

CLOSING SUBMISSION

Parliamentary Commissioner for the Environment

In this submission I wish to:

- Reinforce the challenges facing the application of a science when there are large unknowns about its potential ecological impacts, by tabling a paper I have commissioned: *Key Lessons from the History of Science and Technology: the Knowns and Unknowns, Breakthroughs and Cautions*, by Dr Wren Green;
- Expand on my expectations of the Commission in terms of “where to next”; and
- Highlight key findings from my study of public perceptions of bio-controls for possums.

Expectations:

In my submission I drew your attention to the extent of the unknowns surrounding the development and potential applications of GM technology, and I emphasised the critical need for a strategic approach for New Zealand to be able to effectively address the risks, unknowns and opportunities of this technology. These concerns led me to recommend that you “propose the establishment of an independent Task Force to develop, on the basis of Commission findings and additional consultation, a strategy for the ongoing evolution of genetic sciences and their sustainable application.”

After this New Zealand Biotechnology Strategy is developed, it will need to be implemented by an appropriate independent body, which could be the Task Force itself or a new body such as a Biotechnology Commission (the Mental Health Commission provides a useful model^{*}). Whichever form such a guiding body takes, its independence, its composition, and thus public confidence, will be critical factors.

My principal expectation of this Royal Commission is that you establish the parameters for a New Zealand Biotechnology Strategy by clearly indicating the limits to current applications of GM science in New Zealand, given our current state of knowledge about the technology and its possible applications, and particularly the paucity of information about actual or potential ecological impacts. In short, I expect you will recommend limits, or criteria for the establishment of limits, for the applications of genetic sciences.

These limits or criteria must ensure that any application of the technology and its effects are retrievable and reversible. The limits must recognise the present extent of the unknowns, particularly in terms of potential ecosystem impacts. These limits will shift in the future as more research is undertaken, more experience gained, and public consensus evolves on the many issues.

The identification of clear limits is vital in order to give clarity and certainty to the scientific community and those sectors seeking to develop this technology; and to give assurance to the public concerned with environmental risks, human health and many ethical matters.

The Unknowns:

It can not be emphasised strongly enough that GM technology is a relatively recent science. Globally there has not yet been enough experience of this technology, its applications, and its various effects, to reliably assess risks. Many possible outcomes may only become evident over very extended timeframes or in subsequent generations. This is highlighted by the unexpected consequences of other sciences which gave society asbestos, thalidomide, or technologies that led to the discovery of prions and the phenomenon of acid rain (see *Key Lessons from the History of Science and Technology: the Knowns and Unknowns, Breakthroughs and Cautions*, by Dr Wren Green).

The Commission has heard arguments that GM technology is in essence the same kind of process as earlier human interventions in natural processes eg selective breeding. However there are profound differences with this new technology. Altering the very structure of life itself, in new and significantly different ways, will inevitably throw up a range of unexpected and unforeseeable consequences.

The Commission has heard evidence from scientific researchers about the high degree of imprecision in the technology itself in terms of the randomness of the insertion of DNA from one organism into another. Past applications of compounds such as CFCs and a range of synthetic chemicals (e.g. some insecticides, or certain PCB congeners, including polyvinyl chloride) have led to unforeseen impacts on the ozone layer and disruption of animal hormone functions (see *Key Lessons*, Green).

Further to the unknowns arising from the nature of the technology, the Commission must also consider the range of possibilities that might arise from accidents, operational carelessness, and human error, (e.g. Chernobyl, Sellafield) or from deliberate and unlawful misuse or introduction. New Zealand's experience with RCD illustrates the ease with which such illegal introductions of organisms can occur.

It is important to note that the extent of the unknowns is not the same as the extent of the risks, and that the difference is significant. Assessment of risk depends on knowledge that enables the calculation of probabilities. At present, the extent of the unknowns surrounding the application of GM technologies is such that assessment of for example, ecosystem risks, is not possible.

The Precautionary Principle:

The precautionary principle must be the fundamental cornerstone of your deliberations and of New Zealand's response to GM technology.

A number of pertinent concepts from the precautionary principle are:

- The presumption of environmental risk, which places the burden of proof on the proposer or developer of a method or technology, that it will be safe;
- A willingness to be proactive for environmental and human health protection in advance of comprehensive proof of possible consequences;
- Understanding the resilience or vulnerability of natural systems and resources to perturbation and change;

- Understanding the adaptive capabilities of systems and species, and possible thresholds of irreversibility; and
- Recognising the longer-term timeframes within which effects might become evident.

Another component of a precautionary approach is the preparation of strategies and methods to respond swiftly and effectively when unanticipated effects of GM applications become evident. Potential techniques and systems for the reduction, remediation and mitigation of adverse effects should be developed in advance of any use or release (authorised or not) of GM products or processes, and must be continually reviewed to keep them up to date.

It is important that GM technology does not compromise or foreclose on any potentially beneficial options for an environmentally sustainable future for New Zealand. There is a duty to ensure the ongoing viability of New Zealand's current systems of agricultural production, forestry, and environmental management, and our "clean green" image. New Zealand's organic production sector is particularly vulnerable to the introduction of GM organisms into our landscapes; organic systems as presently defined in international certification standards can not incorporate GM.

Research:

The extent of the unknowns of GM, and thus the need to apply the precautionary principle, mean that a wide range of research projects to address particular needs should be continued or initiated.

This research should be conducted within institutional settings that the public can trust and that are open to scrutiny by a full range of interested parties. In my report *Caught in the Headlights: New Zealanders' Reflections on Possums, Control Options and Genetic Engineering* (2000), I outlined public perceptions regarding what is believed to be a decline in the independence of New Zealand research agencies and hence erosion of public confidence in their science and advice. This concern must be addressed if future GM research findings are to be trusted by the New Zealand public.

Research associated with genetic modification is needed not only in areas of reductionist science, but also, and more importantly, in the sciences of synthesis and integration. The research work being undertaken by my expert witness Dr Mark Lonsdale and his team from CSIRO, which brings together a diversity of expertise from a number of scientific disciplines, is a rare example. It is a positive model from which New Zealand could build a proactive research programme. Research must also move beyond the physical sciences to incorporate many other fields of knowledge including: social science, ethics, cultural values, tikanga and matauranga Maori, history, poetry, geography, planning, environmental management, agriculture and horticulture, community health, education, nutrition, law, and the perspectives and values of ordinary citizens. Diversity of knowledge will be essential to ensure that the many implications of biotechnology are considered and integrated. Without this richness of scope and input, research processes are likely to perpetuate the narrow approaches that characterise the present situation of large unknowns, uncertainty and distrust. The dangers of compartmentalised research are amply demonstrated in my commissioned

paper, (see *Key Lessons*, Green) Ecology and the social sciences have shown us the interconnectedness and complex relationships between individuals, species, ecosystems, and ecosystem processes. This is consistent with the Maori worldview which connects all of creation through the linkages of whakapapa back to the original ancestors.

The inevitability of surprises emerging as GM applications develop and evolve, means the identification of thresholds, both of public acceptability (ethical, cultural etc) and environmental sustainability and irreversibility, is also critically important.

Undertaking the necessary research to explore potential risks and improve our knowledge will inevitably require some GM field based work in New Zealand. But this work must be undertaken in appropriate containment and with stringent safeguards, so that the research itself does not lead to adverse consequences.

Public concerns:

You have heard over the last few months the intense and deeply held concerns of a wide range of New Zealanders about GM technology and its possible applications. The public's insistence on involvement in determining the directions of this technology reflects a widespread lack of trust in the research industry and in the systems set up to assess and regulate the potential applications of GM technology. These concerns are outlined in my report *Caught in the Headlights* (2000).

In my submission I recommended that in the absence of any submission from the insurance industry to this inquiry, the Commission seek a meeting with the New Zealand Insurance Council to explore liability issues associated with GM. There must be systems in place to protect the public from future expensive burdens arising from mistakes or unforeseen consequences of GM. The main beneficiaries of such technology and its development, and the regulatory agencies, must be held clearly responsible for all the possible outcomes of their endeavours. The idea of a contingency fund system was mentioned in the hearings, but the limitations of this kind of provision need to be acknowledged. Prevention is more important than a post-disaster retrieval or compensation process. Furthermore, it may be that for some of the potential effects of GM, no recovery or remediation may be possible.

The concerns of the public are often discounted as being emotive, subjective, uninformed and not based in solidly researched data. However the mere existence of these concerns is valid in itself. The instincts, observations and experience of non-experts should not be under-estimated.

Participation systems:

To protect the public interest, an urgent priority must be to establish systems for community participation in contributing to research directions, in setting the parameters and criteria for decision-making, and in a two-way information flow to open up the dialogue.

The two-way nature of communications on GM is critically important. The flow of expert information from the scientific community and the official agencies working in risk analysis, out to a supposedly information-poor public, is only one part of the process. Scientists and experts must also learn to listen to the lay public and to take on board a wider range of information as part of their work. In my report *Caught in the Headlights* (2000), I recommended the establishment of mechanisms for ongoing fora to facilitate the exchange of information and views between community groups, tangata whenua, researchers and local and central government agencies, and the establishment of an independent information provider to be a trusted source of information about new technologies.

Transparency:

People will not trust research unless it is transparent and perceived to be independent. Therefore it is essential to establish processes by which the concerns, values, ethical and cultural dimensions can be, and are seen to be, taken seriously in the choices made about scientific research.

All publicly funded research must have the highest possible levels of transparency for informed debate by the New Zealand public. As I have already noted, independence is a key factor for credible research. The public are not satisfied that New Zealand's scientific research institutions are following paths that maximise the public good, and the perception is that commercial imperatives frequently dominate.

Key strategic directions:

New Zealand is a small nation dependent on the sustainability of its natural environment for economic viability, and with international responsibilities for the protection of its unique indigenous biodiversity. New Zealand must take a strategic approach to the potential risks, unknowns and opportunities of a powerful new technology such as GM. This is why I believe it is essential New Zealand develops a biotechnology strategy to provide guidance to all involved in this major science field and proposed applications. Current regulatory instruments do not provide the necessary strategic framework.

Ecological sustainability must be the starting point for New Zealand's strategic approach. This must include New Zealand's biodiversity goals, the viability and competitiveness of our agricultural and forest production systems, and the maintenance and enhancement of human health and healthy communities.

A strategic approach must take a long-term view of the potential risks and benefits for New Zealand, beyond the short-term horizons of many commercial and political interests.

In Summary:

- Genetic sciences and their applications will inevitably be a part of New Zealand's future, but given our unique biodiversity and biotic economy any applications must proceed with extreme precaution and within clearly defined limits. The size of the unknowns, particularly in terms of potential impacts on ecosystems, is very large at this time.
- A strategic framework for the application of genetic sciences in New Zealand is urgently needed. The development of a Biotechnology Strategy by a Task Force is proposed. There needs to be an independent body, such as the Task Force or a Biotechnology Commission, to ensure a co-ordinated implementation of the Strategy and provide a strategic overview.
- Particular attention needs to be given to matters of liability for any unforeseen consequences of the application of genetic sciences. This is a matter of particular concern to New Zealanders.

* The Mental Health Commission (MHC) model is relevant to the current genetic modification discourse in two ways. First, the origins of the Commission lay in the investigations of a 1996 Inquiry into Mental Healthcare Services (the Mason Inquiry); and second, the Inquiry was set up to find a solution to a lack of capacity to provide a strategic direction in mental health care services in New Zealand to look at the big picture.

The MHC was originally established as a Ministerial Committee in response to recommendations made in that inquiry with the task of implementing the National Mental Health Strategy produced by the Ministry of Health. The MHC was formally established as a Commission by a separate Act of Parliament in 1998. This Act confers three major roles on the MHC, these are: monitoring and reporting to Government on the performance of the Ministry of Health and the Health Funding Authority on their implementation of the Government's national mental health strategy; working with the mental health sector to promote better understanding by the public of mental illness, and eliminating discrimination; and strengthening the mental health work force.

A similar body could be set up to implement a national strategy for genetic modification developed by the Task Force I promoted in my submission. However the MHC works primarily with stakeholders in the mental health sector, whereas the body I envisage would involve dialogue and monitoring of a broader range of sectors as well as the wider community.

Although there are some differences, the point of raising the MHC with you is to illustrate the precedent for the creation by statute of an overarching body charged with the implementation of a national strategy.