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Science, public participation and spin

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This chapter deals with the relationship between scientific research, government regulation and public perceptions of risk. Two issues that have had a significant public profile and engendered vigorous debate will be discussed to show how the specific dimensions of these varied approaches to the perception of risk unfold. The two issues chosen to illustrate the contradictory and positioned nature of analytical approaches and risk evaluations used by the government, science institutions and the public are dioxin contamination of the environment and its subsequent contested health effects, and conventional versus organic food production and the relationship between these production methods and the consumption of pesticide residues by the general public (once again as an issue concerning public perceptions of health). In each case, scientific research will be discussed to show important ways the science informing wider debates on these topics is a contested field.

Given the publicly articulated community concerns around these issues, the evidence base from which scientific research on dioxin and chemical residues in food has been drawn is surprisingly narrow and resides largely within the domain of toxicology (the science of poisons) and epidemiology (the study of the patterns of diseases in populations). Even within such a narrow specialty base it will be seen that there are significant disagreements between participating scientists as to what constitutes proof of toxicity and adverse health effects. Such varied findings by the relevant 'experts' demonstrate the impact on scientific research of commercial and governmental interests — a specific framing of the parameters of scientific enquiry which I refer to as 'spin'.

In each case study, in addition to discussing the contested nature of the science informing regulatory responses to perceived risks, attention will be given to how the public exercise their democratic right to participate in decision-making. This involves access to information, spin, health concerns and trust, as well as the role played by government in informing the public and in regulating toxic chemicals.

The Dioxin Issue

Dioxin is the name for a group of 210 Individual, structurally similar chemicals' (Wright, Millichamp, and Buckland, 2001), the most toxic of which is 2, 3, 7, 8-TCDD – or TCDD for short. It has been suggested that the dioxin group of chemicals forms the most toxic group of substances known to humans, ranking alongside plutonium (Williams, 2001). It causes cancer in humans and was classified in 1997 by the International Agency for Research on Cancer as a known human carcinogen, as well as the cause of many other health problems. For instance, dioxin is also an endocrine disrupter – it interferes with the chemical messaging systems that control the biological development of animals (Myers, 2002). Dioxin "affects cells by interfering with the expression (the turning on and off) of genes, which are responsible for making specific proteins" (Centre for Health, Environment and Justice [CHEJI 1999: 38). When dioxin enters a cell, that cell's gene function is altered. This results in the gene expression being blocked, or being kept turned ‘on' inappropriately. The result may be a range of defects in normal cell growth, including cancer, birth defects, suppression of the immune system and change in normal hormonal levels. Exactly how dioxin interferes with gene expression is only partially understood (CHEJ, 1999). It has been claimed that there is no safe level of dioxin *(The New Zealand Herald*, 16 February 2001). Even so, as the chapter illustrates, there is still much to be learned about its effects on human health.

Dioxin is fat soluble and bioaccumulates as it goes up the food chain. It is aquaphobic, so will move from water into fish: "dioxin levels in fish are 100,000 times that of the surrounding environment" (Enviroweb, 2000). Dioxin breaks down very slowly. On surface soil, it may take 9-15 years to degrade half the dioxin in the top 0.1 centimeters and 25-100 years to degrade half the dioxin in the subsurface soil below 0.1cm (CHEJ, 1999: 13). In humans, the body excretes dioxin by first metabolising it into less harmful and water soluble compounds in the liver, but this takes a long time. The half-life for dioxin elimination in humans ranges from 5.8 to 14.1 years (CHEJ, 1999: 37). Because of these unique characteristics dioxin has become a local, national and global problem.

The New Zealand Government Dioxin Action Plan

Although there is still some scientific dispute over the toxicity of dioxin (Montague, 1999), mainly due to the difficulty of providing epidemiological and toxicological evidence and of deciding what constitutes proof of toxicity, the scientific consensus is that it is extremely toxic. This has led to many countries, including New Zealand, signing the Stockholm Convention banning the 'dirty dozen' persistent organic pollutants (POPS), including the group of chemicals known as dioxin.

This signing was also the result of public concern about the effects of dioxin on human health and the environment. This was expressed by non-governmental organisations such as Greenpeace which continued to maintain pressure on the government to sign the Stockholm Convention and fight dioxin contamination in New Zealand (Greenpeace, 2002). Television programmes and newspapers carried stories concerning dioxin contamination (particularly over the case of Paritutu discussed below). Pressure was also applied by groups located at sites in New Zealand where dioxin was being produced. For some time residents surrounding these sites had been agitating for the Government to do something about the perceived elevation of their health problems. Yet the scientific investigations of these concerns had always claimed that there was no such problem (we shall consider this in more detail when we look at the Ivan Watkins Dow issue discussed below).

In addition, information was being reported in the media that the toxicity of dioxin was far higher than at first thought. In 1990 the World Health Organisation (Smith and Lopipero, 2001: 61) recommended a daily intake of no more than 10 picograms per kilogram of body weight (a picogram is a million, millionth of a gram). By 1999 that figure was down to 1-4 picograms (Smith and Lopipero, 2001: 62), and in 2001, in a *The New Zealand Herald* report section entitled 'Can there be a "safe" level for dioxins?' (The *New Zealand Herald,* 16 February 2001), it was reported that the "US Environmental Protection Agency believes the figure should be 10 times lower than even that figure" (Smith and Lopipero, 2001). The subject of dioxin toxicity had moved out of the realm of experts into the public arena. The newspaper article stated that no other chemical causes the cancer risk to escalate so rapidly – clearly the Government was under pressure to act.

In 2000 the New Zealand Ministry for the Environment (MfE) commissioned a report on dioxins in New Zealand that was finally published on 20 February 2001 (Smith and Lopipero, 2001). The report appears to have been made public only after details of its very worrying results were leaked to the press on 15 February 2001, contributing to the increase in New

Zealand media interest in the topic. 'Dioxin's fatal toll in secret report', declared *The New Zealand Herald,* and went on to point out that the report the Government had been sitting on suggested that up to 50 cancer deaths each year were due to the high exposure of New Zealanders to dioxin. The report noted that "New Zealanders" dietary intake of dioxin is 70 times above the daily limit recommended by the US Environmental Protection Agency" *(The New Zealand Herald,* 13 March 2001). The *Herald* also indicated that "Environment Minister Marion Hobbs and her officials warned colleagues that its release 'will need to be managed carefully ... to avoid any public

The spin began the very next day. An MfE senior policy analyst said the levels of dioxin in New Zealand were generally lower than those of many other countries *(The New Zealand Herald,* 15 February 2001). Other documents from the MfE reiterated how low our levels of dioxin were compared to Europe and North America. The MfE Action Plan (MfE, 2001) compares New Zealand and other countries based on two methods of assessing dioxin exposure for the general population. The first measures the dioxin levels in food, and the second measures the concentrations of dioxin in blood. The first method shows that the current dioxin intake for New Zealanders is approximately 0.5pg/kg bw/ day. They state that "the dioxin intake of people in industrialised northern hemisphere countries is between two and five times as great" (MfE, 2001:11). The second method shows that the average exposure has been three times higher at 1.4pgfkw bw/day. This exposure is again less than in industrialised northern hemisphere countries, but at 1.4pg/kg bw/day is still "close to the WHO tolerable daily intake" (MfE, 2001:12). Smith and Lopipero also point out that given the average intake of 1.4 pg/kw bw/day, "about half the population would have exceeded this intake" (2001:v),

While the claim about our lower level of dioxin contamination in relation to other countries is true, this does not reduce the seriousness of the report's findings. It can be argued that 50 deaths a year from cancer is the trade-off for the benefits of products such as pesticides and plastics, but, as the Government-commissioned report points out, this cancer estimate is 100 times higher than the level at which the Government regulates carcinogenic exposure from environmental sources (Smith and Lopipero, 2001). It would seem that international, national and local concerns about dioxin, and the increasing scientific information concerning its toxicity, suggested that the Government move to at least regulate dioxin production. According to the local newspapers, the dioxin crisis had arrived, and while New Zealand may not have had vast `smoke stack' industries producing dioxin, "our agricultural economy and

enthusiasm for chemicals have in many ways made up for that" *(The New Zealand Herald,* 24 February 2001).

In May 2001 New Zealand signed the Stockholm Convention, and in so doing was required to come up with an action plan to eliminate dioxin. The draft action plan was released for public submissions in October 2001 and according to a senior policy analyst for MfE, received 124 submissions (S. Buckland, personal communication 14 February 2002). The action plan only addressed discharges of dioxin to air – further action plans will address the other forms of discharge – and aimed to reduce the discharges by developing a National Environmental Standard (NES). The action plan points out that a NES limiting dioxin discharges "is seen as taking a preventative and precautionary approach" (MfE, 2001:viii). But what is meant by a precautionary approach?

The Precautionary Principle (PP)

`Precaution' is now becoming part of the spin to legitimise regulating substances such as dioxin, where it has not been established with scientific certainty that such a substance is toxic to humans. Precaution as used in the PP means that one does not release a substance into the environment if there is uncertainty as to whether it will cause harm to humans and the environment. This is in contrast to the risk assessment approach where such a substance is released into the environment and then assessments of the risks it poses are developed. However, while the New Zealand Government's 'Environment 2010 Strategy' fully endorsed the PP as one of its 11 key principles, the PP is seen as being expensive and "very difficult to implement in practice" (ERMA, 2002: 10). So "in most New Zealand legislation and practice" the PP is watered down to the `precautionary approach' and is adopted within risk assessment (ERMA, 2002: 10). It is argued by ERMA that this is a way of "achieving the same purpose without the formal 'baggage' associated with the Precautionary Principle" (ERMA, 2002: 10). The 'baggage' refers to fundamental values to do with society's expectations for environmental management and to sustainability that are embodied in the PP. This confusion allows for the adoption of a risk-assessment approach under the guise of being precautionary. This is at work in the dioxin issue as well as other issues in New Zealand, most notably GE (Ninnes, 2001, see also Scott and Tipene-Matua in this volume).

The Ministry for the Environment (MfE) argues that it is taking a precautionary approach, yet it has developed a NES that allows some level of dioxin emissions to continue, and allows for the building of more incinerators.

The MfE Action Plan sees the NES as applying to municipal waste incinerators. As yet there are no such incinerators, but the MfE envisages these being built to burn refuse that would otherwise end up in landfills (MfE, 2001: 23). This means that a certain level of dioxin will still pollute the environment and end up in humans. This approach does not seem to be fulfilling the requirement that New Zealand signed up to in the Stockholm Convention, a point made forcibly in some of the public submissions to the Action Plan (Greenpeace, 2002).

Further, the action plan being developed following the signing of the Stockholm Convention takes no account of the dioxin contamination already present in the land. Both the Government and local councils "are deliberately obstructing the public release of details of thousands of locations known to be – or suspected of being – poisoned" *(The New Zealand Herald,* 24 February 2001). A report for the MfE identified 7,800 dioxin-contaminated sites, and noted that in some cases the damage done at these sites cannot be undone (MfE, 1997: 14). Such secrecy undermines public participation in dealing with and solving this problem. It also undermines trust in elected representatives.

From a personal communication with MfE senior analysts working on the dioxin action plan (14 February 2002), it appears that there is a difficulty with developing an action plan in isolation from wider issues to do with dioxin emissions. For example, how should the MfE deal with rural sector plastic waste disposal? Large amounts of plastic waste are produced on farms but cannot now be incinerated or buried. There is also concern that if a NES is to be developed for dioxin emission, what about a NES for other pollutants such as "PCBs, PCP, DDT and dieldrin" (MfE, 1997: 22)). The information to date is that the action plan has not been 'finalised'.

Dioxin issues at the local level

Dioxin is also of major concern at a local level. For example, a report by Sawmill Workers Against Poisons (SWAP) for the MfE detailed alarming statistics of what is claimed are chemically related illnesses affecting sawmill workers in Whakatane, Kawerau, Kinleith and Waipa *(The New Zealand Herald,* 26 June 2002). But the most prominent example of local concern is the claims of dioxin contamination by residents at Paritutu from the Ivan Watkins Dow (IWD – now called Dow AgroSciences) chemical plant. The Dow Chemical Company is the largest chemical company in the United States, with factories in many countries and employing 50,000 people (The Dow Chemical Company, 2003). Dow AgroSciences is a wholly owned subsidiary of The Dow Chemical

Company and produces "pest management and biotechnology products" (Dow Agrosciences, 2003: 1).

In 1960 the IWD chemical plant began manufacturing the herbicide 2, 4, 5-T, along with other agricultural chemicals, in Paritutu, New Plymouth. For the next 27 years it continued to do so, producing TCDD as a byproduct. Due to increasing international concern over the health impacts of dioxin, especially TCDD, it stopped making 2,4,5-T in 1987. It was the last factory in the world to stop making the herbicide *(The New Zealand Herald,* 18 February 2001).

By the 1980s local concerns about the effect of IWD emissions on the residents of Paritutu began to surface. But scientific studies (The Royal Society of New Zealand, 1980) of dioxin in this and other areas in New Zealand continued to claim that there were no health hazards caused by dioxin at the concentrations that were present. Pressure from residents continued and finally a Ministerial Committee of Enquiry was set up in 1986 – the Brinkman Inquiry (Brinkman, Matthews and Earl, 1986). It concluded that there was no substantiated evidence of ill effect on the health of the residents of Paritutu from the IWD manufacture of 2, 4, 5-T. One of its recommendations was, "that manufacture and use of 2,4,5-T continue for 12 months provided that the dioxin content in any new product manufactured after 30 June 1987 is reduced to 1 ppb" (Ministry of Health, 2002: 12).

In a supplementary report one year later they did state that environmental contamination in the area was widespread, and one of their recommendations was that in future all new chemical manufacturing plants should be situated in areas that are remote from residential areas (Brinkman, Matthews and Earl, 1987).

The above reports were made in 1986-7 and were based on recommended daily intake levels that have since been substantially reduced, as previously discussed. The science of dioxin and dioxin's toxicity were not as well understood as they are today. While the residents of Paritutu claimed that there was a relation between their illnesses and dioxin, they could not prove it on the paradigm of scientific evidence that was required. IWD has repeatedly denied that any emissions from its factory have posed an environmental or public health threat *(The New Zealand Herald,* 18 February 2001). In 1985 IWD stated, 'Studies have shown no lasting health effects from sometimes severe dioxin exposure' (IWD 1985: 13). Further to this they state: 'There are no known deaths from exposure to dioxin' (IWD 1985: 7).

The Paritutu residents' organisation, Dioxin Investigation Network, continued to agitate for further inquiry into this issue and to have blood tests. Their claims were also voiced on TV and in the media (such as the Holmes

Show in 2000, 20/20 in 2001 and in *The New Zealand Herald* on a number of occasions during 2001 — see references). Recent epidemiological research on residents at Paritutu showing that they had a 30% increased risk of cancer was also coming to light (Kogevinas, Becher, Berntazzi *et al.*, 1997). Finally, in 2001, the Ministry for the Environment agreed to test the soil at Paritutu for dioxin levels and to investigate claims that IWD had dumped toxic chemicals in that area. The Ministry of Health agreed to test the blood of about 100 residents in the area. The soil at 45 sites was tested and found to be contaminated (in the range of 5 to 15 ng/kg), but not at a level that posed a health risk. Only at one site was the contamination above acceptable guidelines — 92 ng/kg *(The New Zealand Herald,* 26 September 2002). The blood tests, which will show the level of dioxin in Paritutu residents' bodies, have not yet been completed.

The difficulty with this testing is that it is 12 years since IWD stopped producing dioxin, and 30 years since the production of 2, 4, 5-T was at its peak. The levels in the soil and in the bodies of the residents in Paritutu will be considerably less than when the damage to residents is claimed to have happened — back in the 1960s and 1970s *(The New Zealand Herald,* 26 September 2002). So unless other types of evidence are allowed to be included, the residents will never be able to scientifically prove the relation of their dioxin body burden and the illnesses they claim it produced.

This case provides good support for the adoption of the precautionary principle. Given the growing scientific evidence of the toxicity of dioxin, the need for much more scientific research into the mechanisms by which it interferes with human development, and the concerns of the public who have all been exposed to dioxin, it would seem prudent to stop dioxin entering the environment. The precautionary principle can also be argued to be applicable to other areas of human activity such as genetic modification, and in particular to the conventional production of food, to which we now turn.

Organic versus conventionally produced food

The issue that arises here is whether the synthetic chemical residues found in conventionally produced food pose a risk to consumers. The organics movement argues that there is no safe level of chemical residue in food, and that we should move to the development of organic food production. The New Zealand Food Safety Authority (NZFSA) claims that as long as residues are below the stipulated 'maximum residue limits' (MRL) they pose no risk to human health. Let us turn our attention for the next few pages to the state of the scientific debate over such residues.

The question concerning residues nicely illustrates the first level challenge to science, that from within the scientific community itself, as there is much scientific debate as to whether such residues constitute a risk to human health. The testing to determine toxicity, usually whether the chemical in question is a human carcinogen, is by standard high-dose animal cancer tests. In these tests, rodents are given near-toxic doses of a particular chemical – the maximum tolerated dose (MTD). If cancer results, the chemical is seen as a rodent carcinogen and a likely human carcinogen. If the chemical does not produce cancer it is deemed safe for humans.

However, scientists such as Ames and Gold (1999) have argued that high-dose animal experiments do not indicate that a particular chemical may be a human carcinogen. The carcinogenic effect is simply the result of the high dose, not the chemical. Ames and Gold argue that cancer risks to humans cannot be assessed by these standard high-dose tests, and suggest that if such tests are used to determine toxicity, many chemicals that naturally occur in foods are also carcinogenic. They argue that small residues of synthetic chemicals pose no risk to human health – it is the dose that makes the poison. This is disputed by other scientists who argue that there is considerable scientific evidence to show that low levels of residues can be just as much a threat to humans as high doses (Schreinemachers, 2000; Watts, 1994). There is also evidence – in addition to that obtained from high-dose animal experiments –that strongly suggests certain synthetic chemical residues in food for human consumption can cause serious health problems (Colborn, Myers and Dumanoski, 1996). Evidence from experiments using very low doses of synthetic chemicals has found that tiny doses of a chemical over long periods can be more harmful than larger doses, and that the timing of the low dose is very important.

For example, Bisphenol A (BPA), a compound used in the manufacture of polycarbonate plastics used for food and beverage containers, leaves residues in that food and has been found to have significant adverse health effects. If very low doses of BPA are given to mice during the perinatal period it causes an error in cell division called aneuploidy that causes spontaneous miscarriages and birth defects. Low doses have a greater effect than high doses (Rubin, Murray, Damassa *et al.,* 2001; Hunt, Koehler, Susiarjo *et al.,* 2003). Given that current human exposure levels of BPA are the same as the levels delivered to the mice, this effect would be expected to be found in humans. Hunt *et al.* (2003) argue that current safe exposure levels of this compound need to be reevaluated.

The scientific debate over the health effects of synthetic chemicals illustrates

certain difficulties. First, scientific research is open-ended – evidence is never indisputable (Callon, 1995:46). Second, the decision as to whether a synthetic chemical is or is not toxic tends to arise *inter alia* by a growing climate of scientific confidence, based on a collective enterprise related to the design and conduct of experiments, and agreement on results (Callon, 1995: 47). And third, it is very difficult to scientifically show a direct cause–effect relationship between a specific chemical residue and a negative human health effect.

Scientific evidence and public trust

The contested nature of scientific evidence can produce a 'scientific spin' where data contrary to the desired result is suppressed or eliminated from the reported results. This *evidence' is produced by scientists working for private companies in the commercial sector who produce these chemicals. More and more scientists are being employed and their research is specified and funded by organisations who expect them to come up with certain conclusions (Jasanoff, 1990; Gieryn, 1995). This can paralyse regulatory agencies if they seek to regulate on the basis of scientific evidence, as it allows those who manufacture the chemicals to litigate endlessly against regulation. Fagin and Lavelle (1999) provide many examples of how this happens in the USA.

For example, the US Environmental Protection Agency (EPA) is *inter alia* concerned with regulating chemicals such as pesticides that are released into the environment. It relies on research carried out by the manufacturers, or for them, when it considers regulation of toxic chemicals. The manufacturers are required by law to provide the EPA with *all* this research. In 1991 and 1992 the EPA offered an amnesty from hefty fines if manufacturers provided health studies that they should have handed over to the EPA earlier.

> Manufacturers suddenly produced more than 10,000 studies showing that chemicals already on the market could pose a "substantial risk of injury to health or to the environment" – the kind of never-published data that the law says must be presented to the government immediately (Fagin and Lavelle, 1999: 13-14).

This sort of behaviour (corrupted science) undermines public trust in scientists who are not independent and the evidence they produce. In the UK, a recent survey of the public found that 'fewer than 14 per cent trusted what they hear from scientists working for private business or from the news media. Government scientists come somewhere in the middle (32 per cent)' (Economic and Social Research Council, 2002: 3). Another survey showed that 82 per

cent of Britons trusted scientists working for environmental groups, while only 47 per cent trusted those working for industry, and 48 per cent trusted government scientists (Parliamentary Office of Science and Technology, 1995).

A recent survey in New Zealand, showed that a significant proportion of the public distrust scientists. It found that 86% of people believe it is important to have some scientists who are not linked to business interests, and 83% believe it is important to have some scientists who are not linked to government (Hipkins *et al.,* 2002). This flies in the face of the neoliberal reform of scientific institutions in New Zealand, where there is pressure to develop science in partnership with business, and to direct research funding to the development of a 'knowledge economy'. There is not much room for independent scientific research in this approach, nor to scientific research geared to a set of priorities different from 'wealth creation'.

Further limitations of scientific testing

There are a number of other limitations to the scientific testing of synthetic chemicals. Until very recently there has been no testing of chemicals for other health effects such as endocrine and hormone disruption. There has been no testing for the effects of long-term exposure to chemical residues at doses lower than the MTD, and there has been no testing of chemicals in combinations, for their synergistic effect (Ninnes, 2001; MacGarvin, 1993; Zakrzewski, 1997). The limitations of scientific testing cast doubt on the adequacy of this science (toxicology) and epidemiology to deal with the questions of long-term exposure and synergistic effects. Yet it is these sciences that are predominantly used to decide on the risk of chemical residues to human health, because it 'is the best we have at present' (Zakrzewski, 1997: 105).

This raises more general questions concerning what constitutes a scientific approach, how far we are able to assess risk using this paradigm, and what other evidence would be acceptable in assessing risk. Studies since the early 1990s show how extremely small amounts of chemicals can interfere with the natural chemical messaging systems in humans (endocrine disruption). This may be about to cause a revolution in the scientific understanding of the impacts of contamination on health, and the studies point to the fact that our ability to synthesize chemicals has got far ahead of our scientific understanding of their impacts (Myers, 2002). The new science of toxicogenomics holds some promise that we will soon be able to understand how toxins affect the specific genes of our cells at low and high levels, and the long-term effects on genes of multiple toxins (Schmidt, 2003). But the enormous amount and

complexity of data that this approach will yield at the micro level does not necessarily translate into a coherent account of adverse effects of toxins on humans (Schmidt, 2003).

The limitations of the risk-assessment approach are one of the reasons for the growing call for the adoption of the precautionary principle. If we consider what synthetic chemicals are in our food as residues, and the lack of scientific understanding as to their health effects on humans, then on the precautionary principle we should opt for organic food. How then are the chemicals used in food production regulated?

Maximum residue limits

In New Zealand, MRLs are set in accordance with the internationally accepted residue limits set by the Codex Alimentarius Commission (Codex). Though the official mandate of Codex is 'to create a set of international standards to guide the world's growing food industry and to protect the health of consumers', in practice it often makes decisions that benefit profit and production at the expense of nutrition and health. This is because Codex is strongly influenced by 'industry and biotech representatives' (Fagan and Wolfson, 1997). Watts argues that the Commission's aim is `to minimize disruptions in the food trade caused by the presence of pesticide residues in food' (Watts, 1994: 29).

The MRL for a particular pesticide is set on the basis of the quantity of residue expected in a particular food relative to the amount of the pesticide required to kill the pest. So the MRL can vary depending on the food it is being applied to. The fungicide chlorothalonil's MRL varies from 5 mg/kg for some vegetables to 30 mg/kg for some fruits (Watts, 1994). The MRL 'refers to the maximum level of named contaminants in foods that can legally be sold for human consumption' (New Zealand Food Safety Authority, 2002: 1). The MRLs in New Zealand may vary from those set by Codex, because 'these limits are not usually established on purely health grounds' (New Zealand Food Safety Authority, 2002: 3). They also depend on the severity of the pest, and on facilitating trade.

With the advent of pesticide-herbicide-resistant GE food, the MRLs will rise. 'Monsanto, the major manufacturer of glyphosate, has successfully applied to the European Economic Union to raise the maximum residue limit for glyphosate 200 times from 0.1mg/kg to 20 mg/kg. Similar standards have been set at Codex, the WHO/FAO food standards agency, and applied for in Australia and New Zealand' (Dibb, 2000: 5). The NZFSA states that any residue level `allowed in foods must not pose a human health risk' (NZFSA, 2002). But

given what has been said above, the risk assessment based on toxicological testing is limited in its ability to provide such assurance.

Public access to information

So how is the public to know whether the food they buy in the supermarket is safe? For a start there is no labelling of food to inform the public what chemical residues it contains. This, together with the continuing increase in food-borne illnesses, has led to growing public concern as to exactly what is in our food. As Annette King said in her speech to the Food Safety Conference (25 March 2003), "In the seven years from 1990 to 1997 the reported incidence of food-borne illness almost doubled, and the trend since has continued upwards ...

Concerns about these trends were backed by increased consumer anxiety about exactly what was in the food they were eating. For example, there was increased concern about chemicals in food" (King, 2003).

This is one reason for the creation of the NZFSA in 2002 and for the New Zealand Government's recent introduction of new food-labelling requirements. The new food labels will detail the nutritional content of the food, the percentage of main ingredients, the presence of potential allergens, and whether the food contains any genetically modified ingredients. But they will not include information on the residue levels of agricultural chemicals such as pesticides present in that food.

Some very limited information on residues present in food is available – it is contained in the Ministry of Health's 'Total Diet Survey' (TDS). The last TDS was carried out in 1997/8. The TDSs provide a limited amount of information, in that they only test a selection of the foods available – the 'average' New Zealand diet – and they only test for a fraction of the chemicals used in food production. For example, glyphosate, the main ingredient in Roundup, is never tested for in New Zealand food because the process is expensive. Also excluded from testing are many herbicides used in New Zealand (Watts, 2000). The results of the survey show that most of the foods sampled were below the required MRLs.

The TDS is not readily available to the general public, nor is the information in it easily accessible. No information is provided as to the possible health risks associated with these residues. The NZFSA and the Ministry of Health aim to make sure that our food is safe. But food scares overseas and here, and casual attitudes to food preparation and storage, have led the public to be wary about possible food contamination and the assurances of its safety by elected representatives. This is one reason for the increased concern by the public over food safety, and also for the increased demand for organic food.

Organic food

Organic food is certified to be free of synthetic chemical residues, yet if one looks at the way organic food is presented in the supermarket and in the media there is no information as to the health benefits of eating food uncontaminated with these residues. This makes it difficult for the public to decide whether organic food production should be encouraged by the Government, and what the benefits of eating it might be. The debate over organic versus conventionally produced food is conducted in publicity from organic organisations such as Soil and Health, Bio-Gro, Greenpeace and the Green Party on the one hand, and from those such as Ames and Gould (1999) who argue that conventionally produced food is perfectly safe, and that regulations concerning residue levels should be abandoned.

The demand for organic food has grown rapidly, with horticultural production experiencing a 'silent revolution' (Campbell, 2000), and the interest in organics is moving very much into the mainstream. Farming newspapers *(Rural News, Straight Furrow, Country-Wide)* now carry features on organic food production and on conversion to organics, and National Field Days are highlighting the development of organic farming.

But the huge growth in demand for organic products and the discourse that surrounds the organics industry is now primarily focused on financial results, not health or the environment. Large companies such as Fonterra (2003), Zespri International, Heinz-Watties, McCains and ENZA have now entered organics, seeing financial gains to be made in the export market. For example, Zespri now produces kiwifruit for export that are organic or grown with reduced levels of spray (Integrated Pest Management), after New Zealand kiwifruit was rejected for exceeding the MRLs in Europe. According to the Organic Products Exporters of New Zealand (OPENZ), New Zealand's organic exports were $70 million in 2000/2001, and the industry predicts organic export sales will grow to $500 million in the next four years (OPENZ, 2002), with domestic sales of $150 million .

With this growth in organic exports and with an overseas demand that far outweighs New Zealand's ability to supply (USDA 2002), one would expect the New Zealand Government to finance research and development programmes, educate the public as to the process and benefits, and provide incentives for going organic. There is much research needed to examine whether organic fanning is more sustainable than conventional farming in producing for world markets. There are also many problems with converting to organics and with organic certification requirements that need to be addressed.

While other countries such as the UK provide assistance and subsidies to

farmers converting to organics, the New Zealand Government has, up until very recently, not fully supported this industry (Martech, 2003: 26). The government provided only $250,000 for organic farming in the 2001 Budget —being only 0.8% of the $30 million of extra funding to be spent on agriculture and biosecurity over the next four years.

However, a recent report contracted by the Ministry of Agriculture and Forestry outlines an organic sector strategy for New Zealand that seems set to improve government support for organics. This strategy, fully endorsed by Minister for Agriculture Jim Sutton, aims at "a target of $1 billion total sector sales by 2013" (Martech, 2003: i). The strategy will require the Government to provide funding of $2 million per year for five years (Martech, 2003: 45).

While things seem set to improve for the organics sector, the predominant spin from the Government has been about catching the knowledge wave and developing biotechnology. This was clearly stated by the Minister for Agriculture at the launch of a new joint venture between a biotechnology company, ViaLactia, and Livestock Improvement, where he said this development 'demonstrated the rural sector's grasp of what was required in a knowledge society' (Sutton, 2002).

The market for organics overseas is seen as a temporary phenomenon generated by 'food scares such as BSE, E.Coli, listeria and consumer opposition to genetic modification' (USDA, 2002). Once the overseas consumer has got over the scare, they will return to food produced by conventional or genetically engineered means. It will supposedly be cheaper, and the return to the producer higher. Biotechnology will also create wealth, as expressed in the current Labour Government's concern 'to catch the knowledge wave' and to develop a `knowledge economy'. There is not much room for organics here!

Conclusion

This chapter has looked at two issues that have generated considerable public debate. In each the interrelation between science, public participation and spin has been discussed. While each issue has themes that are specific to that issue, there are common dimensions.

The way scientific information is selectively disseminated to the public, the issues of access to information and the way submissions from the public over these issues have been dealt with show a pattern. The risks to human health and the environment have in each case been presented by the government as under control, based on scientific evidence and government regulation. Concerns of the public that fall outside science, or are not based on the current

paradigm of scientific evidence, are not seen as relevant to the issue. But the science of risk assessment based on toxicological research has been shown to be inadequate in assessing risk, and claims to the contrary have led to public distrust of scientists and elected representatives, and concern over health and environment issues. The inability of science to determine health risks in relation to dioxin and pesticide residues in food, and the fact that much science is conducted for commercial or governmental interests, has also contributed to this distrust.

Another element common to these two issues is the way language was employed to obfuscate what were previously clear concerns. This was illustrated with the spin over precaution, and the way this term was 'loosened' to mean caution. This was further illustrated with 'total diet surveys' that were not total and with the labelling of food so consumers could make 'informed' choices while leaving out information on toxic residues in food.

Surveys of the public have suggested that people have concerns over these issues, which are not simply about science and wealth creation. They are also about what sort of society the public want, and whether certain suggested developments may not be in the best interests of society. The democratic process requires that these concerns are really discussed and not spun out of view.

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