the aerial spraying of Foray 48B resulted in adverse health effects on the people exposed to the spraying.

4.11 Comment & Recommendations

We have covered in Part One, recommendations arising from the questions addressed in this section, but would comment on and draw particular attention to, and emphasise, the following recommendations.

The primacy of right to health and a healthful environment, over and above economic interests should be clearly stipulated in the law and enabling rules and regulations. See:

> **Recommendation R11:** All health-related aspects of biosecurity, including the health impacts of future incursion responses and research on those impacts, should be the responsibility of the Ministry of Health. They should be neither funded by nor delegated to MAF or Biosecurity New Zealand. **See also:**
>
> **Recommendation R5:** The Health Select Committee and the Primary Production Select Committee should review the decision processes and priorities that led to a decision to spray a residential area with a pesticide in order, in part, to spare the forestry industry the costs of spraying their forests with that pesticide.

Mechanisms to ensure that political and state power, including delegated power within the bureaucracy and relevant institutions is limited, should be firmly put in place by law and by socially enforceable instruments, including the power of the people to recall decisions adverse to their health and well being in a timely and expeditious manner. See:

> **Recommendation R12**. Sections 7 and 114 of the Biosecurity Act should be reviewed by the Health Select Committee, the Primary Production Select Committee and/or the Local Government and Environment Select Committee, which should consider the proposed amendments contained in Submission 34, Appendix A, to limit the powers currently granted to the "chief technical officer" and the Minister of Biosecurity, in view of the fact that actions taken to protect the primary production sector from pest incursions have the potential to impact adversely on human health and the environment.

True science (Science for the People) should be upheld. The precautionary principle should be applied in the assessment of risks to health and the environment from any proposed activity (such as aerial spraying of pesticides) or any substance or product that is potentially harmful. See:

> **Recommendation R22**. The shortcomings of conventional risk-assessment methods in relation to health and environmental impacts should be acknowledged and efforts made to develop and implement methods that are better able to consider these impacts.

When presented with a patient's report of signs and symptoms, it is essential that all possible pathophysiologic explanations for those symptoms be fully explored first (with thorough personal histories, environmental exposure histories, labwork, etc), before moving to a diagnosis of a psychosomatic illness. Also histories and clinical signs and symptoms reports of patients must be taken seriously and assumed to be true, reasonable and authentic, unless it can be shown that there is strong and persuasive evidence to the contrary. See:

> **Recommendation R14**. The attribution of health effects reported by the community to psychosomatic processes should be given no credence in future risk assessments unless and until such a diagnosis can be supported with empirical, medical evidence. **See also:**
>
> **Recommendation R15**. Symptoms should not be dismissed as psychosomatic simply because their nature and pattern does not fit what the assessor expected based on past risk assessments, particularly where the level of exposure is unusual (e.g., long-term, repeated exposure of an urban population to Foray48B).

Decision makers, especially in government, should be made clearly accountable to the people. The right to information, especially on those matters affecting health and social well being, should not be made subject to confidentiality and should be supplied free of charge. Duties and obligations should be clearly defined and made subject to public oversight. Timely monitoring and grievance mechanisms with clear community participation should be established. See:

> **Recommendation R23**. Biosecurity decision-making should be recognised as being political rather than solely technical, in the sense that it involves decisions regarding whose interests will be protected and to what degree, who will pay the cost of that protection, and who will bear the risks. Biosecurity decision processes should thus be made transparent to the public and should take into account a wider range of interests, views and knowledge than has been the case until now. **See also:**
>
> **Recommendation R20**. Section 162 of the Biosecurity Act should be amended to account for the impacts of biosecurity programmes on urban populations, including changes to the provisions for compensation to recognise the full array of harms that can be inflicted by biosecurity measures**.**

And finally, measures to enhance community empowerment should be instituted at all levels and in all sectors. See:

> **Recommendation R4** Whenever and wherever an incursion or an incursion response has the potential to affect a community, the community or its representatives should be, from the initial stages, actively involved in the analysis of the situation, decision-making as to the response, and planning of any response.

4.12 Conclusions

From the foregoing appraisal of available information and various types of evidence, it is clear beyond reasonable doubt that the aerial spraying of Foray 48B in Auckland, New Zealand has resulted in adverse health effects on the exposed population. The impact of the aerial spraying extends beyond signs and symptoms. As detailed in our main findings in Part One, it has been devastating not only to the physical but also to the emotional, mental, economic and social well being of the affected people.

What is disturbing for a clinical physician is that the detailed testimonies and other supporting evidence presented to the People's Inquiry is, in our view, sufficient to show that the medical personnel engaged to support those adversely affected by the spraying failed in many respects to uphold the basic tenets of medical ethics.[21] In our view the evidence shows there was a lack of compassion and respect shown to those affected by the spraying, and that many patients were kept in the dark or were mislead about their true medical condition. This is of concern.

The process of coming to know, i.e., of coming to believe that something is or is not the case, is not without an ethical dimension, and this is particularly true in the practice of clinical medicine. Two key elements of this ethical dimension relevant to the aerial spraying situation are the primacy of the empirical, and the duty to attend to the voice of the affected. The testimonies at the People's Inquiry were replete with examples of violations of those two principles, particularly in relation to clinicians and telephone screeners who seemed inclined to dismiss individuals' claims of spray-caused sickness.

Just as the process of deciding what to *do* has an ethical dimension, the process of deciding what to *believe*, i.e., deciding what claims should be given credence, has an ethical dimension as well. The empirical datum must be given primacy of place over the a priori belief. Physicians and other clinicians, whether in private practice or in the employ of an incorporated entity or government, have a duty to attend to the claims of the sick.

When an a priori belief (the spray is "safe;" it does not make people sick) comes up against a contradictory empirical claim (this spray is making me sick), the empirical claim deserves to be given more epistemological weight than the a priori belief.

[21] See *the International Code of Medical Ethics Adopted by the Third General Assembly of the world Medical Association at London in October 1949. (World Medical Association Bulletin, vol. 1, no. 3, 0ctober 1949, pp.109, 111*

FINDINGS
PART 3 *by Prof. Tom Kerns* [22]

Ethics and Human Rights Issues

"Society has the right to hold accountable every public agent of the administration."

Declaration of the Rights of Man and Citizen (1789[23])

5.0 Epistemology of moral judgement

Epistemological foundations for assertions about moral value - i.e., about right and wrong, moral and immoral - are different than epistemological foundations for assertions about simple matters of fact.

Assertions about matters of fact are based on many kinds of information sources, most of them variations on the empirical. Claims about matters of fact in this Report, for example, are based on oral and written testimony, publicly available documents and press releases, physical evidence and empirical studies.

Crossing the gap from "is" to "ought", i.e., from assertions about matters of fact to assertions about matters of moral judgement, requires looking to a different set of epistemological foundations.

Judgements about moral value are as a rule based on one or more of the following three kinds of groundings: 1) a narrative's direct appeal to conscience and basic moral sensibility; 2) reasoned arguments; and 3) reference to established and accepted moral standards.

An example:
1) Hearing or reading a narrative account of a young child being treated negligently, abusively or violently can directly and immediately touch one's conscience and move one to moral outrage.

2) Rational justifications that might provide a minimal explanatory grounding for why treating children abusively or cruelly should be considered morally reprehensible could include the moral innocence of young children, their vulnerability, their inability to look out for themselves, to argue on their own behalf or to represent themselves rationally, and their inability to rationally give or withhold consent, as well as other reasons.

3) Or one could defend the moral proscription against such treatment of children by reference to established and accepted ethical standards; these could include standards such as the *Universal Declaration of Human Rights* or the *Convention on the Rights of the Child*. These unambiguously declare that children deserve special protections and insist that "States Parties shall take all appropriate legislative, administrative, social and educational measures to protect the child from all forms of physical or mental violence, injury or abuse, neglect or negligent treatment, [or] maltreatment...."

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[22] Dr Tom Kerns is Professor in philosophy, bioethics and human rights, in Seattle, Washington, USA. Dr Kerns writes and lectures about low-dose toxicant induced illness and environmentally induced illnesses, including an interdisciplinary course titled Choices that can Kill: Ethics, the Environment and Threats to Human Health. He is the author of Environmentally Induced Illness: Ethics, Risk Assessment and Human Rights.

[23] Article 15. The Preamble of the same document states "Ignorance, neglect or contempt of the rights of man are the sole cause of public misfortunes and governmental corruption."

This Report's findings rely primarily on the third and least ambiguous of those moral groundings, the appeal to established internationally accepted human rights standards, though it also makes reference to both conscience and reasoned argument.

5.1 Conscience

The simple narrative account of a situation can sometimes waken a conscience and evoke a sense of moral condemnation and outrage.

Much of this Report can be seen as a narrative appeal to the conscience of the reader. It is hoped that becoming aware of the facts about the health, social and economic impacts this spray programme visited on New Zealand citizens might waken a response in the reader's moral imagination. More simply this has been described as an appeal to compassion, i.e., to fellow-feeling for the sufferings of the other, and that as such it is a specifically human, or perhaps specifically primate, characteristic.

An appeal to conscience was at the basis of Gandhi's non-violent practice of *Satyagraha* (Truth Force) in India. When people are made aware of the truth, he believed, it wakened their moral sense and they could see that a given policy or practice was wrong.

Acts such as those we have seen in the PAM spray programme, particularly when they adversely affected so many individuals and families, when they continued for such an extended period of time, and when they were so inescapable, so unremitting, unrelenting and egregious, offend the conscience and moral sensibilities of most persons who are made aware of them.

Direct appeals to conscience are effective only with conscious beings, such as human beings, that have moral imagination. Corporations, because they are only legal, not personal, entities, would not be expected to have a moral sense, partly because their purposes are so narrowly circumscribed by law. Governments on the other hand, particularly democratic governments, might be hoped to have at least a rudimentary sense of right and wrong because governments are expression of the human persons, with all their varied characteristics, needs and complexities, who give rise to and constitute them.[24]

In the case of this particular government entity, however, the community's appeals to MAF appear to have not been heard.[25]

5.2 Reasoned argument (and risk assessment)

In the history of ethical thought a wide variety of philosophical systems have laid out foundations for distinguishing right acts from wrong or unjust acts, beginning with Plato's analysis of justice in *The Republic*, continuing through the natural law ethic of Thomas Aquinas and more modern social contract theorists, to contemporary feminist and environmental analyses. Most of these reasoned moral systems can be classified as either teleological (or consequentialist), in which ethical decisions are based on the anticipated consequences of behaviors, or as deontological, in

[24] Persons employed by corporations are charged with acting in the interests of the corporation. Persons in a government, at least in a democratic government, are charged with acting in the interests of citizens.

[25] In the next section we weigh the actions of MAF against human rights standards, and yet

> [H]uman rights is a poor substitute for empathy or sympathy, a poor second best to more impalpable conceptions of what is "proper and becoming between people." When human beings lack this civilized sense of what is proper and becoming [as governments often do], when they fail to develop a sense of empathy toward the predicaments of strangers, human rights doctrines alone can do little or nothing to call them back to their better nature." Ignatieff, Michael, *Human Rights as Politics and Idolatry*, Princeton University Press, 2001, p162.

which decisions are based on rationally determined ethical duties. John Stuart Mill's *Utilitarianism* is usually taken as one classic expression of a teleological ethic. He argues that we should always act in such a way as to maximize the sum total of happiness in the world. The modern practice of risk assessment is a stepchild of the consequentialist form of decision-making in that it claims to assess the likely future outcomes of a proposed course of action and then to choose the course of action that promises the most favorable future outcomes and avoids the least favorable outcomes.

Immanuel Kant's *Fundamental Principles of the Metaphysic of Morals* is usually taken as one classical expression of a deontological or duty-based ethic. The modern human rights movement,[26] particularly in its appeal to the concept of dignity and of the respect owed to individual human persons, is one expression of a deontological (duties- and rights-based) ethic.

The consequentialist method of risk assessment has the advantage of appearing, whether in reality or not, to be straightforward, rational and based on considered (scientific) inputs. It has the corresponding weaknesses of having to base its actual decisions on estimates about what the future holds and of having to rely on the deeply fallible calculations and judgements of parties who may have financial and personal interests in the decisions under consideration. (For a well-reasoned, cogent and thorough critique of environmental risk assessment as a methodology, see Watts, Submission 75.[27])

As we will see below MAF appears to have relied solely on the highly malleable risk assessment method for its decision-making and seems to have forgotten or ignored basic human rights principles.

5.2.1 Established moral standards

While established moral standards in other times and places included the Homeric moral virtues articulated by the Greeks and moral codes such as the ten commandments in the biblical traditions, since the end of World War II human rights standards have emerged as important commonly accepted moral norms against which individuals, groups and governments may be measured.

5.3 Human Rights

One recommendation in this Report will be that the New Zealand Human Rights Commission (HRC) establish a working group to formally explore possible human rights violations in relation to the PAM aerial spray programme. This section of the Report suggests several preliminary lines of exploration for the HRC, using a number of international Human Rights instruments that have been accepted and ratified by New Zealand, such as the 1948 *Universal Declaration of Human Rights*,[28] the *International Covenant on Civil and Political Rights*,[29] the *International Covenant on Economic, Social and Cultural Rights*,[30] the 1990 *Convention on the Rights of the Child*,[31] the *Rio Declaration on Environment and Development*, and the *Convention on the Elimination of All Forms of Discrimination against Women*.[32] Two domestic Human Rights laws will also be

[26] The greatest part of the human rights movement has developed since the end of World War II.
[27] See also Part Two of Kerns, Thomas, *Environmentally Induced Illness: Ethics, Risk Assessment and Human Rights*, McFarland, 2001.
[28] Ann Newlands and Colin Aikman represented New Zealand in the United Nations General Assembly in 1948 when the *UDHR* was unanimously adopted by the UN.
[29] Ratified by New Zealand in 1978 and incorporated into New Zealand domestic law (New Zealand reserved articles 10(2)(b); 10(3); 14(6); 20; 22). This means that the provisions of this international instrument do have the force of domestic law in New Zealand.
[30] Ratified by New Zealand in 1978.
[31] Ratified by New Zealand (with no sections excepted) in 1993.
[32] Ratified by New Zealand in 1985.

considered, the New Zealand Bill of Rights Act 1990, and the Human Rights Act 1993 with the Human Rights Amendment Act of 2001.

5.3.1 Universal Declaration of Human Rights

The *Universal Declaration of Human Rights* (*UDHR*),[33] "arguably the single most important international instrument ever negotiated,"[34] was, according to its Preamble, based on a "recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family." The reference here is to *all* members of the human family, not just to some members and not just to a voting majority or a compliant majority of members, but to *all* members of the human family. This means that if the rights of even a few citizens have been violated, then rights have been violated.

The *UDHR* is based on the realization that "disregard and contempt for human rights have resulted in barbarous acts which have outraged the conscience of mankind," and on the belief that every member of the human family deserves to be free of fear. It was based on the tenet that "it is essential, if man is not to be compelled to have recourse, as a last resort, to rebellion against tyranny and oppression, that human rights should be protected by the rule of law."

The Preamble thus recognizes that when individuals and communities feel that their basic rights have been ignored or violated they may be more likely to, from an innate sense of natural justice, eventually lose respect for national laws and, in extreme cases, rebel against them. The *UDHR* emphasizes that it is therefore in the self-interest of governments and in the best interests of societies to ensure that basic human rights are respected and protected by domestic law.

In the case of the PAM spray programme it means that it would have been in MAF's own self interest, particularly if it hopes for citizen cooperation in future programmes, to ensure that the human rights of all – not just of many or most, but of all - citizens were protected.

The *UDHR* intends itself to be "a common standard of achievement for all peoples and all nations, to the end that every individual and every organ of society … shall strive by teaching and education to promote respect for these rights." Evidence is clear that MAF did not actively promote observance of these rights.

For these reasons and others, all member states (including New Zealand) "pledged themselves to achieve … the promotion of universal respect for and observance of human rights…."

Four Articles in the *UDHR* have specific bearing on the PAM aerial spray programme:

> **Article 3**
> "Everyone has the right to life, liberty and security of person."

This right is also supported by Article nine of the *International Covenant on Civil and Political Rights* which reads "Everyone has the right to liberty and security of person."

Testimony of citizens who were made acutely sick, were temporarily disabled, or developed new-onset chronic health conditions or disabilities as a result of being exposed to Foray 48B constitutes strong prima facie evidence that this right to security of person was violated.

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[33] Initially drafted by French jurist Rene Cassin and later approved by unanimous vote in the United Nations General Assembly in 1948.
[34] According to Phillipe Sands, a practicing international lawyer and professor in London, quoted by Brian Urquhart in "The Outlaw World," *New York Review of Books*, Volume 53, Number 8, May 11, 2006, p. 25.

Article 12
"No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence...."

This right is supported as well by Article seventeen of the *International Covenant on Civil and Political Rights* which reads "No one shall be subjected to arbitrary or unlawful interference with his privacy, family, home or correspondence."

Testimony of citizens describing contamination of their homes, properties, gardens, rooftop water catchment systems[35] and possessions by forcible exposure to Foray 48B or to its drift and residues, testimony by families who were made sick by exposure to the pesticide, and testimony by those who suffered social and family loss as a result of the spray, constitutes strong prima facie evidence that this right was violated. We quote here from just two witnesses among many, both of whom offer brief summations of lengthy and detailed testimonies:

> The disruption to my life has been total - health, socially and otherwise. My relationship with my partner became exceptionally rocky as he always said I was never home for him as most times he would have to stay at home for the animals [when she evacuated]. We have now separated." (Submission 12)

The second passage is from a woman who, with her family, experienced devastating health, economic and personal impacts from the spray program.

> It is with overwhelming loss and anger that I write this statement. It is hard to know where to start and what to say when there have been such far-reaching repercussions in our lives as a consequence of the aerial spray programme.... Every person who has had anything to do with me over the spray period from my children & husband through to my business clients, dentist and my child's drama or swimming teacher (ongoing cancelled and rescheduled lessons) has been affected by the MAF aerial spraying campaign. (Submission 61).[36]

Social and relationship losses were common, varying all the way from evacuated persons having to spend Christmas away from their families for two years in a row, to the destruction and demise of partnerships and other significant relationships due to the stresses associated with being sprayed, due to the long separations required by multiple relocations, and due to the PTSD-like[37] impacts suffered as a result of multiple exposures.

We also draw attention to Article twenty-three of the *International Covenant on Civil and Political Rights* which reads "The family is the natural and fundamental group unit of society and is entitled to protection by society and the State," and to Article ten of the *International Covenant on Economic, Social and Cultural Rights* which reads:

> The widest possible protection and assistance should be accorded to the family, which is the natural and fundamental group unit of society, particularly for its establishment and while it is responsible for the care and education of dependent children.

Testimony from families who were forced to deal with the enormous economic losses, severe family disruptions and debilitating interpersonal stresses associated with the spray program, provides prima facie evidence that the right of families to be protected by their government was violated.

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[35] One 85 year old woman testified that she had to climb a ladder prior to every spray period to try to close her water storage tanks to protect them from storing pesticide-contaminated water from her rooftop collection system.
[36] This testimony is particularly well detailed.
[37] Post-traumatic stress disorder.

Article 17
"No one shall be arbitrarily deprived of his property."

Individuals and families forced to leave their homes and belongings, some for weeks at a time and some indefinitely, due to the ongoing exposure to the spray, believed that they were, against their will and for no just cause, deprived of their property.

One family had to mortgage their home, use the funds to purchase a large bus and caravan, outfit it for family living, and then leave their home for two years because it was near one of the frequently sprayed "hot spots" in the spray zone and everyone in the family was made sick by the sprays.

> [The father's] health deteriorated so much he lost the ability to operate his client base as he was an osteopath. He lost his business of 30 years that sustained the family. Initially he fought to be there for his clients, but slowly he had to refer them to colleagues as he could not maintain their best interests when he felt so ill.

The family's mother and three children also suffered serious health effects from the spray, so they could not stay in their home.

> We have a very strong belief in family unity and as such we pulled our 15 year old son out of school. We kept him with us; we kept the two small children with their big brother and toured the north island of New Zealand for two and a half years, looking for work as we travelled. Fighting Aeraqua the entire time to be compensated for the exorbitant fees we had to pay for camp grounds and petrol. This was all fruitless ....
>
> To this moment in time we still feel very angry and betrayed that our government, Aeraqua and the medical services have completely ruined us financially and medically while Sandie is still to this day undergoing tests for neurological problems which only occurred since the spray began. (Submission 48)

Another mother and her daughter, both made sick by the spray, had to give up their home and leave for two years

> I am a 32 year old asthmatic and have been for most of my life. The affects on my breathing from the spray has been nothing short of disastrous.... My 15 year old daughter also suffered affects from the spray, she experienced frequent sore throats, flu-like symptoms & rashes on her body.

She and her daughter had little choice but to leave Auckland due to the sprays.

> We had no choice but to leave the area and left Auckland in 2003, with the MacKay family where we lived in a house bus and caravan for two and half years, making a living by traveling from town to town obtaining Karaoke gigs at the local pubs in the area & providing entertainment. I feel that I had no choice and was driven away from my family and my home....
>
> Not long after leaving Auckland my breathing problems started to ease, but the mental and emotional scars still remain.... I still feel emotionally and physically drained from this ordeal. (Submission 49)

Another woman testified that her spray-related costs came to $3000, "which I really didn't have." Another testified that she had to deplete her entire retirement savings in order to pay the costs associated with avoiding the spray, and that now she has no retirement savings left. Another witness testified that she eventually was forced to sell her home because it was clear she would

never be able to go back to it (since it continued to make her sick). She testified that she lost everything, including her career, her health and her home. [38]

One High School teacher who lived and worked in the spray area testified that, due to his severe spray-associated sickness and disability he had to retire from his teaching job (on his physician's recommendation), and that this was a tremendous financial and emotional loss for him. (His voice quavered while describing this to the Inquiry two years after the event.)

At least three families testified that they lost their entire businesses due to the sprays and were thus left without income. One father testified that because of his severe asthma he was not able to work in the spray area and thus could look for work only outside the spray area. Because of this limitation he was out of work for over a year. He was able to work, but could not work within the spray area. This was a major financial setback for the family, costing them over $20,000, a loss from which they have still not recovered two years later. (Submission 52) The family applied for compensation but all applications were denied; they were told that compensation applied only to damage or loss of physical property, not to loss of earnings.[39]

> MAF have made our lives a living hell. We have no money and are soon to lose our house. We have no future. We struggle to stay in health. We live out of a suitcase. We can not move. If we could, where could we go that may not be sprayed in the future?[40]

Testimony from individuals and families who experienced such loss due to the ongoing spray programme constitutes prima facie evidence that their right to not be arbitrarily deprived of their property was violated.

Article six of the *International Covenant on Economic, Social and Cultural Rights* recognizes the right to work.

> The States Parties to the present Covenant recognize the right to work, which includes the right of everyone to the opportunity to gain his living by work which he freely chooses or accepts, and will take appropriate steps to safeguard this right.

Testimony from those who lost jobs and who lost family businesses due to effects of the spray programme constitutes prima facie evidence that this right to work was violated.

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[38] The extraordinary invasions of privacy suffered by this last witness were detailed in her written submission and oral testimony. (Submission 36). Miss Gray has a medically recognised history of chronic pain and Chronic Fatigue Syndrome exacerbated by chemical exposures. Because of her medical history, Miss Gray was proactive in seeking support for relocation away from the spray. She detailed in her written submission and testimony what she saw as a chronology of harassment, ridicule, disrespect and systematic invasions of her privacy far beyond what she considered relevant to the information that might be required about her health or eligibility to receive assistance. She described a series of struggles with Aeraqua to secure appropriate relocation and support. Documents presented suggest that MAF/Aeraqua did not believe she was ill or affected by the spraying, but was abusing the system for personal gain.

Many of the documents we viewed were obtained by Sue Ella under OIA. Among them was a June 2004 email from the Aeraqua Nursing Team Leader to a private investigator whose firm had been commissioned, presumably by MAF, to review Miss Gray's claim for compensation for spray-related costs. [They were denied]. It shows that Aeraqua actively participated in an investigation into Miss Gray's compensation claim under the Biosecurity Act. The Nursing Team Leader describes obtaining title and deed information on Miss Gray's former home and what is purported to be the new home she felt compelled to purchase in order to be able to keep clear of the spray.

The email included photographs of Miss Gray's former home in West Auckland and the property they were renting for her when she was evacuated from the spray area. The photos of the rental property included one that was apparently taken from inside her property at some unknown time without her knowledge. The Nursing Team Leader details purchase and sale prices and floor areas of the two owned homes and writes: "She has not lost a thing (and seemingly gained much). We can get official census info to compare the areas if you like. We can also go up next week and photo the [new house]." Sue-ella told us that the house photographed and identified as her new home was in fact the wrong house.

We were also shown an October 2004 email from the Nursing Team Leader in which the subject heading was "Poo Smella Day". This was, perhaps inadvertently, sent to Sue-ella Gray herself. The body of the message was empty.

[39] For further reflections on how Articles in the *UDHR* should apply to the PAM spray programme, see Sandra Ethell's Submission 95. Also see above for our critique of the compensation provisions of the Biosecurity Act.

[40] Testimony, in a letter to Dr Simon Hales, Wellington School of Medicine, 8 Sept 2003. (Submission 52)

Article seven of the *International Covenant on Economic, Social and Cultural Rights* recognizes workers' right to safe and favorable working conditions.

> States Parties to the present Covenant recognize the right of everyone to the enjoyment of just and favourable conditions of work which ensure...[s]afe and healthy working conditions"

The Inquiry heard testimony from a number of people who owned businesses inside the spray zone, who taught at schools inside the spray zone, and who worked for employers whose places of business were located inside the spray zones, and who were made sick by exposure to the sprays while at their place of work during regular work hours.

Testimony from these people constitutes prima facie evidence that their right to safe and favourable work conditions was violated.

> **Article 25**
> "Motherhood and childhood are entitled to special care and assistance. All children...shall enjoy the same social protection."

While motherhood and childhood are in fact entitled to special care and assistance according to the *UDHR*, during the PAM spray programme they were provided no special care whatsoever. Mothers, fetuses and children, despite their greater vulnerability to environmental toxicants, were granted no special exemptions or protections from pesticide exposures. In oral testimony the Inquiry frequently heard that "children walking to school in the morning, having their lunch breaks and at other times, were caught in the spray," (and that planes would sometimes spray over school children while they were outside eating lunch with spray landing directly on their food. One mother testified that she personally "got hit in the face" with spray at her home as a result of which she immediately developed weeping facial sores and other chronic effects that still continue long after the spray programme has ended, and that her son was hit with spray at his school. Children had constant coughs and stuffed noses, one family testified, and "half the class was sick."

Meredith Youngson, a medical microbiologist and Board Member of HealthWest, testified that midwives in the spray area were reporting unprecedented numbers of early bleeding, late bleeding and miscarriages (with twelve stillbirths in a three month period during the spray months, more than in the entire previous twelve month period).[41] One woman testified that her one child born during the spray programme had the lowest birth weight of any of her children despite being born sixteen days past the due date. This child, born in April of 2003, weighed only 5lb13 oz, whereas her two other children weighed 6lb14oz and 7lb12oz. Her only low birth weight child was the one who had been conceived, carried and born during the spray programme. (Oral Testimony 99)

Article twelve (section 2a) of the *International Covenant on Economic, Social and Cultural Rights* establishes the obligation of states party to this Covenant to take steps to make "provision for the reduction of the stillbirth-rate and...infant mortality and for the healthy development of the child." Evidence provided in testimony constitutes prima facie evidence that the community's right to this protection was not met.

Mothers who were physically, socially or economically injured by direct or indirect exposure to the pesticide or its drift and residues, or whose children were injured by exposure at home or

[41] Another mother testified: "The aerial spraying was taking place over much of 2003 (during my entire pregnancy) and our third child was born July 27th 2003. Sadly, our baby was born with a rare medical condition called Osteogenesis Imperfecta (commonly known as Brittle Bone Disease). He has suffered over 30 broken bones in his short lifetime, and coincidentally, nearly 20 asthma attacks that have required hospitalization and oxygen." Submission 19

while attending their schools, can argue that they were subjected to a violation of their right to "special care and assistance."

In sum, testimony from those whose homes, yards, rooftop water collection systems or vegetable gardens were contaminated by the spray constitutes prima facie evidence that government and/or industrial interests interfered with their privacy, their health and their well-being. Testimony from those who were forced from their homes for extended periods, who had to abandon or discard their possessions, or who suffered loss of income or loss of a family business due to the spray provides prima facie evidence that they were unfairly deprived of rights outlined in the *UDHR*.

5.3.2 Convention on the Rights of the Child

Three Articles in the *Convention on the Rights of the Child* (ratified by New Zealand in 1993) have a specific bearing on the PAM aerial spray programme (the term "child" in the *CRC* refers to persons under age 18):

> **Article 19**
> States Parties shall take all appropriate legislative, administrative, social and educational measures to protect the child from all forms of physical or mental violence, injury or abuse, neglect or negligent treatment, [or] maltreatment....

This right is supported as well by Article ten (section three) of the *International Covenant on Economic, Social and Cultural Rights*.

> Special measures of protection and assistance should be taken on behalf of all children and young persons without any discrimination for reasons of parentage or other conditions.[42]

As previously noted, several spray victims testified that they had witnessed children being sprayed while on the way to school or while playing or eating lunch outside on school grounds. One mother, for example, testified that "My youngest child asked me to tell you today, that her fellow students were drenched in the spray when they were having their lunch at Waitakere College a few years ago." (Oral testimony 95)

Community activists invited the New Zealand Commissioner for Children to visit West Auckland on a spray day to see what it was like for children.

> We invited cabinet ministers and many other government officials to visit us on spray days and be with us as we were sprayed at places like bus stops and playgrounds and to share our experience. Our requests were ignored or refused except by the then Commissioner for Children, Roger McClay who came. He was sprayed, got a headache and was appalled by the experience of sitting in a school playground at recess while planes flew low spraying those beneath. He listened to a child explain that it was like 9/11. He also appreciated the trauma in a kindergarten on spray day. He was shocked. He spoke to the media including talk back radio about his experience and while on one phone to radio talk back received a call from a government official on another telling him to get out of West Auckland and stop speaking to the media. He informed us of this and did as he was told. The Office of the Commissioner for Children has only advisory power and no power of enforcement. (Oral testimony 104)

Testimony from those whose children suffered physical effects on their bodies (some documented during testimony with photographs) as a result of dermal and inhalation exposure to the spray, as well as those whose children felt suddenly panicked by the sight and sound of low flying aircraft – including the child mentioned in testimony who bolted into street traffic when suddenly startled by a low-flying spray plane, and who barely escaped being struck by a passing car – provides

[42] See section below on Discrimination.

prima facie evidence that these children's right to protection against physical or mental violence, injury, negligence or maltreatment, was violated.

> **Article 24**
> States Parties recognize the right of the child to the enjoyment of the highest attainable standard of health

Spraying children every few weeks for two and one half years with an agent that includes both live bacteria and a mixture of chemicals – especially when it is done in such a way that children are not provided any way to avoid both inhalation exposure to the insecticide and its drift and dermal exposure via contact with the ground, playground equipment and the many other outdoor objects with which they regularly come into contact during the course of an average day (and oral exposure when hands or fingers touch the mouth) – represents a clear violation of this Article. Two illustrative examples chosen from among many:

- Emily was two years old when the spray programme began and suffered fifteen asthma attacks so serious that they required hospitalization. Her asthma "got worse and worse and worse" as the sprays continued. Even now, though the spray has been over for two years, Emily is still chronically sick and suffers from asthma. Her father says that their big fear now is the large amounts of medication she has to take. When asked during testimony what it feels like when she's having an asthma attack, Emily replied "It feels bad." It feels bad to not be able to breathe. (Oral testimony 52).[43]
- Annysha was eight years old when the spray began and developed serious migraines on spray days. "It took over" our lives for three years, she says. She missed a great deal of school during that time. (Oral testimony 105 & 115).[44]

Exposing so many of a community's children so regularly, so thoroughly and forcibly, and over such an extended period, to an insecticide with which they literally could not avoid coming into contact, constitutes prima facie evidence of a violation of both the letter and spirit of this right to "enjoyment of the highest attainable standard of health."

One reason observance of this particular Article is so crucial is that children's biological health is much more vulnerable to adverse impacts from exposure to environmental toxicants than is the case with adults.

Reasons for children's increased vulnerability to toxicants include the following:

1. Children's bodies are smaller, so a dose of toxicants that may not seriously affect a 70kg male could seriously affect the much smaller child because of the higher dose of exposure per unit body weight. For a 70kg male to absorb a 10mg/10kg dose of a given chemical, for example, he would need to absorb 700mg of that chemical; for a small 10kg child to absorb the same dose, she would need to absorb only 100mg of the chemical.
2. In addition, children respire much more frequently than adults, and thus are exposed to larger gross doses of inhalants than adults (newborns at rest breathe 40-50 times per

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[43] In an earlier spray program, i.e., during the White Spotted Tussock Moth spray program in East Auckland in 1996/7, Emily's mother Jackie was working in the drift zone of the aerial spraying and was 11 weeks pregnant with her son Thomas and his twin sister, Melody when the programme started. She gave birth prematurely, at only 24 weeks, and Melody died after 3 days of life. When Jackie was in hospital during that time she reported that there were a large number of premature births and that many of those mothers either lived or worked in the East Auckland spray zone. That daughter, Melody, who died at three days of age, was buried in Waikumete cemetery, considered a "hot spot" by MAF and hence sprayed heavily and frequently. This resulted in the Harvey family being unable to visit the grave of their daughter during the years of the PAM spray programme.

[44] Another child's career dream was taken from her. "My daughter is now fourteen and a half years old. She is an A+ student at high school, she was one of a couple of girls chosen to skip fourth form and go directly to fifth. Her goal was for as long as I can remember was to be a vet. After the spraying she developed a severe allergy to cats which has put an end to her dream, as she says to me 'Mum, how can I be a vet when I can't even be in the same room as a cat?'" (Submission 53)

minute; by the age of five respiration rate is still approximately 25 breaths per minute; adult respiration rate is only 12-18 per minute). This means that children take in not only more airborne toxics *per unit body weight* than adults, but they also take in a larger *absolute* quantity of airborne toxics than adults, even given their smaller relative lung capacity.

3. Children live and breathe three or four feet closer to the ground than adults, i.e. closer to surfaces on which pesticides have settled and where heavier-than-air contaminants such as pesticides are more richly concentrated.
4. Children eat more food and drink more water than adults (in proportion to their body size), so they are exposed to proportionately larger doses of toxicants in food and water.
5. Children's organ systems (including their immune systems and their detoxification pathways for eliminating exogenous toxics) are not yet matured and are thus not yet capable of performing their protective functions as effectively as those same systems in adults.
6. Opportunity for skin absorption is much greater in children than adults because children regularly crawl and play on the ground and on carpets and other sorbent surfaces. Moreover, researchers have found that washing with soap and water sometimes does not completely remove pesticides because they can bind to the skin.
7. Children are more likely to be exposed orally in addition to other routes of exposure because of their propensity to put their hands and objects in their mouths.
8. Finally, children's hair and clothing that has come into contact with airborne pesticides can also become the occasion of continuous exposure both by inhalation and skin contact.

For these reasons and others, small children are much more likely to be adversely affected by exposure to airborne toxicants, particularly to pesticides, and this is a key reason why it is so important that families, communities and governments take extra care in protecting the rights articulated in this article. These rights were not protected in this spray programme.

The right of *all* human beings to the highest attainable standard of health is expressed in Article twelve of the *International Covenant on Economic, Social and Cultural Rights*:

> States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.

The 1978 *Declaration of Alma-Ata* (WHO 1978) states this right more clearly as a duty of governments to their citizens:

> Governments have a responsibility for the health of their people which can be fulfilled only by the provision of health and social measures.

Article seven of the *Declaration* elucidates the meaning of "provision of health and social measures." It says that providing health care includes

> in addition to the health sector, all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food, industry, education, housing, public works, communications and other sectors; and demands the coordinated efforts of all those sectors.

MAF and Biosecurity, in addition to the Ministry of Health, the Ministry of Education and other ministries, have responsibility to foster and support the health of New Zealand citizens. In this case, though, they failed to adequately meet that responsibility.

Testimony from those who suffered adverse health effects, both physical and psychological, provides prima facie evidence that this right to health was violated.

> **Article 28, 1(e)**
> [States Parties shall] Take measures to encourage regular attendance at schools.

This right to education is supported as well by Article thirteen (section 1) of the *International Covenant on Economic, Social and Cultural Rights*: "States Parties to the present Covenant recognize the right of everyone to education."

If States Parties are enjoined to take measures "to encourage regular attendance at schools," then it follows that they are also required, *a fortiori*, to avoid taking measures that make it impossible for students to attend school. The aerial spray programme did, in fact, prevent a number of children from attending school. As was clear in several testimonies, some primary school and high school students were not able to attend school on any of the days when sprays were conducted over their neighborhoods or over the neighborhoods in which their schools were located. This resulted in some children being forced to miss weeks of school, in one student having to miss a full year of school due to the spray, and in a third young girl, who was the primary caregiver for her mother who suffered incapacitating health effects from the spray, having to miss three years of school as a result of the state's actions, a situation that constitutes a clear violation of this article of the *CRC*. Several witnesses testified about how upset their children were because of having to miss school during spray evacuations.[45] Just one example: a mother testified that her daughter's education "was affected greatly."

> She had to miss many days off school when the MAF helicopters were spraying nearby due to the drift. Not only this but she had to miss an NCEA level one exam as they were spraying the day it was conducted and she was not allowed to resit the test another day.
>
> Because of this she had to get compassionate consideration, and even though her drama teachers put in a submission that in their opinion she would have attained an "Excellent" pass, the NCEA qualifications authority passed her with a mere "Achieved" and this affected her overall marks. As you can imagine she was very upset about this. (Submission 79)

One student mentioned in oral testimony that she felt "scared" to return to school after having to miss three years of school due to the sprays.

Another family expressed concern about both the health impacts the spray had on their son and the amount of schooling the spray caused him to miss.

> The reactions suffered by Simon when sprayed with Foray 48B or present in a spray zone after recent application are: nausea, swollen eyes, exacerbation of chronic rhinitis, exacerbation of asthma resulting in the need for constant nebulisers and an admission to intensive care, weight loss, coughing till he vomited every day for 8 weeks, coughing so hard he popped the blood vessels in his eyes, and constant use of steroids to keep his asthma under control....
> He also had a significant amount of time off school during the spray period. We worry this may hinder his ability to participate as a contributing member of society in the future. (Submission 70)

Testimony from parents whose children were unable to attend school due to the spray programme constitutes prima facie evidence that some children's right to attend school was violated.

[45] In addition to lost educational opportunity, loss of friends can be another consequence of missing so much school.

> **Part II, Article 44.1**
> States Parties undertake to submit to the Committee, through the Secretary-General of the United Nations, reports on the measures they have adopted which give effect to the rights recognized herein....

When it comes time for the New Zealand Human Rights Commission to submit its report to the international *CRC* oversight Committee, and when the Commission submits its report as well to the Secretary General of the United Nations as required by Article forty of the *International Covenant on Civil and Political Rights*, and by Article sixteen of the *International Covenant on Economic, Social and Cultural Rights*, it should make clear that complaints about violations of these articles have occurred, and should report also on the extent to which the HRC was or was not able to follow up on those complaints.

And yet the larger New Zealand government does still have opportunity to meet the requirements of Article 39 of the *CRC*.

> **Article 39**
> States Parties shall take all appropriate measures to promote physical and psychological recovery and social reintegration of a child victim of: any form of neglect, exploitation, or abuse; ... or any other form of cruel, inhuman or degrading treatment or punishment.... Such recovery and reintegration shall take place in an environment which fosters the health, self-respect and dignity of the child.

This Article mandates that measures be taken by the government to rectify effects of human rights violations that have occurred.

5.3.3 New Zealand Human Rights legislation

Three articles in the New Zealand Bill of Rights Act 1990 have particular bearing on the PAM eradication programme.

> **Section 9** states that "Everyone has the right not to be subjected ... to cruel, degrading, or disproportionately severe treatment...."

This right is also supported by Article five of the *Universal Declaration of Human Rights* which reads "No one shall be subjected to...cruel, inhuman or degrading treatment or punishment."

Testimony from those whose bodies, families, property and incomes were adversely impacted by exposure to the spray and its drift and residues provides prima facie evidence that they were subjected to disproportionately severe treatment by their government. Spraying large numbers of citizens against their will with an insecticide that, as we have seen earlier in this report, could be expected to make a certain percentage of them sick, perhaps severely or chronically sick, particularly when many of those citizens had pleaded with their government to not be sprayed, constitutes a form of "degrading or disproportionately severe" treatment. More than one witness used the word "cruel" to characterize the spray programme and its impacts on residents. Several referred to it as a nightmare.

> The worst nightmare imaginable began when MAF started aerial spraying West Auckland including directly over our house. At first I was determined not to let it affect me any more than necessary....
> Each time I felt ill afterwards, getting gradually worse. Nose bleeds, itching skin, panic attacks, fuzzy brain, sore gritty red eyes, stomach sore and bloated, watery bowels, a red itchy lump on the thyroid area, headaches, chest pains and cough, sore gums, hot and cold sweats, sinus troubles, irregular heartbeat and high and low blood pressure, burning urine, heavy tired legs etc etc....

> The nightmare became even worse after them accepting I was badly affected. I had to go to motels all over the city at very little notice and sometimes be stuck there for days as the spraying didn't go ahead as planned. I have never been so lonely and miserable in my life... [I could not] visit or check on my 92 year old father who was ill and needing me and lived in the spray zone, [nor] go to my own doctor also in the zone.(Submission 32)

Several who lived through the spray program and who subsequently provided oral or written testimony reported that the experience of being forced to endure the presence of planes flying low and loud overhead spraying pesticide onto everyone and everything below "felt like living in a war zone."

> It was like being back in Amsterdam in my childhood, with the threatening planes flying low over our heads. Wartime all over again. (Submission 7)

Another witness testified that

> It was extremely traumatising experience. I remember the first time we went out to Laingholm beach on the spray day, and when the plane flew over our heads (it was its turning place coincidentally), I burst into uncontrollable crying.... growing up in Hungary after the war this was not an easy thing to cope with. (Submission 77)

Many who provided oral testimony made reference to how low planes had flown over their rooftops – "I was sure they were going to hit our roof." "We all ducked when we saw them coming so low." One witness referred to what she called the intangible, involuntary "terror effect" of seeing planes coming at you just a few feet above your head. (Oral testimony 108)

Some witnesses described being frightened by the possibility of a plane crashing into a home or neighborhood. Apparently these fears were not groundless, as one incident made clear.[46]

The right to protection against degrading treatment is supported as well by Article seven of the *International Covenant on Civil and Political Rights*, which reads "No one shall be subjected to...cruel, inhuman or degrading treatment." This right is fundamental. "Protections against cruel, inhuman and degrading treatment...are widely viewed as the core of a human rights regime." (Gutman, 2001. ppx-xi)

> **Section 10** states that "Every person has the right not to be subjected to medical or scientific experimentation without that person's consent."

More on this issue below in section 5.6, the Addendum on Research Ethics.

5.3.4 Compensation

> **Section 27** urges that the "HRC should explore remedies in the form of compensation, judicial review, etc" for any actions that in its judgment may constitute human rights violations.

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[46] Whether there was risk to homes and persons from potential spray plane crashes is an important question. Apparently it was not an unrealistic concern. According to one testimony

> "Fears of an air accident were not groundless, as one incident showed. Some of the planes used for spraying during the day, was [sic] used for the NZ Postal run at night. During this time, on a mail run, an experienced pilot who did PAM spraying during the daytime, was tragically killed when one of these planes crashed while doing the mail flight." (Submission 95)

One wonders what outcomes would have occurred if there had been an aircraft accident that resulted in community fatalities.

This right is supported as well by Article 2(3)a of the *International Covenant on Civil and Political Rights* which reads

> Each State Party to the present Covenant undertakes: To ensure that any person whose rights or freedoms as herein recognized are violated shall have an effective remedy, notwithstanding that the violation has been committed by persons acting in an official capacity....

"The legal obligation to offer restitution for injury is as old as the Code of Hammurabi, the first formal set of laws in history." (Drinan 2001, p186) It is recognized both internationally and domestically that "one of the major, primordial functions of the law is to return the victims of an unjust act to their previous condition." (Drinan 2001, p170)

In the case of many in West Auckland who suffered both physical injury and economic loss, returning victims to their previous condition will require monetary compensation.

> In 1985 the U.N. General Assembly spelled out the nature of indemnification in the Declaration of Basic Principles of Justice for Victims of Crime and Abuses of Power. This declaration insists that "victims are entitled to prompt redress for the harm that they have suffered' and that offenders should 'pay fair restitution to victims, their families and dependents." (Drinan 2001, p171)

As Robert Drinan, Professor of Law at Georgetown University Law Center and longtime advocate for international human rights, has argued

> The basic moral law of every society asserts that a government which wrongly injures its own citizens must make them whole insofar as this is possible. (Drinan 2001, p187).[47]

Making whole those whose bodies were injured, whose businesses were destroyed, whose rights were ignored, whose education was disrupted, whose jobs were lost, and whose lives were disrupted in myriad ways – making them whole in this case will clearly require monetary compensation.[48]

In respect of these rights to remedy and compensation, we again draw attention to **Recommendation R2** above on compensation.

5.4 Right to know

Principle 10 of the *Rio Declaration on Environment and Development* establishes citizens' right to information about environmental toxics to which they may be exposed. Such information is a necessary corollary to the right to full participation in decision-making, also expressed in Principle ten.

> **Principle 10**
> Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the

[47]. And "governments are recognizing or being forced to recognize that they owe indemnification to those whose rights they have violated."(p 186)

[48] "International juridical bodies such as the UN Commission of Human Rights and the Inter-American Court of Human Rights have developed a substantial body of case law in which they have defined the obligations which offending states are required to carry out. The European Court of Human Rights has awarded 'just compensation' (Article 50 of the convention) in well over 100 cases. The Inter-American Court has ruled in fewer cases but the principle of the requirement of indemnification is becoming more clearly defined with each case. Punitive damages have not usually been awarded." (Drinan 2001, p171-72)

> opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available.

As we noted above, quoting Dr Gordon Hosking, leader of the WSTM eradication programme in East Auckland, "One of the strongest recommendations emerging from a review of the WSTM programme was that the affected community should be involved in analysis and decision making from day 1." (Submission 41). In other words, active citizen involvement in decision-making about a programme of this sort is, in addition to being a right, also pragmatically beneficial to the programme.

Citizens of West Auckland argued strenuously and at length for their right to know the ingredients in the pesticide that would be sprayed on them, but this information was denied them, and denial of that right directly impacted their right to participate actively in decision-making about the PAM programme.

5.4.1 The pesticide

The biological insecticide used in the aerial sprays, Foray 48B, manufactured by Valent Biosciences Corporation,[49] is, according to its label, a "flowable concentrate" for the control of lepidopterous larvae. It consists of a small percentage (less than 20%) of the active ingredient, Bacillus thuringiensis subspecies kurstaki, in the form of "fermentation solids and solubles." The identity of this smaller portion of the spray mixture was publicly disclosed by MAF, but no information was provided about the identity of the remaining (more than 80%) of "other ingredients" in the pesticide. These consisted of a chemical mixture formulated to preserve and enhance functions such as spreadability, durability, and stickability of the spray.

As noted above, MAF, MoH and AerAqua officials regularly asserted to individuals, to citizen groups and to public media, that the undisclosed ingredients were "safe," that the spray had a "proven safety record" (Jim Sutton, Minister of Agriculture and Biosecurity, 2002) that health effects would be "insignificant" (Dr Francesca Kelly, Director of the MAF-funded Aeraqua Medical Service, 2001) and that the spray was "harmless to humans and animals" (Kelly 2002).

How these officials arrived at the opinion that the biological and chemical ingredients in this product would be safe for inhalation and dermal contact exposure by adults and children (and possible oral exposure by children) was not made clear.

As Sir Geoffrey Palmer noted in his 2002 written opinion on the PAM spray programme, "People who are subject to these sprayings are being subjected to ongoing low doses of a range of chemicals. Science cannot say there is no harm to human health in this." (Appendix A of Submission 34)

Nor does the manufacturer of Foray 48B claim its product is "safe." In the user's manual for Foray 48B the manufacturer writes

> We can never prove that a product is absolutely safe. We can only demonstrate that when Btk is applied following the label instructions, that the risk to non-target organisms, whether they are birds or humans, is acceptably low. (Valent BioSciences Corporation, p 29)

"Acceptably low" is a statement of judgement (not fact) about what one may consider acceptable. What is actually considered acceptable may vary from person to person, perhaps depending on whether the person making that judgment is the one spraying or the one being sprayed.

[49] Headquarters in Libertyville, Illinois, USA.

Decisions about which risks are acceptable and which are not should be made by those who are being asked to bear the risk; i.e., the right to determine which burdens they are willing to bear belongs to those who will be bearing them. Any community that "lies in the path of a policy" deserves both full information about facts related to that policy, and an active, effective voice in decision-making about implementation of the policy.

In the case of the PAM programme, citizen groups, parents worried for their children, school officials concerned for their students and staff, and local government agencies had asked that MAF inform them of the undisclosed ingredients in the pesticide to which they would be exposed. MAF officials refused their request.

However, in May 2003 one citizens group announced that, in response to an Official Information Act Request, they had received a list of the undisclosed ingredients in Foray 48B.

> The names of the ingredients were blanked out. However the reference to the *Martindale Pharmacopoeia* from which the information of the ingredient had been taken was left in, as were the page numbers of each chemical. It was a simple matter to find the appropriate page in the manual and identify the chemical. The identification was confirmed by the fact that frequently the assessment [of the chemical] was just lifted verbatim from the *Martindale Pharmacopoeia*. (Submission 75)

The list of undisclosed ingredients included

- benzoic acid/sodium benzoate
- hydrochloric acid
- methyl paraben
- sorbitol
- polyacrylic acid
- potassium sorbate
- propylene glycol[50]

When Biosecurity eradication programmes manager Ian Gear was asked if the list was accurate, he declined to confirm or deny, saying only, "It is a list that has been prepared by some of the opponents to the programme; I can't comment on that, and nor will I." (Dateline, 2003)

Citizen activists replied that the list was not "prepared" by them, but was discovered by them via the Official Information Act Request.

The list included chemicals that had never been adequately tested for health effects that could result from inhalation or dermal exposure.[51]

Whether this particular list of undisclosed ingredients is complete or fully accurate, it turns out that the Btk bacterium is not the only, and probably not the most significant, ingredient of the pesticide when considering possible human health effects. If undisclosed ingredients constituted over eighty percent of the spray, as the manufacturer-authored MSDS indicates, then it may be anticipated that a significant percentage of the reported adverse health effects could be attributable to exposure to those undisclosed ingredients. (See Appendix 5 for Foray48B MSDS)

As we have seen in the Health Effects section of this Report, adverse effects reported by citizens

[50] This ingredient is on the US EPA's inert ingredients "List 2: Potentially Toxic Other Ingredients/High Priority for Testing." The EPA lists only eight "inert" ingredients on List 1, i.e., ingredients that are known to be more toxic than those on EPA's List 2.
[51] For an explanation of the known and expected health effects associated with each of the undisclosed ingredients, see submission 75.

who were sprayed were often identical to the health effects that are known to occur with exposure to these undisclosed ingredients.

5.4.2 A note on the MSDS

The Material Safety Data Sheet for Foray 48B[52] includes the warning:

> Special Precautions: Wash thoroughly with soap and water after handling. Keep impervious gloves on until all potentially contaminated personal protective equipment is removed.

Pesticide applicators are not normally, except in the event of an accident, directly sprayed with the pesticide they are applying. In the PAM aerial spray campaign, however, residents of West Auckland and visitors, children and pets were directly exposed to pesticide spray during the course of their daily activities. Exposure to spray or spray drift was unavoidable, particularly since sprays lasted several hours on spray days, often including both morning and afternoon hours when it would be expected that many people might be outside carrying on normal activities. Nor would it have been expected that those in the spray zones and in the wider drift zones, would normally be wearing protective long-sleeved clothing, long pants, impervious gloves or protective goggles during the normal hours of spraying.

The inconsistency of requiring applicators to wear protective clothing while spraying the insecticide on adults and children who were not wearing protective clothing is here noted.

The practice of forcibly exposing human beings to unidentified airborne toxicants from which they are unable to escape has been recognized as wrong on so many levels that the movement to fully disclose so-called "inert" ingredients in pesticide formulations is gaining increasing popular and legislative support around the world, particularly in western democracies. New Zealand, and MAF in particular, should actively place themselves in the forefront of this movement. All ingredients, whether designated "active" or "inert," in any pesticide formulation should be fully and publicly disclosed well before decisions are made to disperse any pesticide over or near a populated area. If full disclosure is not an option, then dispersal of the pesticide should not be an option.

We have seen above, in our section on Foray 48B, that Sir Geoffrey Palmer, drafter of the New Zealand Bill of Rights Act 1990, argued in his 2002 written opinion that citizens' right to know the full list of ingredients should have been respected. His words bear repeating here:

> There are strong reasons in the public interest that favour disclosure of the ingredients of the spray, not only so 200,000 people can know what it is they are being exposed to, but also so that independent assessments of the health risks can be made. A strong argument can be made that the public interest in disclosure here outweighs the commercial protection....[53]

> It seems quite unreasonable to keep secret the ingredients of a spray to which something of the order of two hundred thousand people are being exposed regularly on the grounds of commercial confidentiality. It means there is no transparency and that claims made by the authorities as to the health effects cannot be checked by independent reference to the medical literature. [54]

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[52] Written by the manufacturer as are almost all MSDSs.
[53] cf. attached written opinion from Chen Palmer & Partners, ¶19
[54] cf. attached written opinion from Chen Palmer & Partners, ¶21

Most current legislation does still protect pesticide manufacturers' practice of designating many of a pesticide's ingredients as proprietary and thus protected from public disclosure, but it is not entirely clear just whom manufacturers want to keep that information away from.

Anyone who can afford the expensive services of a good analytical chemistry lab can "reverse engineer," or "deformulate," most pesticide products and legally determine for themselves the nature and composition of virtually any pesticide. Competing pesticide manufacturers, or in fact anyone who can acquire a sample of the product, can legally acquire this information about a pesticide's undisclosed ingredients. They would not be allowed to replicate, produce or market the pesticide, of course, but there is nothing to stop them from identifying the ingredients.

Pesticide manufacturers are not therefore protecting this information so much from competitors (who can easily and legally acquire it themselves) as they are protecting it from being readily accessible by the public. Pesticide manufacturers may be concerned that an informed public would not like what they discover those undisclosed ingredients to be, and might decide to make changes in their own personal pesticide usage and/or to urge changes in their government's pesticide usage and policy. Manufacturers may be concerned that this could affect their long term business interests. But this alone would not be sufficient justification for denying individual citizens the right to know the identity of the chemicals to which they are being exposed.

In sum, prima facie evidence clearly indicates that citizens' right to know was infringed in this case.

In the case of the PAM programme, two key consequences of this infringement of citizens' right to know were 1) that citizens were not able to undertake their own assessment of potential health risks that would be independent of MAF's and the pesticide manufacturer's assessments; and 2) that citizens were left unable to participate effectively in decision-making about the aerial spray programme. Without access to this knowledge, citizens did not have available to them what was needed to participate actively in decision-making. As one human rights author says, "Without human rights human beings lack 'agency.'" (Gutman 2001, p.xvii)

Recommendation 24: All ingredients in any pesticide formulation that will be deployed in or near any vicinity where human beings are likely to be exposed to direct spray, spray drift or spray residues should be fully and publicly disclosed. If full disclosure is not possible, then the pesticide should not be deployed in any location where humans will be exposed. "Fully disclose or don't expose" should be a key operating principle in MAF's pesticide policy. The Ministry of Health, whose primary responsibility is to the health of New Zealand citizens, has an even stricter duty than MAF to insist on full disclosure.

See also Recommendations R5 and R6

5.4.3 Questions about the Foray 48B label in New Zealand

Pesticide labels are important because "the label is the law" in pesticide practices. This means that pesticide applicators are considered to be in compliance with the law if they handle and apply the pesticide in accordance with the instructions, warnings and restrictions on the label, and are considered to have violated the law if they do not. So knowing what is on the label is important when it comes to citizen involvement in pesticide issues.

In the case of the New Zealand label for Foray 48B, it appears that label cautions and usage restrictions on the New Zealand label are less strict than they are on labels for the same product in

other countries. In the US, for example, the labeling requirements for Foray 48B are more detailed, more restrictive and more cautionary than in New Zealand. See Appendix 6 and 7

Labels on Foray 48B containers in NZ have only these precautions: "Keep out of reach of children," "Avoid skin and eye contact," and "wash hands and exposed skin before meals and after work."

Labels on the identical product in the US, in addition to these three cautions, include several more warnings and restrictions. US labels, for example, urge anyone who has accidentally been exposed to the pesticide on their skin or clothing to

> Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes.... If in eyes, hold eyes open and rinse gently with water for 15-30 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
>
> Avoid contact with skin, eyes, open wounds or clothing.

US labels restrict applicators from contaminating food, water or animal feed with the product, and require them to "Keep out of reach of children," because the product is a "potential sensitizer." It also requires applicators to "Keep unprotected persons out of treated areas until sprays have dried." Several of these protections were clearly not implemented during the PAM sprays.

US labels require that "Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks."

> Mixers/loaders and applicators must wear a dust/mist filtering respirator... Repeated exposure to high concentrations of microbial proteins can cause allergic sensitizations.

This last sentence deserves note: "Repeated exposure to high concentrations of microbial proteins can cause allergic sensitizations." The manufacturer seems to suggest here that some level of exposure to ingredients of Foray 48B can result in adverse health effects.

> Do not apply directly to water, or to where surface water is present or to intertidal areas below the mean high water mark.

It is clear that MAF ignored this restriction, though, and did spray waterways, riparian margins and mangroves.

US labels add,

> Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

During the West Auckland PAM sprays many thousands of adults and children were in the spray area when MAF planes applied the pesticide.

It appears that if the restrictions on the US label had been on the New Zealand label, then application over heavily populated areas may not have been considered legal.

US labels read,

> Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of **4** hours" [the emphasis on "4" is on the label].
>
> Avoiding drift at the application site is the responsibility of the applicator.
>
> Not for use on plants being grown for sale or other commercial use, or for commercial seed production, or for research purposes....

These differences between labels bring several questions to mind.

1. Was the New Zealand label actually less cautious and restrictive than labels for the same product in other countries?
2. If so, how did it came to pass that New Zealand labels for the pesticide were less restrictive and less cautionary than labels for the same product in other countries?
3. How does policy about pesticide labeling come to be determined?
4. Which offices and officials are involved in pesticide labeling decisions?
5. Are there laws or rules that govern pesticide labeling policy?
6. Are these labeling procedures open, documented and available for public scrutiny?[55]

Full and clear information about pesticide labels, labeling practices, and label policy-making should be publicly and easily available.[56]

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[55] For more details see appendix 6 & 7 for images of Foray 48B labels from both New Zealand and the US.
To complicate these questions further, the Inquiry heard testimony from the author of an article that had appeared in the January 2006 issue of *Metro Magazine* titled "Mother of All Battles." The article was about the author's mother and her battle with the motor neurone disease she suddenly developed during PAM spray operations. In the article the author recounts the story of someone who worked on the wharf where containers of Foray 48B were apparently unloaded and who saw labels on the 1000-litre vats of the spray that apparently read:

> *Keep unprotected persons out of the treated areas until sprays have dried.*
> Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.
> Do not enter or allow worker entry into treated area during the restricted entry interval (REI) of 4 hours.

This article's account of what was seen on a labeled container of Foray 48B in New Zealand differs significantly from copies of the New Zealand label obtained by other activists. We were not able to learn which version was accurate. [Peter Malcouronne, "Mother of All Battles," *Metro* magazine, January 2006]. See Submission 94.

[56] A corollary of the right to know is the right to know the truth, i.e., to not be intentionally deceived or misled. One place this right is addressed is in New Zealand's Code of Advertising Ethics. Rule two in this code requires that claims in public advertisements be presented truthfully and that they not be deceptive or misleading.

> **Rule 2: Truthful Presentation** - Advertisements should not contain any statement or visual presentation or create an overall impression which directly or by implication, omission, ambiguity or exaggerated claim is misleading or deceptive, is likely to deceive or mislead the consumer, makes false and misleading representation, abuses the trust of the consumer or exploits his/her lack of experience or knowledge.

Complaints were brought against MAF for violations of this rule. One complainant, for example, pointed out three questionable claims in an ad placed by MAF in the *New Zealand Herald* of 11 March 2003. The ad said:

> 1. *"People are asking is there any evidence of long-term health effects resulting from the spray? The answer is no.*
> 2. *"An independent health risk assessment carried out in 2002 confirmed the findings of other international studies which found that there are no health effects such as neurological or auto-immune effects or problems with pregnancy or birth defects associated with the aerial application of Foray 48B"*
> 3. *"And MAF offers a free, independent health service to anyone who feels their health is affected by the Painted Apple Moth eradication programme."*

Advertising complaint 03068 was lodged with the New Zealand Advertising Standards Authority in March 2003 alleging that those claims were misleading and untruthful.
Details about the disposition of that claim can be found on the Advertising Authority's website at http://www.asa.co.nz/display.php?ascb_number=03068
Disposition of another ASA complaint against a MAF advertisement can be found at http://www.asa.co.nz/display.php?ascb_number=03031

Recommendation 25: The government should make Foray 48B labels (indeed all pesticide labels) readily available to the public. The public has a right to know 1) precisely what is on the pesticide's label; 2) whether the New Zealand label for Foray 48B is less restrictive and cautionary than labels for the same product in other countries; 3) if it is less restrictive, why it is so and how it did it come to be so; and 4) how pesticide labeling is determined, and what negotiations about labeling, if any, occur between the New Zealand government and a pesticide's manufacturer.

5.5 Discrimination and the right to fair treatment

Discrimination against persons and classes is proscribed as a violation of an individual's and community's right to fair and equitable treatment.

The right to freedom from discrimination is supported by Article twenty-six of the *International Covenant on Civil and Political Rights* which reads

> All persons are equal before the law and are entitled without any discrimination to the equal protection of the law. In this respect, the law shall prohibit any discrimination and guarantee to all persons equal and effective protection against discrimination on any ground...

This right is supported as well by sections in Chapter three of the New Zealand Bill of Rights Act 1990 and in the Human Rights Act 1993.

As of January 1, 2002 the government is no longer excused from compliance with non-discrimination standards as it had been prior to that date. The PAM spray programme began after January 1, 2002.

Testimony indicates that discrimination against West Aucklanders occurred under two different forms, 1) direct discrimination against the residents of West Auckland as a class, in the form recognized by the principles of environmental justice, and 2) discrimination in its indirect form against a subset of West Auckland residents who were differentially impacted by the spray due to their unique conditions or situations.

5.5.1 Environmental justice

The basic principles of environmental justice require that those communities that are disadvantaged in any way – socially, economically, as a result of discriminatory racial policies, etc, or who simply have less ready access to resources – be accorded the same degree of respect, fair treatment and opportunity for meaningful involvement in decision-making as communities that are more socially or economically advantaged and have greater access to resources. "Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of...negative environmental consequences."[57]

And yet the socioeconomically less privileged communities of West Auckland were treated quite differently during the PAM eradication programme than were the relatively more privileged communities of East Auckland during the WSTM eradication programme. A much larger number of West Auckland residents were exposed to the insecticide, they were exposed much more frequently and over longer time-periods, they were exposed to sprays that covered larger areas than the WSTM programme, the spraying continued for over two years. Thus, the West Auckland spray programme was more aggressive, covered a larger area, lasted much longer, and

[57] US EPA's definition of environmental justice. See http://www.epa.gov/compliance/resources/faqs/ej/index.html Quoted in Robert D Bullard, *The Quest for Environmental Justice: Human Rights and the Politics of Pollution*, Sierra Club Books, San Francisco, 2005, p. 4.

dispersed a much greater quantity of insecticide over the population than was the case in East Auckland. In the East Auckland programme greater care was taken to use the least intrusive and most effective and up-to-date trapping, monitoring and extermination methods; in West Auckland, on the other hand, offers from experienced scientists, even offers for free services to research how best to adapt those less intrusive trapping and control methods to the PAM incursion, were rejected outright.

Thus, MAF's treatment of West Auckland communities during the PAM programme was qualitatively different than its treatment of East Auckland communities during the WSTM programme, and West Aucklanders bore "a disproportionate share of...negative environmental consequences." [58]

Basic principles of environmental justice are violated when environmental risks and hazards are unequally distributed among advantaged and disadvantaged populations. Prima facie evidence suggests that this occurred during the PAM eradication programme.

5.5.2 Indirect discrimination

It may initially seem as if discrimination could not have occurred among any subsets of West Aucklanders if all West Aucklanders were sprayed equally. But indirect discrimination occurs when any sub-group is disproportionately impacted by a policy or practice, and that is what happened with the PAM aerial spray programme. Individuals with asthma or other respiratory conditions, chemically sensitive persons, people with various allergies, immunocompromised people, the elderly, the very young, pregnant women,[59] any place-bound persons (in hospitals or elder care facilities, for example) to name a few vulnerable sub-sets of residents, could have been reasonably anticipated to experience more serious adverse effects than the general population. As we have seen, many in these sub-groups did experience disproportionately large impacts from the spray.

Given this potential for indirect discrimination, did MAF and MoH undertake adequate measures to protect these subpopulations from suffering disparate impacts due to the spray programme?

Much of this Report provides evidence that what measures were taken were far from adequate. The Inquiry heard testimony every day from those who suffered disproportionately severe impacts from the spray in the form of various adverse health effects, exacerbations of chronic conditions, new-onset physical disabilities and chronic illnesses, severe economic effects – loss of income, loss of jobs, loss of home businesses, etc – as well as adverse social impacts on intimate and other important relationships, loss of school days for children, and so on.

Taken together testimony about these impacts constitutes strong prima facie evidence that certain sub-sets of West Auckland residents were differentially impacted by the PAM spray program and did suffer real effects of discrimination.

5.6 Addendum on research ethics

Sir Geoffrey Palmer, in his December 24, 2002 written opinion on the potential illegality of the PAM aerial spray programme, refers specifically to Section 10 of the New Zealand Bill of Rights Act 1990, which states "Every person has the right not to be subjected to medical or scientific experimentation without that person's consent." Sir Geoffrey's concern here is significant. It is

[58] See 57

[59] In this regard, see provisions in the *Convention on the Elimination of All Forms of Discrimination against Women.*

supported as well by Article seven of the *International Covenant on Civil and Political Rights* which reads "no one shall be subjected without his free consent to medical or scientific experimentation."

To date we have available only the most inadequate data on human health effects of multiple-dose exposure to aerially applied Foray 48B. MAF officials regularly made reference to data gleaned from previous aerial spray programmes in other countries to argue that the spray was "safe," even though those data were incomplete, were derived from poorly designed research that yielded unreliable results, and certainly did not prove the spray to be safe. (see submission 65)

Clearly more research is needed, and each spray programme is an opportunity to collect more data. Human subjects research is thus undertaken each time an aerial spray program over a populated area occurs.

The argument here is a simple one: if human beings are being studied in these spray programmes, then this is human subjects research. Further, if the results from these spray programmes are commonly referred to as data from studies (and they are so referred to), and if those data are used in the way research data are used, for example to make claims about the "safety" or the absence of adverse health effects of a pesticide (and this is already being done even with data from the PAM spray programme[60]), then the studies are in fact studies and the persons whose bodies are being used, monitored and counted in those studies deserve the universally accepted protections for human beings who serve as research subjects.[61]

In the case of the West Auckland PAM spray programme, a large human population comprising all ages and levels of human development, from fetuses to adults to the elderly, was regularly exposed over a period of two and one half years, many of them fifty to sixty or more times, by contact exposure and inhalation exposure, to an aerially applied mixture of the chemicals and bacteria spores in Foray 48B. For a time during the spray period, this population was unsystematically monitored for health effects, though they were not monitored for adverse economic, personal, social or any other type of effects, and the monitoring was only passive and incomplete, and thus not adequate.[62]

This arrangement was thus, in addition to whatever else it may have been, a series of experiments on the human health effects that may result from long-term exposures to Foray 48B, even if what was learned from the experiments was less than what could have been learned with better

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[60] References to the New Zealand PAM aerial spray programmes are already showing up on websites in other parts of the world as "evidence" of the "safety" of Foray 48B when sprayed on humans.

In the state of Oregon in the US, for example, Department of Agriculture plans are already underway for aerially spraying Foray 48B over two Oregon cities in May of 2007. On the government informational website set up to prepare communities for that spray programme, the Frequently Asked Question is posed, "Can Btk make people sick?" The government, choosing its words carefully, responds

> Btk has an excellent safety record for humans. If you eat vegetables, you probably have already ingested this bacterium. It is commonly used on commercial, and even organic, produce. The safety has been established both by laboratory research and monitoring people in the areas of the U.S., Canada and New Zealand where it has been used for more than 25 years.

From the "Btk Fact Sheet," March 4, 2007, on the Oregon DHS (Department of Human Services) website at http://www.oregon.gov/DHS/ph/pesticide/btkfacts.shtml#info

As we have noted above in our Findings and repeat here, we consider it inappropriate to use any results from the PAM spray programme as evidence that Foray 48B should be considered "safe."

[61] Dr John Wargo, Associate Professor in the School of Forestry and Environmental Studies at Yale University, concurs. He says that "pesticide licensing under conditions of such uncertainty [about their potential adverse health effects] has been an act of uncontrolled human and ecological experimentation." Quoted in "Review of John Wargo, *Our Children's Toxic Legacy*," *American Journal of Public Health*, 87, Number 3 (March 1997) 473.

[62] In addition, more than one family explicitly offered their homes to MAF for testing the indoor concentrations of the pesticide during and after spray periods, to test the actual effectiveness of sealing windows and doors, etc. This could have been another opportunity to research the effectiveness of remaining indoors during and after spray periods to minimize exposure. MAF declined those offers.

experimental design and more complete and transparent monitoring and record-keeping. The West Auckland experiment was in effect posing a set of research questions about short- and long-term health effects that might result from contact and inhalation exposure to aerially applied Foray 48B.

The West Auckland experiment was thus similar in one way to Phase I safety trials for a proposed new pharmaceutical product in that this experiment too was testing for a product's safety. In another sense it was analogous to phase IV postmarketing trials of a pharmaceutical product in that those trials too monitor for safety, though in a much larger population sample.

The West Auckland experiment also had some similarities to a double-blind study: many of the subjects were in effect blinded, since they were exposed to the spray and drift at times they were not aware of, and no citizens were ever informed of the chemicals to which they were being exposed, so they were blinded in that respect as well. Those conducting the experiment were partially blinded as well, since they did not know or keep records of which specific subjects were being exposed on which spray days.

The key consideration that appears to have been missing from the planning for this experiment, however, was any concern for identifying and meeting ethical and human rights requirements for the treatment of the people who would be serving as research subjects in the experiment.

Ethical standards for human subjects research had already been implicit for many decades, but they were first made explicit in the *Nuremberg Code*, a document drawn up as a result of atrocities uncovered after World War II at the Doctors' Trials at Nuremberg (1946–49).[63] These trials found Nazi medical researchers guilty of conducting biological experiments on human beings with neither the full knowledge nor the free consent of those upon whom the experiments were being conducted.

West Aucklanders who were forced to participate in this aerial spray experiment, the longest such aerial spray experiment ever conducted on an urban population, were not provided full information about the nature or duration of the experiment, were not fully informed about the agents to which they would be regularly exposed, and were not given opportunity to freely choose whether they wished to participate in the experiment or not.

The principles outlined in the *Nuremberg Code* are the basic minimum ethical requirements for proper conduct of any research that involves human beings as participants. There is little or no room in these principles for the weighing of costs and benefits or the weighing of various stakeholder interests that so characterizes environmental risk assessment processes today.

The philosophy behind the *Nuremberg Code* is that all individual human beings – all, not just some or most – have worth in themselves and have certain rights due to them; human persons are not merely to be used as a means for the benefit of others, or for the benefit of government programmes, even if that benefit might be great and accrue to many.

The German philosopher Immanuel Kant (1724–1804) enunciated this principle. "So act," he says, "as to treat humanity, whether in thine own person or in that of any other, in every case as an end withal, never as a means only." The *Nuremberg Code* insists that every human person be treated with full respect for their humanity and for their right to self determination – based on the principle of autonomy – and not be treated only as a subject in an experiment.

The core of the *Nuremberg Code* is its insistence on the principle of informed consent. "The voluntary consent of the human subject is absolutely essential," it states in its first paragraph.

[63] The Nuremberg Code is available at many places on the web, including http://ohsr.od.nih.gov/guidelines/nuremberg.html

> This means that the person involved should have legal capacity to give consent; should be so situated as to be able to exercise free power of choice, without the intervention of any element of force, fraud, deceit, duress, overreaching, or other ulterior form of constraint or coercion, and should have sufficient knowledge and comprehension of the elements of the subject matter involved as to enable him to make an understanding and enlightened decision. This latter element requires that before the acceptance of an affirmative decision by the experimental subject there should be made known to him the nature, duration, and purpose of the experiment; the method and means by which it is to be conducted; all inconveniences and hazards reasonably to be expected; and the effects upon his health or person which may possibly come from his participation in the experiment. (*Nuremberg Code* ¶1)

The *Code* thus requires that each individual subject participating in an experiment have full legal capacity to give consent (i.e., that they not be a legal minor, not be mentally compromised, etc), and that each person "be so situated as to be able to exercise free power of choice." This means that there must be no force, no coercion and no "undue inducement" involved in procuring subjects' agreement to participate in any experiment.

In this situation, though, exposure to the pesticide was forcible and unavoidable.

> There was no escaping Foray 48B at that time as it was on the grass, on hand rails, pedestrian traffic light push buttons, on car door handles, playground equipment, on our vegetable gardens, bodies, the washing on our washing lines and it hung in the air we breathed. Aerial spraying bears little resemblance, as a human rights issue, to any other government action. It has a little in common with permitting smoking in the workplace where a person would be unable to avoid passive smoking. We have legislation now to protect people from that infringement of their human rights. (Submission 34)

Even those who took special pains to avoid direct exposure to the spray were sometimes forcibly exposed, as one couple describes.

> On receiving maps, information [about planned sprays] etc we followed it with precision.
> March 2003. Went to our local supermarket. Parked and locked up car. Hearing an unusually loud noise we looked up only to see a plane flying dangerously low. It was too late to go forwards or backwards. Trapped and nowhere to go to avoid it. With the speed and pressure the spray came down like a napalm bomb. No time to get to cover it was too late. The spray had already made contact and Peter had started coughing. We were dowsed again before we could reach cover. We got undercover but had to go back out in the open, and lo and behold we got sprayed again 3 times within a very short space of time....
> …. If we hadn't followed the dates times etc on the program it would be our fault. But the spray that day was not on the program. So I believe MAF or whoever should accept responsibility. (Submission 60)

Another witness, a psychotherapist, described a similar experience.

> 30th January 2003, was another spray day. I had little choice but to drive through the spray area to visit a client. I closed the air vent on my car and kept the windows wound up until I was more than 15 minutes past the area, despite the intense heat (I do not have air conditioning). I could see two aircraft spraying over the motorway as I drove through the area.
> My measures were insufficient to keep the chemicals away from me. I smelled the familiar smell in the car, and again, later that day, I had the same symptoms as I had experienced in October last year, in particular the extreme pain in the sinuses……
> …. Because of the health effects, I am serious about avoiding any contact with the pesticide. This has meant a severe loss of income at times, as I have refused to go into the area to work on any spray day. I have had to choose my health over income. (Submission 97)

Thus the most fundamental principle of informed consent was violated on each spray day. Citizens were not fully informed about the nature and duration of the experiment, were not asked for their consent, and were not given opportunity to withdraw from the experiment if they wished to. They did not have the freedom to say, "No, I would rather not participate and I would rather not have my children participate in this experiment."

The *Code* further requires that each person be given "sufficient knowledge and comprehension of the elements of the subject matter involved as to enable him to make an understanding and enlightened decision." No citizens were given sufficient information about the potential risks of exposure to the pesticide, nor about the chemicals to which they would be exposed. The manufacturer of the pesticide apparently considered that information proprietary and that disclosing the contents of their spray could be detrimental to their long-term business interests.

The *Nuremberg Code* also requires that there be made known to subjects

> the nature, duration, and purpose of the experiment; the method and means by which it is to be conducted; [and] all inconveniences and hazards reasonably to be expected.

As we have seen earlier in this Report, West Aucklanders were not given accurate information about how frequently they would be exposed or about how long the experiments would last; nor were they fully informed about the "inconveniences and hazards reasonably to be expected" from exposure to the undisclosed ingredients.

The *Code* requires that each individual person be properly and fully informed about the potential "effects upon his health or person which may possibly come from his participation in the experiment." It appears that some West Aucklanders, had they been provided with knowledge about potential health effects for them and their children (aggravation of asthma, for example, emergence of new-onset asthma, development of multichemical sensitivity, migraines and other neurologic effects, immune system and endocrine system dysregulation, etc), might have chosen, if they had had the freedom to make such a decision, to not participate in this experiment. One family testified that if they had known the spraying was going to last two years or more they would definitely have uprooted their family and moved out of the area. (Submission 61)

Finally, the *Nuremberg Code* requires that each subject "be at liberty to bring the experiment to an end" whenever they wish. That is, each subject must be able to freely withdraw from the experiment at any time for any reason at all (or even for no reason). This opportunity was not provided to West Aucklanders.

It thus appears that this aerial spray programme violated virtually every ethical norm outlined in the *Nuremberg Code*. Subjects were not informed about the chemicals to which they would be exposed, were not asked for their consent to participate, were not given the freedom to choose whether they would participate or not, and were not allowed to withdraw from the experiment at any time. In these ways West Aucklanders were in a situation very like that which the entire *Nuremberg Code* was designed to prevent.[64]

The *Nuremberg Code* was promulgated in 1947. The World Health Organization's *International Ethical Guidelines for Biomedical Research Involving Human Subjects,*[65] promulgated in 1993, is a more detailed iteration of the principles expressed in the *Nuremberg Code*. It too insists on the principle of informed consent but in addition it more fully develops the concept of "vulnerable

[64] Paragraph 5 of the Code reads "No experiment should be conducted where there is an a priori reason to believe that death or disabling injury will occur, except, perhaps, in those experiments where the experimental physicians also serve as subjects." A few witnesses wondered aloud whether any MAF or MoH officials lived inside the spray areas.

[65] The *International Ethical Guidelines for Biomedical Research Involving Human Subjects* is available on the website of the Council for International Organizations of Medical Sciences at http://www.cioms.ch/frame_guidelines_nov_2002.htm

populations," i.e., groups of persons who need special protections due to their unique vulnerabilities. Infants and children, for example, need special protections due to their unique biological vulnerabilities and due to their inability to protect themselves. Pregnant women, the elderly and persons with limited mobility need special protections, as well as those with certain mental incapacities or behavioral disorders, and any other persons whose ability to comprehend information, make judgements or give free consent, has been compromised in any way.

The aerial spray programme, with its inclusion of virtually every adult and child in the spray area, took no special care for vulnerable populations. Vulnerable persons and groups were fully enrolled as subjects in the experiment without protections for their unique vulnerabilities, and without requesting their free and uncoerced consent. The experiment thus also violated provisions of WHO's *International Ethical Guidelines for Biomedical Research Involving Human Subjects* related to vulnerable populations.

MAF's justifications for the PAM programme leaned heavily toward the utilitarian and consequentialist,[66] weighing what they said were potentially large ecological and economic impacts against some "discomfort and inconvenience" (Minister of Biosecurity, the Hon Jim Sutton's words) that might be experienced by a few West Aucklanders. (*Dateline*, 2003)

As Minister Sutton put it during a television interview

> It is necessary to endure some discomfort, and inconvenience in order to avoid the grave risks and the greater problems of introducing this potentially very serious new pest to our environment.

The interviewer then asked, "So getting rid of [the moth] is worth the human collateral?"

> Yes it is, and, I think that for the overwhelming majority of West Aucklanders, they accept this; I'm grateful for their patience and forbearance, and I think that the inconvenience and the occasional discomfort that they've endured is, on behalf of all New Zealanders, is well worthwhile. (*Dateline* 2003)

Reference here to "inconvenience" and "the occasional discomfort" are more than incongruous with testimony heard on every day of the Inquiry detailing the spray's impacts on citizens. It represents a monumental failure to adequately characterize the impacts on individuals and families and recalls the proverb "The burdens that are easiest to bear are those that are borne by others." It also serves as an illustration of the inadequacies of consequentialist methods of decision-making when they fail to pay close attention to human rights standards.

What actually occurred here is that the "collateral damage," i.e., the impact of the aerial spray programme on community members, was trivialized by their government, and the dramatic impacts that many West Aucklanders experienced – acute physical reactions, acute exacerbations of existing medical conditions (asthma, allergies, etc), and new-onset chronic health conditions and disabilities, such as asthma, chemical sensitivity, allergic hyper-sensitization, etc, that, for some, will be carried for the remainder of their lives – as well as economic impacts,[67] loss of income, loss of jobs, loss of whole businesses, social impacts on personal relationships, and educational impacts suffered by many West Auckland children – all counted for less, in MAF's assessment, than the presumed (but undocumented and unproven) advantages to the country of eradicating the PAM via aerial spraying.[68]

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[66] "Utilitarian" in the strictly ethical sense, in which decisions are made solely by weighing potential costs against potential benefits, regardless of other concerns (such as human rights).

[67] As just one example of the large economic, educational and social impact environmentally induced illnesses can cause, see J G Lipson and N Doiron, "Environmental Issues and Work: Women with Multiple Chemical Sensitivities," *Health Care for Women International*, Vol 27, No. 7, August 2006, pp. 571-584.

[68] And, as we noted above, much of MAF's estimated cost to the country consisted of "costs to the plantation forestry industry (much of which is foreign-owned)."

The sufferings of the "few," in other words, when weighed against presumed benefits to the many, were simply counted as less important. Such consequentialist (risk assessment) reasoning can work appropriately in some kinds of situations, but only when the rights of all, not just of the many, have been met. That did not happen in this case.

5.7 What happens when human rights standards are neglected?

Risk assessment is the process of weighing anticipated future costs against anticipated future benefits for a given proposed action, and then choosing the course of action that is thought to have more benefits and fewer costs. Its task is thus to assess, given a certain set of assumptions and given the belief that everything about the proposed program will go as planned, what the likely future outcomes of that proposed program will be. In the process it needs to decide which of those potential future outcomes should be designated as benefits and which should be designated as costs, and then needs to weigh those potential future costs against the potential future benefits. Finally it needs to make an estimate as to whether the proposed program will turn out, in the *actual* future, to be ultimately more beneficial or more costly. Risk assessment, in other words, begins with a broad set of assumptions, makes estimates about how events will turn out in the future, makes judgements about whether to count those future outcomes as costs or benefits, decides how much weight to assign each of those outcomes, and then makes judgements about whether those estimated future benefits will have more value than the estimated future costs, or vice versa.

Both environmental and health risk assessment processes are thus highly inexact partly because futurology is an inexact science, and partly because the processes must so often rely on personal and biased judgments that have little or nothing to do with science. As William Ruckelshaus, the first administrator of the US Environmental Protection Agency, once said, "We should remember that risk assessment data can be like the captured spy: If you torture it long enough, it will tell you anything you want to know." And that is one reason it is important, in any decision-making process that relies on risk assessment, to make sure the process is both accurate and complete, and that it is counter-balanced with more fundamental moral considerations such as respect for human rights and respect for civil law.

As we have seen above, the risk assessment processes in this case appear to have been incomplete and inadequate on a number of levels and to have been based on premises and assumptions – about economic impact of the PAM, the necessity for aerial spraying, the health impacts that could be reasonably anticipated, etc – that had not been adequately substantiated.[69]

Decision-makers do want to select options that are effective and efficient, of course, but it is crucial that the list of options from which they choose are all within the boundaries of both civil and moral law.

MAF decision-makers, however, appear to have considered PAM spray programme issues only from within a risk assessment framework. Ethics and human rights concerns appear to have not been part of the decision-making process.

And yet the risk assessment question as to whether the aerial spray programme "worked" or not is a legitimate one, though the answer may not be simple or obvious. If only the one single dimension of a spray programme's outcomes is considered, viz., whether the mission of eradicating the PAM was accomplished, the answer at this point appears to be yes.[70] If broader and longer-term outcomes are considered though, such as resulting damage to community-

[69] For details cf Dr John Clearwater's Submission 40, and Dr Gordon Hosking Submission 41. See also Dr Meriel Watts' Submission 75.
[70] MAF announced to the media on March 22, 2006 that the moth had been eradicated.

government relations, community anger toward MAF, a consequent potential for citizen refusal to cooperate with future eradication programmes, increased potential for legal liabilities, disaffection with one's government and the possible implications of undermining community support for future government programmes and policies – when these larger outcomes are considered, the answer as to whether the PAM program "worked" is not as clear. It may turn out that while the aerial spray programme accomplished a single short term goal, it may not have accomplished that goal in the most efficient manner, and may also have violated the principle of minimum harm.[71] It may also have done serious long term damage to MAF's own interests; i.e., MAF's behavior may have alienated communities dramatically enough that some of its larger goals may now be put at risk. As one witness said, echoing the sentiments of others: "I still don't even know what [the moths] look like but if I ever found one MAF would be the last person I would call!" (Submission 78)

Another witness took MAF to task for other failures:

> Before MAF pat themselves on the back for eradicating this moth, as a job well done, I am here to say that they, MAF and the medical team commissioned to look after the health interests of West Aucklanders, have failed miserably in looking after the people on whom they have inflicted their campaign. I felt **violated** by them every time they sprayed their nasty chemical over my house. And every time they betrayed me with their lies that this spray would not affect my health. And every time their doctors told me they would help and did nothing. And every time they listened to my concerns and did nothing. When they trawled through my personal medical records only to find information that would vindicate their narrow contemptuous position, I felt akin to being raped by them once again.
>
> It is my understanding that medical practitioners have a professional duty to uphold high standards of integrity in their dealings with people, and swear a Hippocratic Oath to practice their profession with respect, conscience, and dignity to the service of humanity.
> They have failed spectacularly. (Submission 90)

The infamous forty year Tuskegee syphilis study[72] in the US (1932-72), and the long term damage it did to the US government's ability to conduct effective public health work among African American communities, is a case in point. Largely as a result of human rights violations in that study and others, a legacy of distrust, suspicion and the public health equivalent of iatrophobia still continues in many African American communities. Public health and biomedical research efforts in African American communities are often severely hampered by this distrust, even today.

> The Tuskegee Syphilis Study ended a quarter of a century ago, but its effects can still be felt.... 'Many African Americans' distrust in today's medical establishment can be attributed to Tuskegee.'[73]

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[71] "As a natural extension of the precautionary principle, it is sensible to choose the method or methods for managing or eradicating the intended species which are effective but which cause the minimum harm to people and the environment. This principle is more weakly expressed in the substitution principle, which requires that hazardous chemicals be replaced with safer alternatives, and in alternative assessment which requires that all alternatives to a pesticide should be considered. In applying the principle of minimum harm, one starts with the questions 'what do we want to achieve and what is the least harmful way of achieving it', rather than simply establishing whether or not aerial spraying poses no unacceptable risk to health." (Watts, Meriel, *Ethical Pesticide Policy: Beyond Risk Assessment*, PhD Thesis, University of Auckland, 2000, ch 5) See. Dr Meriel Watts, Submission 75.

[72] "The Tuskegee Study of Untreated Syphilis in the Negro Male" (1932-72) observed the effects of untreated syphilis on poor black men in Macon County, Alabama, even after an effective treatment for syphilis was available, and without ever obtaining proper informed consent from any of the subjects.

One of the effects of that study in African American communities has been an immense erosion of trust, ultimately making it exceptionally difficult for public health researchers to recruit black volunteers for studies, and indeed difficult for public health workers to work successfully on any number of projects in African American communities.

[73] According to Dr Carl C Bell, executive director of Chicago's Community Mental Health Council," in "Mistrust of Doctors Lingers After Tuskegee," *Washington Post*, April 15, 1997. Quoted in Harriet A Washington, *Medical Apartheid*, Doubleday, 2006, New York, p 180.

> "Thanks to this brutal history, many African-Americans today [even into the 21st century] are wary of participating in potentially lifesaving medical studies." That's really the true cost of all of these abusive practices," says Washington. "Because of past crimes against our health, we're too afraid to trust those in authority." A recent study in *The American Journal of Law & Medicine* estimated that only 1 percent of the nearly 20 million Americans enrolled in biomedical studies are black. [74]

The Tuskegee study has long served as an object lesson in the importance, even from a purely utilitarian point of view, of ensuring that human rights concerns be fully respected and observed in government programmes.[75]

Ensuring that human rights standards are protected and upheld turns out, in the end, to be in everyone's best interests even when viewed through a consequentialist lens. When these standards are violated the consequences can be monumental, costly and long lasting. As we noted in our Findings above, "biosecurity itself is compromised by the attitude toward the community displayed by MAF during the PAM programme."

Is it possible for negative effects of this magnitude to be healed and countered? The author of one recent study of the effects of the Tuskegee experiment writes, "By bringing these atrocities out in the public, some healing can occur...."[76] That is, by acknowledging the truth of what was done, by formally apologizing, and by assuring communities that those things will not happen again, a sense of balance and justice can begin to be restored. As one social analyst writes, what the hope for justice requires is a belief "that wrongs will be made right, that the underlying order of things is not flouted with impunity." (Lasch 1991, pp 80-81) [77]

There is little doubt that a genuinely sincere official apology to the community in this instance could go some distance toward healing community rancour and distrust.[78]

5.8 A short note on drift

The fact of spray drift exacerbates concerns about human rights primarily because of the larger number of persons who are affected by the spray but who, because they are outside the designated spray area, are uninformed, unwarned and unconsenting.

Some testimony described adverse effects experienced by persons exposed to spray drift outside the targeted spray zone, so the issue of spray drift must be addressed.

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[74] *Newsweek*, February 12, 2007, p. 49.
cf also Harriet Washington, *Medical Apartheid: The Dark History of Medical Experimentation on Black Americans From Colonial Times to the Present*, Doubleday, 2007, 512pp

[75] For a brief history of the "Tuskegee Study of Untreated Syphilis in the Negro Male" cf. http://www.cdc.gov/nchstp/od/tuskegee and particularly the Tuskegee timeline at http://www.cdc.gov/nchstp/od/tuskegee/time.htm

[76] *Newsweek*, February 12, 2007, p. 49. Formal apologies are also important. Washington quotes President Clinton's formal apology for the Tuskegee Syphilis study:

> To the survivors, to the wives and family members, the children and the grandchildren, I say what you know: No power on Earth can give you back the lives lost, the pain suffered, the years of internal torment and anguish. What was done cannot be undone. But we can end the silence. We can stop turning our heads away. We can look at you in the eye and finally say on behalf of the American people, what the United States government did was shameful, and I am sorry.... To Macon County, to Tuskegee, to the doctors who have been wrongly associated with the events there, you have our apology, as well. To our African American citizens, I am sorry that your federal government orchestrated a study so clearly racist. That can never be allowed to happen again." – Harriet A Washington, *Medical Apartheid*, Doubleday, 2006, New York, p 184.

[77] One People's Inquiry witness expressed it as a hope that "those responsible are brought to and held to some sort of justice." [Submission 71]

[78] One model for such an apology might be the recent formal apology of the North Carolina Senate for slavery in the US:
Following the lead of lawmakers in neighboring Virginia, the Senate unanimously backed a resolution acknowledging its "profound contrition for the official acts that sanctioned and perpetuated the denial of basic human rights and dignity to fellow humans." (*Boston Globe*, April 6, 2007)

A certain amount of pesticide drift, i.e., "that portion of the spray cloud that leaves the target area," (Barry & Ciesla 1981) is considered inevitable, particularly with aerial applications.

> Pesticide drift is "unavoidable" whenever pesticides are applied. Drift is greatest from aerial applications, when typically about 40 percent of the spray is lost to drift. Drift from aerial applications routinely is measured hundreds of yards away from the application site, and has been measured miles away. (Cox 1995)

Several factors (wind speed, droplet size, application altitude, type of aircraft, etc) can affect quantity and distance of drift, but "wherever and whenever pesticides are used, drift occurs." (Cox 1995)

What quantity of an aerially applied pesticide is normally expected to drift?

> The amount of drift has been characterized as "considerable"[79] by the [US] National Research Council and is thought to vary from about 5 percent (under optimal, low-wind conditions) to 60 percent (under more typical conditions).[80] The [US] Office of Technology Assessment estimates that about 40 percent of an aerial insecticide application leaves the "target area" and that less than 1 percent actually reaches the target pest. (US Congress 1990)

Pesticide drift, particularly from aerial applications, can thus be considerable. If adverse health, economic and social impacts are experienced by persons within the targeted spray area, some degree of adverse effects can be expected in the larger drift areas as well. (Kegley et al, 2003) Adverse health effects reported in testimony by those exposed to spray drift outside the immediate target areas can thus be considered credible.

Thus, if drift is inevitable in aerial spray operations, and if the quantity of such drift can be considerable, additional human rights issues emerge because this means that some unknown larger number of persons, i.e., those who live, work, attend school and visit in drift-affected areas, will suffer spray exposure and its effects without benefit of being notified, being fully informed or having opportunity to give or refuse consent. They also may not have opportunity to participate in decision-making about the spray application.

Drift is significant partly because, like secondhand cigarette smoke, it is forced on others against their will and can cause serious adverse health effects. And like secondhand cigarette smoke

> exposure to airborne pesticides may not necessarily make a person feel sick at the time, but can lead to increased incidence of any number of chronic diseases. (Kegley et al, 2003, p1)

Because of this it is worth looking into and studying the likely extent of spray drifts. Spray drift is not always detectable by normal sense perceptions.

> Sometimes drift is very noticeable as a cloud of spray droplets or dust during application, or as an unpleasant odor afterwards. But it is frequently insidious – invisible to the eye and odorless – often persisting for days, weeks, or even months after application as volatile chemicals evaporate and contaminate the air. (Kegley et al, 2003, p1)

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[79] National Research Council, Board on Agriculture, Committee on Long-Range Soil and Water Conservation, 1993. "Soil and water quality: An agenda for agriculture." Washington DC, National Academy Press, pp 323-24. Quoted in Caroline Cox, "Indiscriminately from the Skies," Journal of Pesticide Reform, 1995, vol 15, No. 1, p 2.

[80] National Research Council, Board on Agriculture, Committee on Long-Range Soil and Water Conservation, 1993. "Soil and water quality: An agenda for agriculture." Washington DC, National Academy Press, pp 323-24. Quoted in Caroline Cox, "Indiscriminately from the Skies," Journal of Pesticide Reform, 1995, vol 15, No. 1.

Determining the spatial extent of drift is not easy and has not been well characterized. It is well known that aerial applications, however, are likely to involve much greater drift than ground-based applications. One witness at the People's Inquiry testified that she could clearly smell the Btk pesticide some 10-12 kilometers away (a straight line distance of approximately 3-4 kilometers) from the spray zone. (Submission 64) And according to one study

> Typical estimates of pesticide drift following aerial application range from 100 meters (330 feet) to 1600 meters (5250 feet). In virtually every study available to NCAP[81] (totaling 16), pesticides were detected as far away from the application as samples were taken, so these numbers cannot give a definite answer to the question of how far pesticides can drift. (Cox 1995, p3)

There is thus good reason to suspect that pesticide drift can occur over much greater distances than has been suggested by pesticide manufacturers.

> For example, cold air drainage carried forestry applications of the insecticides orthene and trichorfon over 1.25 miles in Washington's Cascade mountains. Moderate winds carried cabaryl over 2 miles from a Vermont apple orchard. Using a fluorescent tracer, drift was measured 4 miles from an insecticide application on a California oat field. From Colorado wheat fields during hot weather, 2,4-D and dicamba drifted between 5 and 10 miles. In central Washington [state], winds and hilly terrain combine to cause 2,4-D drift for 10 to 50 miles and paraquat drift for up to 20 miles. (Cox 1995, p3)
>
> Drift from ground applications is more likely to be measured in meters (and feet) rather than in kilometers (and miles). (Cox 1995, p3)

Spray drift can occur both during and after spray application. Pesticides "are carried away from the application site by wind and on windblown soil particles. Drifting pesticides can travel for miles." (Kegley et al, 2003, p1) In fact

> the bulk of off-site pesticide movement occurs as the pesticide volatilizes (evaporates) after application.... [M]onitoring data show that concentrations of pesticides in air peak between eight and 24 hours after the start of application, with concentrations declining over several days to several weeks. (Kegley et al, 2003, p4) [82]

Because drift appears to be inevitable and often considerable, particularly with aerial applications, the potential for human rights issues to be magnified is increased. The farther and greater the drift the larger the number of unknown persons who will be exposed to the risks of exposure without benefit of prior notification, without benefit of being fully informed – hence without opportunity to leave the area – and without opportunity to give or refuse consent.

5.9 In sum

It does seem surprising that a government ministry, particularly a large and powerful ministry in the government of a modern democratic polity, would undertake to spray such enormous quantities of pesticide over such a broad expanse of populated area, exposing such a large number of persons so frequently and over such a prolonged period of time. But to have done so without informing those citizens what it was with which they were being sprayed seems unconscionable.

MAF appears, in other words, to have displayed a disturbing unfamiliarity with both national and international human rights standards serious enough to risk ultimately undermining the ministry's own interests and hence the country's interests as well.

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[81] Northwest Coalition for Alternatives to Pesticides. http://www.pesticide.org

[82] This study recommends that "post application drift must be regulated as well as drift that occurs during applications." (p 4)

> We have subjected enormous numbers of people to contact with these poisons, without their consent and often without their knowledge. If the Bill of Rights contains no guarantee that a citizen shall be secure against lethal poisons distributed either by private individuals or by public officials, it is surely only because our forefathers, despite their considerable wisdom and foresight, could conceive of no such problem. (Rachel Carson, *Silent Spring*, 1962)

Rachel Carson writes here of the US Bill of Rights, but her insight applies more universally and perhaps to New Zealand's situation as well.

At the closing ceremony of the People's Inquiry on the final day of oral testimony, one Maori elder who had listened carefully to the full week of oral testimony from community victims of the spray, stood and solemnly stated "I feel bad for my country."

He then, after reflection, expressed hope that some day soon Aotearoa could once again come to deserve its reputation as "clean and green."

Recommendation 26: In keeping with the mandates of recently legislated new "primary functions" for the Human Rights Commission (under the Human Rights Amendment Act 2001)

- **to advocate and promote respect for and appreciation of human rights in New Zealand society...**
- **to advocate and promote, by education and publicity, respect for, and observance of, human rights;**
- **to make public statements promoting an understanding of, and compliance with, the New Zealand Bill of Rights Act 1990; …**
- **to promote, by research, education and discussion, a better understanding of the human rights dimensions of the Treaty of Waitangi and their relationship with domestic and international human rights law**

the Human Rights Commission should establish a procedure for hearing PAM-related complaints publicly and should disseminate their concerns widely.

The HRC should work with the Waitangi Tribunal to explore possible violations of the spirit, intent and letter of the Treaty of Waitangi.

5.10 Restorative justice

Even government ministries, particularly those which have direct dealings with citizens, have an obligation to be good neighbors – more than that, to preserve a just public order and strong functioning relationships with communities; and when there have been violations of the standards of justice in such relationships, a proper order needs to be restored. It will be in MAF's interest, in the community's interest, and certainly in the nation's interest that some level of trust be restored.

The principles of restorative justice require, as Desmond Tutu has said, a response that is "restorative of the dignity of the people." (Minow 1998, p81) Such restoration will require

1. acknowledgement of responsibility for the real injuries suffered by the community;
2. assurances that what happened here will not happen again – this usually entails some degree of policy or ministerial reform;
3. material compensation for real losses; and
4. genuine public apology.

Restorative justice, in a word, seeks repair, not revenge; seeks reconciliation, not recrimination.

The community's active participation in these processes will be essential.

Recommendation 27: The government should make public assurances to the community that what happened in West Auckland will not happen again anywhere in New Zealand. In support of those assurances it should take action to reform the Biosecurity Act as outlined in R12, R.20 and R.21 above.

With regard to compensation we draw attention again to **Recommendation 2** above that urges the government to establish procedures for providing material compensation to affected parties. **And** (we add here)**, in the matter of proving loss, when there is prima facie evidence of harm to an individual or group, the burden of proof should be on the government to prove that a victim was *not* harmed, not on victims to prove they *were* harmed.**

And finally we draw attention again to **Recommendation R1 above** which urges the government to issue a formal apology for its mishandling of the spray programme, its inadequate support for those affected **and (we add here) for its egregious disregard for the rights and dignity of so many who live, work, attend school and visit in West Auckland.**

5.11 Conclusion

"The fundamental responsibility of any government is to protect its citizens from physical harm."[83]

In its prosecution of the PAM aerial spray programme, the New Zealand government failed to meet that basic responsibility. This failure was due largely to the fact that it did not include ethics and human rights considerations in its planning processes.

As a result of these failures, actions knowingly undertaken by agents of the government resulted in the infliction of serious physical, social and economic injury on a significant number of West Auckland citizens.

The government now has a pragmatic obligation (for the good of the country) and an ethical obligation to individual injured citizens (based on human rights standards) to act as effectively as it can to restore public faith in the processes of democratic government; to provide adequate remedy and compensation to every individual who suffered physical, social or economic injury as a result of the spray programme; and to ensure that what was perpetrated on the people of West Auckland will not be perpetrated again on anyone, anywhere in New Zealand, ever.

[83] John and Teresa Heinz Kerry, *This Moment on Earth: Today's New Environmentalists and Their Vision for the Future*

CONCLUSION

In conclusion, we would simply like to acknowledge those whose experiences are the reason for this report. We thank all those who gave oral or written testimony to the Inquiry. We acknowledge your courage in coming forward and speaking publicly about painful experiences. We also thank the organisers for the competence and professionalism they brought to the Inquiry.

It should be noted that the Inquiry is extraordinary in having been brought about by the unpaid labour of members of the affected community itself. It became clear to us that this involved many hours of emotionally and physically taxing work. We were deeply impressed by the dedication of the organisers and many of the witnesses to others in their West Auckland community. We thank Te Piringatahi O Te Maungarongo marae for making us welcome and Waitakere City Council for hosting the Inquiry, and we particularly thank Warahi Paki and Fred Holloway for their guidance and care during the Inquiry.

Our purpose has been to make a positive contribution to biosecurity policy and operations in New Zealand. We hope our contribution goes some way toward ensuring that the experiences related to us are never repeated.

Dr Joanna Goven
Dr Tom Kerns
Prof. Romeo Quijano
Dell Wihongi

October 2007

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APPENDIX 1

COMMUNITY STUDIES & REPORTS

These studies and reports have been written, published or commissioned by members of the community actively involved in both the Painted Apple Moth and the White Spotted Tussock Moth eradication campaigns in Auckland. Copies available on www.peoplesinquiry.co.nz

October 2004: ***Painted Apple Moth Eradication Campaign (legality of aerial spraying) – Report to the Prime Minister***. Hana Blackmore for the PAM Community Network

Report detailing serious concerns regarding the legality of continued aerial spraying, lack of public consultation and governmental review, and the failure of the compensation system. Calls for urgent action and the setting up a full public inquiry.

May 2003: ***"Is PAM Easy?"*** John Clearwater. Published in Avondale Newsletter May 2003

Analysis and comparison of two moth eradication projects, detailing critical decisions that resulted in two totally different outcomes.

March 2003: ***New Zealand Education Institute (NZEI) West Auckland aerial spraying survey.*** Correlated by Meredydd Barrar – NZEI West Auckland Committee of management.

Survey of staff and principals in all West Auckland schools carried out during February 2003 on the effects of the Painted Apple Moth aerial spraying on teachers and pupils.

February 2003: ***Interim Report of the Community-based health & incident monitoring of the aerial spray programme. January – December 2002***. Hana Blackmore

Report detailing the impacts and effects of the first year of the Painted Apple Moth aerial spraying programme. Includes data recorded by the community from over 390 reported incidents. Details for the first time the social and economic impacts, and questions the adequacy of the health risk assessment to accurately predict the level, extent and seriousness of the adverse effects.

January 2003: ***Painted Apple Moth Eradication Programme – Health Risk and Effects***. Meriel Watts, Phd. for the Stop Aerial Spraying (SAS) group.

Paper addressing the adverse health effects experienced by the community exposed to the aerially applied insecticide Foray 48B. Compares the difference between health effects apparently experienced and the government's assessment of the health risk.

January 2003: ***A Review of the Painted Apple Moth Eradication Programme.*** Kubi Witten-Hannah, for the Painted Apple Moth Community Advisory Group. PAM-CAG.

A paper reviewing the PAM eradication programme after one year of aerial spraying. Examines a programme that is neither safe nor effective. Details the need to work with the community to develop an approach that can succeed, and proposes effective solutions and strategies.

December 2002: ***Legal Opinion on the Painted Apple Moth Spraying***. Sir Geoffrey Palmer for Stop Aerial Spraying, SAS.

Preliminary legal advice for community groups on the issues around the possibility of securing an injunction to stop the aerial spraying of West Auckland. Examines

adverse health effects, human rights and the non-disclosure of spray ingredients. Legal remedies with a reasonable chance of success are confirmed and outlined.

October 2002: ***Updated Report. Exposure Risks for Schools during the Painted Apple Moth Aerial Spray Programme.*** Hana Blackmore, Meriel Watts, Meredith Youngson, Glenys Bean for the Painted Apple Moth Community Coalition – CC-PAM.

Open letter and updated 2001 Report to parents, schools and childcare establishments in the exposed West Auckland spray zone. Details what is, and what is not, being revealed about the exposure risks and unique hazards faced by children. Outlines prudent actions that should be taken to protect them.

May 2002: ***Painted Apple Moth Eradication – Community Option. Report and Recommendations of Special Science Meeting***. Dr Meriel Watts, Hana Blackmore for the Painted Apple Moth Community Advisory Group (PAM-CAG)

Report of a specially convened science meeting of six scientists with experience in successful eradication of NZ insect pests, to critique, develop and strengthen the community's option for eradicating the Painted Apple Moth. Formed part of the community submission to the Ministry of Agriculture and Forestry's (MAF) eradication options to the Government. Includes the ***PAM Community Advisory Group's 10 point plan for eradication.***

January 2002: ***MAF bungle the Biosecurity in West Auckland.*** Meriel Watts, PhD

A paper outlining fundamental reasons why the PAM eradication programme has gone so badly wrong. Examines the failure of the Ministry to learn the lessons of a previous successful eradication programme, and details concerns about their use of toxic chemical sprays.

November 2001: ***Aerial spraying against the Painted Apple Moth – Btk pesticide exposure, spray drift and environmental persistence***. Hana Blackmore for Society Targeting Overuse of Pesticides, NZ (STOP) and CC-PAM

Report detailing issues of concern about the proposed PAM aerial spraying programme in West Auckland. Covers questions of the level of pesticide exposure and drift, penetration into buildings and homes, and environmental persistence. Recommends urgent studies and advice on prudent avoidance for vulnerable people.

February 2001: ***Timeline comparison of Two Moth Eradication Programmes***. Hana Blackmore.

Detailed timetable comparing the responses and actions taken by the government to eradicate the White Spotted Tussock Moth (April 1996 – April 1999) and the attempted eradication of the Painted Apple Moth (April 1999 – January 2001).

August 2000: ***Biosecurity & Pest Management. Implications of the Painted Apple Moth eradication programme. Report to the Minister of Biosecurity***. Hana Blackmore for the Society Targeting Overuse of Pesticides NZ.

Report raising concerns about the failure to eradicate the fifteen month-old Painted Apple Moth infestation in West Auckland and the implications for pest-management strategies in New Zealand. Details the need for an urgent review of current Biosecurity, pest management programmes and policies.

APPENDIX 2
MAF aerial operations summary

Operation Number	Date of Application	Area (ha)	Volume of Foray48B (ltr)	Craft Used	Target Areas	Notes re areas requiring additional application to ensure adequate penetration and coverage
1	21-Jan-02				West Auckland including riperian areas and parts of Waikumete Cemetery	Areas of dense vegetation at the heads of major creeks.
	22-Jan-02	626		Helicopter BK 117		
	23-Jan-02					
	24-Jan-02					
Total Mapped Area:		570				
2	17-Feb-02				West Auckland including riperian areas and parts of Waikumete Cemetery	Areas of dense vegetation at the heads of major creeks.
	18-Feb-02	594	3710	Helicopter BK 117		
	19-Feb-02					
Total Mapped Area:		570				
3	16-Mar-02				West Auckland including riperian areas and parts of Waikumete Cemetery	Areas of dense vegetation at the heads of major creeks.
	20-Mar-02	569	3030	Helicopter BK 117		
	21-Mar-02					
Total Mapped Area:		570				
4	10-Apr-02	635	3200	Helicopter BK 117	West Auckland including riperian areas and parts of Waikumete Cemetery	Double application of gullies.
	11-Apr-02					
Total Mapped Area:		599				
5	30-Apr-02	625	3000	Helicopter BK 117	West Auckland including riperian areas and parts of Waikumete Cemetery	Double application of gullies.
Total Mapped Area:		599				
6	1-Jun-02	186	3400	Helicopter BK 117	West Auckland including riperian areas and parts of Waikumete Cemetery	Double application of gullies.
		272		Fixed Wing AT 602		
	2-Jun-02	0		Helicopter BK 117		
		170		Fixed Wing AT 602		
Total Mapped Area:		617				
7	16-Jul-02	295	3620	Helicopter BK 117	Significant change in target areas Kelston, Glendene and Te Atatu South dropped out. Riverpark, Stagecoach bus depot and Delta Ave included for first time.	Main gullies
		397		Fixed Wing AT 602		
Total Mapped Area:		722				
8	23-Aug-02	381	4250	Helicopter BK 117	Small area along rail track east of the cemetery added. Subtle changes to boundaries of other parts of target zone.	
		487		Fixed Wing AT 602		
Total Mapped Area:		868				
9	15-Sep-02	424	4500	Helicopter BK 117	Last of small aerial operations. Outlying blocks were enlarged to ensure better coverage.	Over mangroves.
	17-Sep-02	538		Fixed Wing AT 602		
Total Mapped Area:		962				

Aerial Operations Summary January 2002 to June 2004

Operation Number	Date of Application	Area (ha)	Volume of Foray48B (ltr)	Craft Used	Target Areas	Notes re areas requiring additional application to ensure adequate penetration and coverage
10	23-Oct-02	115 3305 4560	40,100	Helicopter BK 117 Fixed Wing AT 602 Fixed Wing F27	First large scale aerial operation. 7835ha zone defined.	Areas with dense vegetation and difficult terrain received an additional treatment by helicopter. This area was 115ha in size.
Total Mapped Area:		7980				
11	13-Nov-02 15-Nov-02	115 3305 4560	40,600	Helicopter Fixed Wing AT 602 Fixed Wing F27	Second large scale aerial operation. Area treated the same as first large scale programme.	Areas with dense vegetation and difficult terrain received an additional treatment by helicopter. This area was 115ha in size.
Total Mapped Area:		7980				
12	2-Dec-02 3 Dec	273 2958 5455	46,500	Helicopter Fixed Wing AT 602 Fixed Wing F27	Third large scale aerial operation. Area treated increased to 8522. Point Chevalier area added.	259ha given second treatment by helicopter.
Total Mapped Area:		8686				
13	20-Dec-02 21-Dec-02	361 3085 5457	44,100	Helicopter Fixed Wing AT 602 Fixed Wing F27	Fourth large scale aerial operation. Same area with the addition of the Hobsonville area.	338ha given second treatment by helicopter
Total Mapped Area:		8903				
14	7-Jan-03	458 6555 3532	50,400	Helicopter Fixed Wing AT 602 Fixed Wing F27	Fifth large scale aerial operation. Total area 9969ha. Area increased with addition of 1526ha in the Hobsonville area.	338ha given second treatment by helicopter
Total Mapped Area:		10,545				
15	30-Jan-03 31-Jan-03	370 3486 6777	52,400	Helicopter Fixed Wing AT 602 Fixed Wing F27	Sixth large scale aerial operation. Total area 10263ha. Area increased with addition of 1526ha in the Hobsonville area.	369ha given second treatment by helicopter
Total Mapped Area:		10,632				
16	16-Feb-03 17-Feb-03	298 3451 6805	53,000	Helicopter Fixed Wing AT 602 Fixed Wing F27	Seventh large scale aerial operation. Total area 10256 ha.	298ha given second treatment by helicopter.
Total Mapped Area:		10,554				
17	14-Mar-03 17-Mar-03	298 3451 6805	46,800	Helicopter Fixed Wing AT 602 Fixed Wing F27	Eighth large scale aerial operation. Reduction of 850ha from Oratia and 363ha from New Lynn reduced total treatment area to 8760ha. No new areas added.	298ha given second treatment by helicopter.
Total Mapped Area:		10,554				
18	2-Apr-03 3-Apr-03	354 2896 5240	45,000	Helicopter Fixed Wing AT 602 Fixed Wing F27	Ninth large scale aerial operation. Henderson Corridor was reduced, area added around Ranui to create buffer area. The total treatment area	354ha given second treatment by helicopter.
Total Mapped Area:		8490				

Operation Number	Date of Application	Area (ha)	Volume of Foray48B (ltr)	Craft Used	Target Areas	Notes re areas requiring additional application to ensure adequate penetration and coverage
					reduced to 8150ha.	
19	22-Apr-03	382	44,500	Helicopter	Tenth large scale aerial operation.	Area of 382ha given a second treatment by helicopter.
	23-Apr-03	2976		Fixed Wing AT 602	No changes to spray area.	
		5744		Fixed Wing F27	Total treatment area 8720ha	
	Total Mapped Area:	9101				
20	14-May-03	297	32,400	Helicopter	Eleventh large scale aerial	297ha given a second treatment
		2669		Fixed Wing AT 602	operation. Significant reduction in	by helicopter.
		3892		Fixed Wing F27	the Waterview - Avondale area.	
	Total Mapped Area:	6860			This reduced the target zone to 6563ha.	
21	12-Jun-03	884	5700	Fixed Wing AT 602	Winter aerial operation concentrating only on active sites with suitable buffer area. Five distinct areas included were: Hobsonville, Meola, Waikumete Cemetery, Ranui-Swanson, and Riverpark. Total area of 884ha.	
22	3-Jul-03	884	5600	Fixed Wing AT 602	Second winter aerial operation. Areas remaining the same.	
23	4-Aug-03	202	5800	Helicopter	Third winter aerial operation.	202ha given second treatment by
		726		Fixed Wing AT 602	Areas remaining the same. With a	helicopter.
	Total Mapped Area:	928			small area of Riverpark not treated. Total area of 874ha.	
24	26-Aug-03	202	5600	Helicopter	Fourth winter aerial operation.	202ha given second treatment by
		726		Fixed Wing AT 602	Areas remaining the same. With a	helicopter.
	Total Mapped Area:	928			small area of Riverpark not treated. Total area of 884ha.	
25	30-Sep-03	202	5900	Helicopter	Fifth winter aerial operation.	202ha given second treatment by
		726		Fixed Wing AT 602	Areas remaining the same. With a	helicopter.
	Total Mapped Area:	928			small area of Riverpark not treated. Total area of 884ha.	
26	21-Oct-03	297		Helicopter	Twelfth large scale aerial	297ha given second treatment by
	22-Oct-03	2669		Fixed Wing AT 602	operation. First summer aerial opera	helicopter.
		3892		Fixed Wing F27	Significant reduction in the	
	Total Mapped Area:	6860			Waterview - Avondale area. Total area 6563ha.	

Aerial Operations Summary January 2002 to June 2004

Operation Number	Date of Application	Area (ha)	Volume of Foray48B (ltr)	Craft Used	Target Areas	Notes re areas requiring additional application to ensure adequate penetration and coverage
27	11-Nov-03	316		Helicopter	Thirteenth large scale aerial operation. Significant reduction in the Waterview - Avondale area. Total area 6563ha.	316ha given second treatment by helicopter.
	19-Nov-03	3598	34,500	Fixed Wing AT 602		
		3103		Fixed Wing F27		
Total Mapped Area:		7017				
28	1-Dec-03	56		Helicopter	Area reduced to the same as the winter programme.	56ha given second treatment by helicopter.
		891	4700	Fixed Wing AT 602		
Total Mapped Area:		946				
29	12-Dec-03	56	400	Helicopter	First of the targeted helicopter operations. Including Ranui and Riverpark only.	
30	18-Dec-03	56		Helicopter	Area reduced to the same as the winter programme.	40ha of riparian areas in Riverpark and 16ha around Ranui were treated with a second application by the helicopter.
		891	4700	Fixed Wing AT 602		
Total Mapped Area:		946				
31	31-Dec-03	56	400	Helicopter	First of the targeted helicopter operations. Including Ranui and Riverpark only.	
32	9-Jan-04	56		Helicopter	Area reduced to the same as the winter programme.	40ha of riparian areas in Riverpark and 16ha around Ranui were treated with a second application by the helicopter.
		891	4700	Fixed Wing AT 602		
Total Mapped Area:		946				
33	18-Jan-04				Operation not carried out	
34	29-Jan-04	56		Helicopter	Area reduced to the same as the winter programme.	40ha of riparian areas in Riverpark and 16ha around Ranui were treated with a second application by the helicopter.
		891	4700	Fixed Wing AT 602		
Total Mapped Area:		946				
35	18-Feb-04	56		Helicopter	Area reduced to the same as the winter programme.	40ha of riparian areas in Riverpark and 16ha around Ranui were treated with a second application by the helicopter.
	23-Feb-04	891	4700	Fixed Wing AT 602		
Total Mapped Area:		946				
36	18-Feb-04					
37	9-Mar-04	702	3400	Fixed Wing AT 602	Hobsonville and Meola removed from the programme. Treatment area included Waikumete Cemetery, Riverpark and Ranui/	

Aerial Operations Summary January 2002 to June 2004

Operation Number	Date of Application	Area (ha)	Volume of Foray48B (ltr)	Craft Used	Target Areas	Notes re areas requiring additional application to ensure adequate penetration and coverage
					Swanson.	
38	31-Mar-04	254	1400	Fixed Wing AT 602	Riverpark and Waikumete Cemetery removed from the programme. Treatment area included Ranui/ Swanson. Total 254ha.	
39	20-Apr-04	254	1400	Fixed Wing AT 602	Treatment area included Ranui/ Swanson. Total 254ha.	
40	13-May-04	254	1550	Fixed Wing AT 602	Treatment area included Ranui/ Swanson. Total 254ha.	

Targeted Helicopter Aerial Operations Summary January 2002 to June 2004

Operation Number	Date of Application	Area (ha)	Volume of Foray48B (ltr)	Craft Used	Target Areas
TH -M	21-Nov-02	26	130	Helicopter BK 117	Motions Creek. One off treatment, required due to new infestation found.
TH-H	28-Dec-02	17	85	Helicopter BK 117	Hobsonville. One off treatment, required due to new infestation found.
TH-1	14-Jan-03	58	250	Helicopter BK 117	3 areas, Rutherford, Riverpark, Swanson
TH-2	Unstable Weather, Operation not carried out			-	-
TH-3	4-Feb-03	276	925	Helicopter BK 117	Hobsonville, Riverpark riparian, Swanson, Motions, Holly St, Waikumete
TH-4	Unstable Weather, Operation not carried out			-	-
TH-5	Unstable Weather, Operation not carried out			-	-
TH-R	21-Mar-03	132	660	Helicopter BK 117	Ranui. One off treatment, required due to new infestation found.
TH-6	8-April to 9-April03	378	2000	Helicopter BK 117	Waikumete, Riverpark, Swanson, Motions creek, Hobsonville, Holly Street and Ranui extension
TH-7	29-Apr-03	206	1040	Helicopter BK 117	Waikumete, Riverpark, Swanson, Motions creek, Hobsonville
TH-8	6-May-03	132	650	Helicopter BK 117	Ranui extension

25/08/2004

APPENDIX 3

TABLE OF ADVERSE HEALTH EFFECTS REPORTED TO THE PEOPLE'S INQUIRY

	No. of incidents	Sub totals	
unclassified – A&E visit	3		
unclassified – hospitalised	17		
unclassified – never had before	36		
unclassified – condition became chronic / ongoing / permanent	25		
unclassified – existing condition aggravated/ become chronic	18	**117**	(see note1)
unclassified – existing condition reappeared	5		
unclassified – sick/unwell all the time	4		
unclassified – eastern suburb WSTM spraying	9		
general – multisystem condition / autoimmune conditions – (listed) Developed SLE (1), existing SLE (1), fibromyalgia (2) unspecified immune (1) worsening of ME/CFS (4), Miller Fisher syndrome (1)	10	**10**	
allergy new / spray sensitised	14		
allergy – aggravation – got worse	9		
allergy – aggravation – severe	4	**29**	
anaphylactic reaction, collapse	2		
fatigue – no energy	6		
fatigue – chronic new	8		
fatigue – drowsy, sleepy, dopey, lethargic	9	**39**	
fatigue – wiped out, extreme	11		
flu-like symptoms	5		
cancer – (list) skin,kidney,blood, leukemia, liver	5	**5**	
circulation – BP – affected /high	3		
circulation – heart rate affected	2	**12**	
circulation – temperature affected /high	2		
circulation – other (list) – transitional mini strokes, angioplasty vascular blood clot, heart attack, stroke	5		
digestive – bowel bleeding	2		
digestive – irritable bowel	3		
digestive – diarrhoea	9		
digestive – diarrhoea – severe	4		
digestive – hernia (caused by cough)	1		
digestive – hiatus hernia	1		
digestive – stomach pains/cramps/sore	2	**65**	
digestive – liver problems	3		
digestive – loss of appetite/ inability to eat	2		
digestive – upsets/flatulence/bloating	4		
digestive – nausea	11		
digestive – vomiting	8		
digestive – effects on mouth/gums/tongue/lips/taste	14		
digestive – crohns disease – aggravation	1		

	No. of incidents	Sub totals
endocrine – thyroid (list) thyroid ceased functioning, lumps on	2	
endocrine – other (list) adrenal	2	**6**
diabetes – developed	2	
ear – pain/bleeding/blocked	6	**6**
eye – effects – burning	2	
eye – effects – sore, painful, inflamed, swollen	14	
eye – effects – itchy, inflamed	4	
eye – effects – weeping, watery, oozy	9	**41**
eye – effects – acute, ulcerated etc	3	
eye – vision blurred – tunnel vision problems – sight affected (list) temp loss of vision (1), Blurred (4) double vision (2) perm loss of vision (2)	9	
hormonal – female – menstrual cycle problems	2	**2**
muscular / muscularskeletal	6	**6**
neurological – headache, migraine	37	
neurological – seizure / vascular fainting syndrome	1	
neurological – minor blackouts	1	
neurological – Motor neurone disease	3	
neurological – Motor neurone disease – additional anecdotal reported	6	
neurological – dizziness / losing balance / unsteady	8	
neurological – paralysis, muscle weakness	4	
neurological – numbness/tingling	1	**79**
neurological – lightheaded / spaced out / fuzzy headed	2	
neurological – disorientated /drugged	2	
neurological – difficulty concentrating	4	
neurological – memory loss – short-term	3	
neurological – memory loss – episodic	3	
neurological – memory loss – still experiencing/permanent	3	
neurological – other (list) – hallucinations	1	
pregnancy – miscarriage	4	
pregnancy – stillbirth	1	
pregnancy – foetal/congenital effects	3	**10**
pregnancy – early/prem birth	1	
pregnancy – low birthweight	1	
psychological – anger	4	
psychological – anxiety attack / panic attack	4	
psychological – behavioural problems (child)	2	
psychological – depression	7	
psychological – postnatal depression	1	
psychological – distress	1	**34**
psychological – insomnia	3	
psychological – post traumatic stress disorder	2	
psychological – stress (severe)	8	
psychological – suicidal	1	
psychological – withdrawn	1	

	No. of incidents	Sub totals
respiratory – asthma aggravation	22	
respiratory – asthma new – temporary	3	
respiratory – asthma new – ongoing – chronic	6	
respiratory – breathing difficulties – acute	16	
respiratory – breathing difficulties – chronic/wheezy	16	
respiratory – respiratory failure	2	
respiratory – bronchitis	1	
respiratory – broncospasm	1	
respiratory – chest pain	3	
respiratory – lung scarring/burn	2	
respiratory – aggravation of existing lung problem	1	
respiratory – congestion	2	
respiratory – cough acute	8	**189**
respiratory – cough chronic	21	
respiratory – cough still present – weakness	1	
respiratory – infection	5	
respiratory – loss of voice	1	
respiratory – nose – bleeding	22	
respiratory – nose – congestion / runny	10	
respiratory – nose – sinusitis	15	
respiratory – nose – sore / painful / burning	8	
respiratory – throat sore / painful / burning / dry	15	
respiratory – tonsillitis / throat infection	5	
respiratory – swollen glands	3	
skin – burning	2	
skin – itch	3	
skin – psoriasis	1	
skin – rash general	8	**33**
skin – rash □localized	13	
skin – sores, blistering	4	
skin – lumps	2	
urology – kidney / bladder	4	**5**
urology – renal failure	1	
OTHER – not noted elsewhere (list) side effect of medication (weight gain) – (2) death (6) hair loss (1)	9	**9**
TOTAL INCIDENTS & REPORTS (see note 2)	**580**	**580**
TOTAL INCLUDING UNCLASSIFIED TOTAL	**697**	**697**

Note 1: these unclassified totals not included in the total health incidents
Note 2: the total incidents & reports represent 163 individual people
Note 3: there were 125 submissions to the Inquiry of which:
105 reported personal or family health effects - represented in the table above
72 people appeared before the commissioners to give oral testimony
20 only gave oral testimony
105 were written submissions
Note 4: No repeat episodes of a symptom have been included in the totals
Note 5: Only individuals identified have been included. Reports of a 'many' nature or anonymised totals are not included here.

APPENDIX 4
Ingredients of Foray 48B

Dr Meriel Watts – 75
Attachment 4

MINISTRY OF HEALTH
MANATU HAUORA

FILE COPY

133 Molesworth Street
P.O Box 5013
Wellington
New Zealand
Phone 04-496 2000

FACSIMILE COVER PAGE

	Name & Organisation	Fax Number
To:	[redacted] Virginia Hope Auckland Regional Public Health Service	09 262-1880
From	[redacted]	Date 19 August 1996
Phone	04-496 2121	No. of pages 3 (including cover page)
Fax	04-496 2340	

Subject: Toxicological assessment of Foray 48B: Ineft ingredients

File No: PH20-16-4

STATEMENT OF CONFIDENTIALITY
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Message

URGENT

Dear [redacted] Virginia

I have done an assessment of the toxicological significance of the inert components in Foray 48B. Attached is a copy of this material for consideration by you and the other people putting together the HIA. If there are any aspects that you consider need further consideration please identify these. As indicated in the conclusions there are a couple of aspects that we consider need further consideration.

Please ensure that this is kept CONFIDENTIAL to those who are permitted to sight the commercial formulation of Foray 48B, as this are included.

Yours sincerely

[redacted]

[redacted]
Adviser (Toxicology)
Public Health Policy and Regulation

TOXICOLOGICAL ASSESSMENT OF FORAY 48B

CONFIDENTIAL

I have been asked to provide a toxicological review of the ingredients in Foray 48B, the proprietary formulation of *Bacillus thuringiensis* var *kurstaki* (Btk) that the Ministry of Forestry intends to use to eradicate the white spotted tussock moth from areas of eastern Auckland.

This document includes the CONFIDENTIAL formulation of Foray 48B. This is only to be divulged to people authorised to have access to it.

THE ACTIVE INGREDIENT

I have not provided an in-depth review of the toxicology of the active as this has been thoroughly considered in the studies supplied to the ACU in support of the registration of the product. Also, the potential of the Btk organism, its spores and the endotoxin that is toxic to the moth and butterfly caterpillars to be pathogenic to other species, particularly man has been considered separately by Dr [redacted]

THE "INERT" INGREDIENTS

It may be useful to clarify the sense in which the term "inert ingredients" is used in relation to the formulation. In the context of a pesticide, the "inerts" refer to the all the components of the formulation other than the active ingredients. They are "inerts" in the sense that they do not exert the direct desired effect on the target of the formulation. Thus, the use of the term "inert" does not imply that these components are necessarily inactive or non-toxic. In some pesticide formulations, the "inerts" contribute more toxicity to the formulation than the active ingredients.

A detailed review of the health impact of Foray 48B carried out by Durkin et al (1) noted that the inert ingredients of the material formulated by Novo Nordisk all fall within list 3 and 4 of the US EPA, whereas the Abbott Laboratories formulation for Foray 48B contained only materials from list 4. The US EPA categories are set out in table 1.

Table 1 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY CLASSIFICATIONS	
List 1	Materials known to be toxic
List 2	Materials suspected to be toxic
List 3	Materials with insufficient information for assessment.
List 4	Materials that are generally recognised as safe (GRAS)

The Science Panel drew to our attention that there is a difference between the two formulations of Foray 48B in respect to their fermentation base. The panel identified that one formulation (that of Novo Nordisk) was prepared from Btk grown on a potato base, whereas the Abbott Laboratories formulation was prepared from Btk grown on a corn-syrup base. The Durkin HLA statement on the classification of the inert materials indicates that there is also a difference between the two

formulations of Foray 48B in respect to their composition of inert ingredients. The formulation that Ministry of Forestry intends to use in New Zealand is produced by Abbott Laboratories and this contains only materials from the US EPA List 4 (the "GRAS" list) about which there is a greater confidence of safety.

I have set out in table 2 the chemical components (apart from water) in the formulation which are the "inerts" and indicated their status under the New Zealand Food Regulations 1984. There is one component ([redacted]) which is not permitted to be added to food. A review of its toxicity and uses of it that give an indication of its toxicity are provided below. Comments are also made about the toxicity of the other components.

TOXICOLOGY OF THE INERT INGREDIENTS

METHYL 4-HYDROXY BENZOATE/ METHYL PARABEN

[redacted] is one of a family of [redacted] preservatives that are [redacted] of [redacted] (2) (p1136.1). It is the only inert ingredient in Foray 48B which is not permitted in New Zealand as a food additive in some uses under the Food Regulations 1984. The [redacted] compounds have anti-bacterial and anti-fungal activity. They are used in both oral and topical pharmaceuticals in concentrations up to 0.25%). Martindale (2) refers the [redacted] preservatives being widely used in cosmetics and also as food preservatives, but, as stated above, [redacted] itself is not a permitted food additive in New Zealand.

There is an established FAO/WHO acceptable daily intake (ADI) of up to 10 milligrams/kilogram of body weight of a combination of [redacted] (3).

To reach an intake of 10 mg/kg of [redacted] from exposure to Foray 48B, a person weighing 60 kilograms would need to consume 0.01 g*60 = 0.6 g of the material. At a concentration of 0.05%, this would be contained in about 10 grams of Foray 48B. The estimated spray dose is 5 litres (5 kilograms) per hectare, thus this quantity would be deposited on an area of about 20 sq. metres. This suggests that even if a person experienced direct exposure to the spray, was unprotected by clothing (which is unlikely) and that absorption through the skin was complete, they would be unlikely to absorb enough of the spray to reach the ADI for [redacted].

[redacted] POLY ACRYLIC ACID / CARBOPOL

[redacted] acid is a polymer of [redacted] acid, and as such consists of a saturated carbon chain with [redacted] acid residues along it length. The [redacted] acid groups are only weak acids. Some forms of [redacted] acid are formulated with the polymer chains cross-linked via the [redacted] acids with [redacted] molecules. The polymer can be neutralised with bases [redacted] or [redacted]. The resulting charged polymer will then be much more water soluble. (The bases are neutralised by the [redacted] acid groups, so they are not of health significance in the mixture.)

[redacted] acid is of very low toxicity. The Registry of Toxic Effects of Chemical Substances (4) lists a single rat oral LD_{50} as 20 grams per kilogram. Martindale (2) lists a number of [redacted] acid formulations which are used in human medicine. The [redacted] salt of [redacted] acid is permitted for use in the production of steam for use in food preparation under the New Zealand Food Regulations 1984.

[redacted] is used as a suspending agent, a gel basis, an emulsifier, and a binding agent in tablets for human use. [redacted] contains a high molecular weight [redacted], cross-linked with [redacted] of [redacted] or [redacted]. Liquid gel preparations are used as a [redacted]. Clearly, this polymer has extremely low irritancy to the eye and mucous membranes.

[redacted] is a [redacted] of a [redacted] acid cross-linked with [redacted]. This may given by mouth as a laxative and bulking agent at the rate of 1 gram tablet, 4 times per day. (The principal side effect of excessive intake, diarrhoea, relates to the [redacted] ion content of the formulation.)

[redacted] acid is a polymer (it has a high molecular weight) and consists of a continuous carbon chain which would not readily be metabolised in the human body. Therefore it is very unlikely to be absorbed into the body through the skin or in the intestine. This leaves the possibility of irritant/sensitising effects on the skin, mucous membranes or the eye. Bearing in mind the therapeutic uses for [redacted] polymers discussed above as a tear substitute, the likelihood of such toxic effects from exposure to this material is very unlikely. The likely exposures of the public to the [redacted] polymer from the Foray 48B formulation is likely to be lower than that in food, cosmetics or human medicines and without harmful effect.

[redacted] SORBITOL

[redacted] is a [redacted] compound very similar to [redacted]. It is used in food and medicines as a sweetener (when sugars are undesirable, such as in diabetic products) and as a humectant. (A humectant is a substance added to a mixture to soften it and have the effect of moistening it without actually increasing the available water content.) It is very poorly absorbed from the gut, but partially metabolised to [redacted] and [redacted]. The adverse effects of excess intake are flatulence, abdominal pain and diarrhoea. Although [redacted] is present at substantial concentration in Foray 48B, the exposures that could result from the use of this spray could not give rise to sufficient intake into the human body to produce any of the effects associated with the excessive administration of [redacted] in food or medicine (2) (p1375.2 and 1363.2).

[redacted] PROPYLENE GLYCOL

Although [redacted] is used in some medicines, foods and cosmetics, it can cause local irritation of the skin and mucous membranes. Hypersensitivity reactions have been reported, but these are reported to be rare (2) (p1745.2). Skin reactions occurred when the substances was present under occlusive dressings. Hyperosmolality, lactic acidosis and CNS depression have occurred particularly in the renally-impaired. Considering the low concentrations in Foray 48B and the indirect exposure that may result from it use, the only relevant finding would be the hypersensitivity. I will seek the background references to confirm the circumstances of the hypersensitivity. It seems highly unlikely to occur without more direct skin exposure than is likely from public exposure to the spray.

[redacted] POTASSIUM SORBATE

This is the [redacted] of [redacted]. [redacted] and its [redacted] are used as preservatives in pharmaceutical products, cosmetics and foods. There have been some reports of hypersensitivity and irritation, represented by contact dermatitis from the direct skin application of products containing it (2) (p1146.1). The typical concentration in pharmaceutical preparations is about [redacted]. The Foray 48B spray contains slightly more. While it is possible that a member of the public may receive sufficient direct exposure to the material to cause a hypersensitivity reaction (giving rise to a skin rash), it is highly unlikely. It may be possible for people with such a sensitivity to avoid exposure.

[redacted] BENZOIC ACID/ SODIUM BENZOATE

[redacted] possess antibacterial and antifungal properties and are used as preservatives in medicines cosmetics and food. Hypersensitivity can occur, but there have also been reports of non-immunological contact urticaria. Respiratory sensitivity to [redacted] is more common in patients with aspirin-induced asthma. Anaphylactoid reactions have been reported in two patients. The concentrations in pharmaceutical and cosmetic preparations are typically about [redacted]. Foray 48B contains slightly more than this, but the exposure is far less direct (2) (1118.3).

Bearing in mind that the adverse reactions reported occur from exposure by mouth or intravenously to preparations containing [redacted] or [redacted], the likelihood of such reactions from exposure of the public to Foray 48B appears remote.

The likelihood of exposure to the spray causing an asthma episode in member of the public with aspirin-induced asthma should be discussed further with an asthma specialist.

The FAO/WHO has established an ADI for [redacted] and [redacted] of 5 mg/kg of body weight (expressed as [redacted]) (3).

[redacted] HYDROCHLORIC ACID

The toxic effects of [redacted] are irritation and corrosion, and as with other [redacted] are entirely concentration dependent. In a formulation such Foray 48B, the [redacted] is present to adjust the pH. The [redacted] would be neutralised by other components of the mixture and their buffer capacity. The effects of [redacted] as listed above are irrelevant to the exposure of the public to the [redacted] in the formulated product because of the concentration present and the pH of the resulting formulation.

FERMENTATION [redacted] solids

The [redacted] solids are the residues of the medium on with the *Bacillus thuringiensis* var *kurstaki* (Btk) is grown by the proprietor together with the waste product from the bacterial growth. The main components will be normal food components, such as [redacted], [redacted] and [redacted]. There may be some simple organic compounds such as [redacted], [redacted] or [redacted]

The toxicological assessment of the product takes into account the presence of these materials in formulation, as some animal research studies have been done using the complete formulation. Obviously, epidemiological studies on groups of workers or members of the public relate to those who have been exposed to the formulated products including these [redacted]

CONCLUSIONS

1. The inert ingredients are of low toxicity, but it is possible that some people may by hypersensitive to these components as a result of their previous exposures in food, cosmetics or medicines. Even if a person has such a sensitivity, it is unlikely that a member of the public would be exposed to sufficient of the component as a result of the use of Foray 48B to generate a reaction. This assumes such a person would take the sensible precaution of staying indoors with the windows closed during the spray operation.

2. The Ministry of Health needs to get additional advice from asthma experts on the significance of the [redacted] content and the impact this may have on aspirin-sensitive asthmatics.

benzoate

[redacted]
Adviser (Toxicology)
Public Health Policy and Regulation

19 August 1996

[redacted]

REFERENCES

1. Gypsy Moth Management in the United States: A Cooperative Approach, Final Environmental Impact Statement, Volume III, Appendix F, Human Risk Assessment, Patrick R Durkin, et al. November 1995.

2. Martindale, The Extrapharmacopoeia 31st edition, London 1996.

3. WHO Technical Report Series 539, 1974

4. Registry of Toxic Effects of Chemical Substances, DIALOG Information Services Limited, 1996.

CONFIDENTIAL: Contains Sensitive Commercial Information

Table 2: FOOD ADDITIVE STATUS OF THE "INERT" INGREDIENTS

Component	Use in Foray 48B	Concentration in Foray 48B (average in %)	Food Additive (Y/N)*	Food Additive Use	Concentration (allowed in food)*
[redacted]	production residue	[redacted]	No	NA	NA
[redacted]	anti-evaporant/ stabiliser	[redacted]	Yes-[redacted]	humectant	See [redacted]
[redacted]	anti-evaporant/ solvent	[redacted]	Yes-[redacted]	humectant	See [redacted]
[redacted]	surfactant	[redacted]	Yes - [redacted]	preparation of steam	See [redacted]
[redacted]	preservative	[redacted]	Yes-[redacted]	preservative	in some foods for direct consumption up to 3000 ppm (calculated as [redacted]).
[redacted]	preservative	[redacted]	Yes - [redacted]	preservative	in some foods for direct consumption 1000 ppm (calculated as [redacted]).
[redacted]	preservative	[redacted]	No	NA	NA
[redacted]	acidity regulator	[redacted]	Yes - [redacted] and [redacted]	emulsifier/anti-foaming agent acidity regulatory	See [redacted]

* Food Regulations 1984 reference is given in brackets

APPENDIX 5
MSDS for Foray 48B

Foray 48F

ISSUED 06-11-01

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATERIAL NAME: Foray 48F
EPA Registration No. 73049-35
Drug Code: 31049
List Number: 60177
MANUFACTURER: Valent BioSciences Corporation
870 Technology Way, Suite 100
Libertyville, Illinois 60048
EMERGENCY TELEPHONE NUMBERS
Emergency Health or Spill:
Outside the United States: 1-651-632-6184
Within the United States: 1-877-315-9819

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME: Bacillus Thuringiensis subsp. kurstaki
CAS/RTECS NUMBERS: N/A / N/A
OSHA-PEL
8HR TWA: N/L
STEL: N/L
CEILING: N/L
ACGIH-TLV
8HR TWA: N/L
STEL: N/L
CEILING: N/L
OTHER LIMITS
8HR TWA: N/A
STEL: N/A
CEILING: N/A
INGREDIENT NAME: Inert Ingredients - identity withheld as a Trade Secret
CAS/RTECS NUMBERS: N/A / N/A
OSHA-PEL
8HR TWA: N/L
STEL: N/L
CEILING: N/L
ACGIH-TLV
8HR TWA: 10 ppm for a minor ingredient
STEL: N/L
CEILING: N/L
OTHER LIMITS
8HR TWA: N/A
STEL: N/A
CEILING: N/A

3. HAZARDS INFORMATION

EMERGENCY OVERVIEW: This material is an eye irritant, a skin sensitizer and may irritate the lungs if inhaled by analogy to a similar formulation.
ROUTE(S) OF ENTRY:
Skin: No
Inhalation: No
Ingestion: No
INGESTION RATING: None
SKIN ABSORPTION RATING: None
INHALATION RATING: None
CORROSIVENESS RATING: None
SKIN CONTACT RATING: None
SKIN SENSITIZATION RATING: Sensitizer
EYE CONTACT RATING: Irritant
TARGET ORGANS: Eyes, skin; possibly lungs
CARCINOGENICITY RATING:
NTP: N/L
IARC: N/L
OSHA: N/L
ACGIH: N/L
None
SIGNS AND SYMPTOMS: N/D. Analogy suggests skin or eye irritation and allergic skin reactions are possible. Inhalation may result in respiratory tract irritation.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: N/D. Hypersensitivity to DiPel 6AF or similar formulations. Data suggest pre-existing skin or eye lesions or lung ailments.

4. FIRST AID MEASURES

EYES: Remove from source of exposure. Flush with copious amounts of water. If irritation persists or signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.
SKIN: Remove from source of exposure. Flush with copious amounts of water. If irritation persists or signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.
INGESTION: Remove from source of exposure. If signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.
INHALATION: Remove from source of exposure. If signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.

5. FIRE FIGHTING PROCEDURES

FLASH POINT: N/D
FLASH POINT METHOD: N/D
LOWER EXPLOSIVE LIMIT(%): N/D
UPPER EXPLOSIVE LIMIT(%): N/D
AUTOIGNITION TEMPERATURE: N/D
FIRE & EXPLOSION HAZARDS: N/D.
EXTINGUISHING MEDIA: Use appropriate medium for underlying cause of fire.
FIRE FIGHTING INSTRUCTIONS: Wear protective clothing and self-contained breathing apperatus.

6. ACCIDENTAL RELEASE MEASURES

SPILL OR RELEASE PROCEDURES: Recover product, place into appropriate container for disposal. Ventilate and wash spill area.

7. HANDLING AND STORAGE

HANDLING: N/D.
STORAGE: Keep containers tightly closed when not in use. Do not store at temperatures below 0 degree F or above 90 degree F. Roll or shake drum before dispensing.
SPECIAL PRECAUTIONS: Wash hands and face after handling this compound. Keep latex gloves on until all potentially contaminated personal protective equipment is removed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use local exhaust.
RESPIRATORY PROTECTION: Air purifying respirator with high efficiency particulate filter (P100).
SKIN PROTECTION: Wear 2 pairs; latex inner, thicker glove outside.
EYE PROTECTION: Goggles or full-face respirator.
OTHER PROTECTION: Wear saranex tyvek coverings if contact may occur.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE: Tan to brown suspension
ODOR: N/D
BOILING POINT: N/D
MELTING/FREEZING POINT: N/A
VAPOR PRESSURE (mm Hg): N/A
VAPOR DENSITY (Air=1): N/A
EVAPORATION RATE: N/D
BULK DENSITY: 9.27-9.59 lb/gal
SPECIFIC GRAVITY: N/D
SOLUBILITY: Dispersible in water
pH: 4.6-5.2
VISCOSITY: N/D

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: N/D
INCOMPATIBILITIES: Alkalinity inactivates product.
HAZARDOUS DECOMPOSITION PRODUCTS: N/D.
HAZARDOUS POLYMERIZATION: N/D.

11. TOXICOLOGICAL INFORMATION

ORAL TOXICITY: N/D. LD50 > 5,000 mg/kg in rats for a similar formulation. No signs of toxicity were observed.
DERMAL TOXICITY: N/D. LD50 > 2,000 mg/kg in rabbits for a similar formulation. No signs of toxicity were observed.
INHALATION TOXICITY: Not lethal in a rat inhalation study at the maximum achievable concentration of 5.47 mg/L/4 hours as an aerosol.
CORROSIVENESS: N/D
DERMAL IRRITATION: N/D. A similar formulation was slightly irritating in a skin irritation test in rabbits reversible within 9 days.
OCULAR IRRITATION: N/D. A similar formulation was slightly to moderately irritating in an eye irritation test in rabbits; reversible within 7 days.
DERMAL SENSITIZATION: N/D. A similar formulation was considered to be a sensitizer in the modified Buehler skin sensitization study in guinea pigs.
SPECIAL TARGET ORGAN EFFECTS: N/D. In subchronic oral toxicity studies in rats and sheep and a 2-year chronic oral toxicity study in rats with the active ingredient, no significant treatment-related effects were observed at dosages of 500 mg/kg/day or more. In a 4-week inhalation study in guinea pigs, animals receiving 10.35 mg/l nominal (0.23 mg/l gravimetric) exhibited some evidence of inflammation in the lungs.
CARCINOGENICITY INFORMATION: N/D

12. ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: N/D

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHODS: Dispose of product in accordance with federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

DOT
STATUS: Not Regulated
PROPER SHIPPING NAME: N/D
HAZARD CLASS: N/D
UN NUMBER: N/D
PACKING GROUP: N/D
REPORTABLE QUANTITY: N/D
IATA/ICAO
STATUS: Not Regulated
PROPER SHIPPING NAME: N/D
HAZARD CLASS: N/D
UN NUMBER: N/D
PACKING GROUP: N/D
REPORTABLE QUANTITY: N/D
IMO
STATUS: Not Regulated
PROPER SHIPPING NAME: N/D
HAZARD CLASS: N/D
UN NUMBER: N/D
PACKING GROUP: N/D
REPORTABLE QUANTITY: N/D
FLASH POINT: N/D

15. REGULATORY INFORMATION

TSCA STATUS: Exempt
CERCLA STATUS: N/D
SARA STATUS: N/D
RCRA STATUS: N/D
PROP 65 (CA): N/D

16. OTHER INFORMATION

LEGEND:
N/A = Not Applicable
N/D = Not Determined
N/L = Not Listed
L = Listed
C = Ceiling
S = Short-term
(R) = Registered Trademark of Valent BioSciences
(TM) = Registered Trademark of Valent BioSciences
The information and recommendations contained herein are based upon tests believed to be reliable. However, Valent BioSciences does not guarantee their accuracy or completeness nor shall any of this information constitute a warranty, whether expressed or implied, as to the safety of the goods, the merchantability of the goods, or the fitness of the goods for a particular purpose. Adjustment to conform with

APPENDIX 6
US label for Foray 48B

Flowable Concentrate

Foray® 48B

Biological Insecticide

KEEP OUT OF REACH OF CHILDREN

CAUTION

List No. 60170

ACTIVE INGREDIENT:

Bacillus thuringiensis subsp. *kurstaki*, strain *ABTS-351*, fermentation solids and solubles	17.19%
OTHER INGREDIENTS	82.81%
TOTAL	100.00%

POTENCY: 10,600 International Units (IU)/mg of product (equivalent to 48 billion IU/GAL).

There is no direct relationship between intended activity (potency) and the Percent Active Ingredient by Weight.

FIRST AID	
If on skin or clothing	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If in eyes	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.

HOT LINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-877-315-9819 (24 hours) for emergency medical treatment and/or transport emergency information. For all other information, call 1-800-323-9597.

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
CAUTION

Causes moderate eye irritation. Avoid contact with skin, eyes, open wounds or clothing. Wash thoroughly with soap and water after handling.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:
- Long-sleeved shirt and long pants
- Waterproof gloves
- Shoes plus socks

Agricultural Use Requirements:

Mixers/loaders and applicators must wear a dust/mist filtering respirator meeting NIOSH standards of at least N-95, R-95 or P-95. Repeated exposure to high concentrations of microbial proteins can cause all allergic sensitizations.

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

Non-agricultural Use Requirements:

Mixer/loaders and applicators not in enclosed cabs or aircraft must wear a dust/mist filtering respirator meeting NIOSH standards of at least N-95, R-95, or P-95. Repeated exposure to high concentrations of microbial proteins can cause allergic sensitization.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

Users should: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

Environmental Hazards

For terrestrial agricultural uses, do not apply directly to water, or to where surface water is present or to intertidal areas below the mean high water mark.

Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal of waste.

Storage: Store in a cool, dry place. Keep containers tightly closed when not in use. Store in temperatures above freezing and below 32° C (90° F).

Pesticide Disposal: Pesticide waste resulting from the use of this product may be disposed of on site or at an approved waste disposal facility in accordance with federal and local regulations.

Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning or puncture and dispose of in a sanitary landfill or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep unprotected persons out of the treated areas until sprays have dried.

DIRECTIONS FOR USE FOR AGRICULTURAL APPLICATIONS:

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

Do not apply this product through any type of irrigation system.

DIRECTIONS FOR USE

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

Coveralls
Waterproof gloves
Shoes plus socks

APPLICATION

Foray 48B may be applied by ground or aerial equipment undiluted or with quantities of water sufficient to provide thorough coverage of plant parts to be protected. The amount of water needed per acre will depend upon crop size, weather, spray equipment, and local experience.

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower/treatment coordinator are responsible for considering all of these factors when making decisions.

MIXING

Shake or stir Foray 48B before use. Fill spray or mixing tank half full of water. Begin agitation and pour Foray 48B into water while maintaining continuous agitation. Add other spray material (if any) and balance of water. Agitate as necessary to maintain suspension. Do not allow diluted mixture to remain in the tank for more than 72 hours.

The use of a spreader-sticker approved for use on growing crops is recommended for hard to wet crops such as cole crops or to improve weather-fastness

of the spray deposits. Combinations with commonly used spray tank adjuvants are generally not deleterious to Foray 48B, if the mix is used promptly. Before mixing in the spray tank, it is advisable to test physical compatibility by mixing all components in a small container in proportionate quantities.

SPRAY VOLUMES

Ground Application: Use recommended amount of Foray 48B in ground equipment with quantities of water sufficient to provide thorough coverage of plant parts to be protected. The amount of water needed per acre will depend upon crop size, weather conditions, spray equipment used and local experience.

Aerial Application: Use recommended amount of Foray 48B in aerial equipment undiluted or with quantities of water sufficient to provide thorough coverage of plant parts to be protected. In the western U.S. 5-10 gallons per acre is the normal minimum; in the eastern regions a minimum of 2-3 gallons is normally used. The minimum amount of water needed per acre will depend upon crop size, weather conditions, spray equipment used and local experience.

GENERAL AGRICULTURAL USE INSTRUCTIONS

Foray 48B is a biological insecticide for the control of lepidopterous larvae. It contains the spores and endotoxin crystals of *Bacillus thuringiensis kurstaki*. Foray 48B must be ingested by the larvae to be effective. For consistent control, apply at first sign of newly hatched larvae (1st and 2nd instar larvae). Susceptible larvae that ingest Foray 48B cease feeding within a few hours and die within 2-5 days.

Foray 48B may be applied up to and on the day of harvest.

For maximum effectiveness the following is recommended:

Monitor fields to detect early infestations.

Apply Foray 48B when eggs start hatching and larvae are small (early instars) and before significant crop damage occurs. Larvae must be actively feeding to be affected.

Repeat applications every 3 to 14 days to maintain control and protect new plant growth. Factors affecting spray interval include rate of plant growth, weather conditions, and reinfestation. Monitor populations of pests and beneficials to determine proper timing of applications.

Under conditions of heavy pest pressures or when large worms are present use the higher rate, shorten the application interval, and/or improve spray coverage to enhance control. When these conditions are present, a contact insecticide should be used to enhance control.

Thorough coverage is essential for optimum performance. Ground applicators equipped with directed drop nozzles can improve coverage.

APPLICATION RATES

Crop	Pests	Rate[1] (oz./acre)	Dosage[1] (BIU/acre)
Forests, Shade Trees, Ornamentals, Shrubs, Sugar Maple Trees, Seed Orchards, Ornamental Fruit, Nut and Citrus Trees[2]	Gypsy Moth & Asian Gypsy Moth, Elm Spanworm	21 - 107	8 - 40
	Spruce Budworm, Browntail Moth, Douglas Fir Tussock Moth, Coneworm, Buck Moth	21 - 80	8 - 30
	Tussock Moths, Pine Butterfly, Bagworm, Leafrollers, Tortrix, Mimosa Webworm, Tent Caterpillar, Jackpine Budworm, Blackheaded Budworm, Saddled Prominent, Saddleback Caterpillar, Eastern and Western Hemlock Looper, Orangestriped Oakworm, Satin Moth	16 - 43	6 - 16
	Redhumped Caterpillars, Spring and Fall Cankerworm, California Oakworm, Fall Webworm	11 - 21	4 - 8

Special Instructions

[1] Use the higher recommended rates on advanced larval stages or under high density larval populations.

[2] In treating Gypsy Moth and Asian Gypsy Moth infected trees and shrubs in urban, rural, and semi-rural areas, exposure of non-target vegetation including, but not limited to, native and ornamental species and food or feed crops is permitted.

This product can be mixed and used with other pesticides only in accordance with the most restrictive of label limitations and precautions. This product cannot be mixed with any product containing a label prohibition against such mixing. No label dosage rates may be exceeded.

DIRECTIONS FOR USE FOR NON-AGRICULTURAL APPLICATIONS

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

Not for use on plants being grown for sale or other commercial use, or for commercial seed production, or for research purposes. For use on plants intended for aesthetic purposes or climatic modification and being grown in interior plantscapes, ornamental gardens or parks, or on golf courses or lawns and grounds.

Not for use on trees being grown for sale or other commercial use, or for commercial seed production, or for the production of timber or wood products, or for research purposes except wide-area public pest control programs sponsored by government entities, such as mosquito abatement, gypsy moth control, and Mediterranean fruit fly eradication.

Foray 48B contains the spores and endotoxin crystals of *Bacillus thuringiensis kurstaki*. Foray 48B is a stomach poison and is effective against lepidopterous larvae. After ingestion, larvae stop feeding within hours and die 2-5 days later. Maximum activity is exhibited against early instar larvae. Foray 48B may be used for both ground and aerial application. The product should be shaken or stirred before use. Add some water to the tank mix, pour the recommended amount of Foray 48B into the tank and then add the remaining amount of water to obtain the proper mix ratio. Agitate as necessary to maintain the suspension. The diluted mix should be used within 72 hours.

APPLICATION

Ground Application: Use an adequate amount of tank mix to obtain thorough coverage without excessive run off. Use the recommended per acre dosages of Foray 48B in up to the following amounts of water:

High volume hydraulic sprayers	100 gallons
Mist blowers	10 gallons

Aerial Application: Foray 48B may be applied aerially, either alone or diluted with water at the dosages shown in the application rates table. Spray volumes of 32-128 ounces per acre are recommended. Best results are expected when Foray 48B is applied to dry foliage.

For smaller spray volumes mix the proper number of teaspoons of Foray 48B from the following chart to attain the desired rates:

If the rate is:	Add this amount per gallon of mix:
0.5 pts./acre	1/2 teaspoon
1.0 pts./acre	1 teaspoon
1.5 pts./acre	1-1/2 teaspoons
2.0 pts./acre	2 teaspoons
3.0 pts./acre	3 teaspoons
4.0 pts./acre	4 teaspoons
5.5 pts./acre	5-1/2 teaspoons

HOME GARDEN USE DISPOSAL INSTRUCTIONS

Securely wrap original container in several layers of newspaper and discard in trash.

APPLICATION RATES

Crop	Pests	Rate[1] (oz./acre)	Dosage[1] (BIU/acre)
Forests, Shade Trees, Ornamentals, Shrubs, Sugar Maple Trees, Ornamental Fruit, Nut and Citrus Trees[2]	Gypsy Moth & Asian Gypsy Moth, Elm Spanworm	21 - 107	8 - 40
	Spruce Budworm, Browntail Moth, Douglas Fir Tussock Moth, Coneworm, Buck Moth	21 - 80	8 - 30
	Tussock Moths, Pine Butterfly, Bagworm, Leafrollers, Tortrix, Mimosa Webworm, Tent Caterpillar, Jackpine Budworm, Blackheaded Budworm, Saddled Prominent, Saddleback Caterpillar, Eastern and Western Hemlock Looper, Orangestriped Oakworm, Satin Moth	16 - 43	6 - 16
	Redhumped Caterpillars, Spring and Fall Cankerworm, California Oakworm, Fall Webworm	11 - 21	4 - 8
Home Garden Use	Foray 48B may be used for any labeled pest and crop using the rates and mixing instructions in the Directions for Use for Agricultural Applications section and the additional information specified in GENERAL AGRICULTURAL USE INSTRUCTIONS section.		

Special Instructions

[1] Use the higher recommended rates on advanced larval stages or under high density larval populations.

[2] In treating Gypsy Moth and Asian Gypsy Moth infested trees and shrubs in urban, rural and semi-rural areas, exposure of non-target vegetation including, but not limited to, native and ornamental species and food or feed crops is permitted.

NOTICE OF WARRANTY

Seller makes no warranty, express or implied, of merchantability, fitness or otherwise concerning the use of this product other than as indicated on the label. User assumes all risks of use, storage or handling not in strict accordance with accompanying directions.

EPA Reg. No. 73049-46
EPA Est. No. 33762-IA-001

VALENT BIOSCIENCES CORPORATION
870 TECHNOLOGY WAY, SUITE 100
LIBERTYVILLE, IL 60048

84-031-6788

NZ label

FORAY® 48B

Flowable Concentrate
For the control of Lepidopterous larvae

Active Ingredient:
12,700 International Units/µL *Bacillus thuringiensis* subspecies *kurstaki*, (H-3a, 3b, HD1)
in the form of a flowable concentrate.
Equal to 10,600 International Units per mg at a specific gravity of 1.2.

WARNING
This material may cause eye irritation.

Precautions:
Keep out of reach of children
Avoid skin and eye contact.
Wash hands and exposed skin before meals and after work.
Container disposal: Triple rinse container and add residue to spray tank.
Burn if circumstances, especially wind direction permit, otherwise bury in landfill.
Avoid contamination of any water supply with chemical or empty container.

STORAGE:

Foray® 48B should be stored in a cool, dry place. At the optimum storage temperature (4°C) in sealed, original containers the shelf-life is 12 months.

Shelf life will be impaired by storage above 25°C for more than a brief period. Keep containers tightly closed when not in use.

Marketed By:
Nufarm Limited
2 Sterling Avenue, Manurewa
Auckland, New Zealand
Telephone: 0-9-268 2920
Facsimile: 0-9-267 8444
Nufarm Emergency Phonelink: 0800 651 911 Toll Free 24 hours

Registered to:
Sumitomo Chemical Co., Ltd
New Zealand Branch
Level 16, ASB Bank Tower
2 Hunter Street, WELLINGTON, NZ

Net Contents: 20 Litres / 200 Litres / 1000 Litres

Registered pursuant to the ACVM Act 1997, No. P4714
See www.nzfsa.govt.nz/acvm for registration conditions

Lot No.
D.O.M.

Foray 48B contains the active protein crystals and spores of *Bacillus thuringiensis* subs *kurstaki*. It is a stomach poison and is highly specific against lepidopterous larvae. After ing larvae stop feeding immediately and die 2-5 days later. Maximum efficacy is exhibited agai and second instar larvae.

GENERAL DIRECTIONS:
- FORAY 48B may be used for both aerial and ground applications.
- Thorough coverage with uniform distribution provides best control results.
- FORAY 48B should be applied undiluted, but can be diluted with water, if required.
- Do not dilute with diesel and mineral oil solvents.
- The product should be well shaken, pumped or stirred before use.

BEES AND BENEFICIAL INSECTS:
FORAY 48B does not adversely affect foraging honeybees, or beneficial insects.

WITHHOLDING PERIOD: Nil days.

TIMING AND APPLICATION DIRECTIONS:
- Treat the young active larvae (1st and 2nd instars) before extensive damage has occurred.
- Apply to dry foliage only, and do not apply if rain is forecast within 6 hours.
- Under good drying conditions Foray 48B is rainfast within 1 hour.
- Good coverage is essential.
- Apply as required at 7-10 day intervals dependent on egg hatch numbers and monitoring.

DOSE RECOMMENDATIONS:

Crop	Pest	Application Rate	Comments
Forests, parks shrubs trees etc	Gypsy moth	4 litres / ha	Apply as soon as larvae are present and repeat a necessary against subsequent generations.
	White-spotted tussock moth	5 litres / ha	**Aerial Application:** Preferably apply undiluted. If dilution is required, dilute in 2-50 litres of water hectare. Spray equipment should be calibrated t deliver droplets sized between 75 to 200 microns
	Painted apple moth	5 litres / ha	**Ground Application:** Apply undiluted through ULV equipment to delive droplets sized between 75 and 200 microns or dil and apply in 50-100 litres of water per hectare. Ensure thorough coverage is obtained.
	Fall Web Worm	2.5 - 4 litres / ha	

CONDITIONS OF SUPPLY:
All goods supplied by us are produced under rigid quality control procedures which assu purchaser that at the time of sale they are physically suitable for use in the manner However, as we cannot exercise control over matters such as mixing, use, climatic condition of application, crop or crop stage, we cannot guarantee any application results. No liability accepted for any damage, injury or loss which arises from the storage, handling, application of the goods.