CONTAMINANTS IN FOOD: THE AUSTRALIAN SCENE

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Summary

Government departments, both at a State and Federal level, have responded to public concern over food safety by instigating a series of food surveillance measures, notwithstanding limited resources. This paper addresses the current Australian data on pesticide residue levels, heavy metals, cadmium, natural toxicants and microbiological contaminants. The data indicates that contamination of Australian foods is minimal.

I. INTRODUCTION

In July 1992 the Federal Minister for Primary Industries and Energy Simon Crean and the Minister for Industry Technology and Commerce John Button launched the Clean Food Export Strategy and announced that it would enhance Australia's image as a supplier of clean, fresh quality food to the rest of the world to underpin future growth in our exports. Mr Crean said that Australian exporters would be able to take better advantage of a relatively untapped asset, our reputation and ability to produce clean and wholesome foods in a comparatively unpolluted environment.

He went on to say that overseas customers are becoming increasingly concerned about the quality of the food which they consume. They are particularly concerned about toxic wastes, acid rain, nuclear radiation following Chernobyl, and pesticide and herbicide residues. In contrast, Australia's image of clean, open spaces with low ambient pollution can be built on through an export promotion program enhancing Australia's reputation as the supplier of clean and safe food.

And it is not only our overseas consumers who are becoming concerned at the safety of our food supply - all consumers are.

So just how clean, green and safe is our Australian Food supply and what are its strengths and weaknesses. To give you a snapshot of the current situation, I would like to focus on the following areas:

1. the data sources we have
2. pesticide residues and agricultural chemicals, antibiotics, antimicrobials, growth hormones etc.
3. heavy metals
4. natural toxins
5. microbial contaminants and
6. real and perceived risks.

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Food safety is one of the pieces of the public health jigsaw. It fits among those that concern communicable diseases, epidemiology, waste management, water quality, vector control and general environmental hygiene.

It is one of the basic foundations of our society, that every person when purchasing food, expects that food to be fit for human consumption and above all to be safe. We expect food to contain levels of contaminants, either intentional or unintentional, so that the food does not represent a risk to health.

From a food surveillance point of view there are potentially thousands of foods available in the market place and a myriad of natural and man-made contaminants that may potentially contaminate foods. However, the resources available to health authorities for food surveillance are limited. There are three main data sources that provide information to health authorities in targeting their resources.

These are as follows:

1. The Australian Market Basket Survey
2. The National Residue Survey
3. State Food Monitoring Programs such as the Western Australian Food Monitoring Program.

The Australian Market Basket Survey is a national survey conducted on a biennial basis whereby samples of food are taken directly from the market place in the capital cities throughout Australia. The survey represents the total diet and a wide variety of foods are taken. However, only a few samples of each food are analysed. This survey concentrates on pesticide residues, heavy metals such as cadmium, mercury, lead and aflatoxins.

The National Residue Survey is designed to ensure that Australian export produce meets acceptable standards. This survey is particularly geared to meats, grains, fruits and vegetables and covers contaminants such as pesticide residues, heavy metals and drug residues such as antibiotics and antimicrobials.

The Western Australian Food Monitoring Program is a cross government approach to food monitoring which maximises resources and avoids duplication of effort, using this strategy detailed reports have been prepared on individual survey and circulated to local authorities, industry and other state authorities, parliament etc. Work carried out under this program provides substantiation for legislative change and a strong implementation tool as well as providing a significant database as a reference source. It covers pesticide residues, heavy metals, food additives, natural toxicants and microbial contaminants.

II. PESTICIDE RESIDUES

Australia's food supply is clean with respect to pesticide residues. This is borne out in the Market Basket Survey, the National Residue Survey and in the Food State Monitoring Programs. Take for example fruits and vegetables in Western Australia. We have monitored pesticide residues in fruits and vegetables constantly over the last eight years under the West Australian Food Monitoring Program.

Our policy in taking these samples is as follows:

1. samples are as fresh as possible, taken direct from orchards or market gardens so that the levels of pesticides are potentially at their highest.
2. foods targeted are those which are sprayed directly.
3. trace back to the growers where violative levels are found.

In that period we have carried out five surveys each of about 200 samples.

As a case study in the 1990 survey, 70% of all samples of fruits and vegetables had no detectable levels of pesticide residues, 95% of all samples had pesticide residues below half the MRL and almost 98% of all samples tested had levels below the MRL, no sample exceeded the MRL by more than 50% and those that were found to exceed the MRL were organophosphates which are rapidly broken down in the environment and do not pose a long term health problem.

In those surveys samples were taken direct from the market place, just as a normal consumer would. In the 1991 -1992 survey pesticide residues in particular regions were targeted. For example Geraldton tomatoes, Carnarvon and Ord River products and the fragile fruits and vegetables such as peaches, strawberries and stone fruits.

In that survey of 339 samples, 64% had undetectable residues or levels less than 0.1 of the MRL, 94% of all samples had residue levels below half the MRL and only 2% had residue levels above the MRL. All of these were organophosphates and harvesting fruit and vegetables within the withholding period was the major contributor to residues levels above the MRL.

Recognising that the MRL is not a health or safety level but represents a level consistent with good agricultural practice and that huge safety factors are involved, this latest survey shows excellent results because it targeted in on what was most likely to be the most contaminated fruits and vegetables.

I now what to briefly hone in on the monitoring of meat and meat products for residues of pesticide, antibiotics and other veterinary chemicals.

This monitoring program is a good example of the co-operative arrangements between Commonwealth, State and local governments. Surveys carried out under the National Residue Survey co-ordinated by the Department of Primary Industries and Energy. Samples are taken by officers of the Health Department and local authorities for a range of different meats, offal and other materials and are taken from both export and domestic abattoirs on a random basis. The type of meat selected is proportion to the throughput of the species through that works.

Just to give you a ball park figure of the number of analyses that adds up to Australia wide - for the most highly sampled product beef-fat - there were about 10,000 samples taken in 1989 and 7,000 in 1991. In that same year 1991 nearly 2,000 samples of beef kidney were analysed for antimicrobials and over 15,000 samples tested for zeranol and stillbenes.

The meat species sampled are predominantly beef ovine and porcine but others include horse, rabbit, poultry, deer, goat and kangaroo.

The results show that Australian meat products are indeed clean. Take for example the 1925 samples of beef kidney tested for antimicrobials in 1991 which only one was found to contain a trace of antimicrobials. Possibly the worst product sampled was pork liver were 933 samples tested for sulphonamides only 26 were positive and that represents about 2.8%.

Perhaps the most convincing data on the safety of our meat supply is that on pesticide residues. The sampling strategy in this area is:

1. to determine stock or properties contaminated
2. to concentrate resources on those properties or stock known to be contaminated
3. not to test stock demonstrated to be free of pesticide residues.

Our data shows that even when we have zeroed on the potentially most contaminated properties and resampling of those properties or stock is included in those statistics the number of samples in excess of the MRL is infinitesimal.

III. HEAVY METALS

The heavy metals of greatest concern in the Australian food supply are mercury, lead and cadmium.

Mercury is of concern in certain species of shark and in those fish species at the top end of the food chain such as marlin etc. Monitoring of mercury in fish over a long period has enabled health authorities to predict with accuracy the range of mercury expected in any species. Restrictions on size of large species enables marketing of those species without undue concern.

However there have been areas of real public health concern where contamination of waterways have occurred. For example in Princess Royal Harbour in Albany, effluent from the superphosphate works led to mercury levels in fish, crustacea and molluscs approximately 100 times the normal levels for those species. Because this was a valuable fish nursery area, the harbour was closed to the taking of all fish crustacea and molluscs for eight years before the mercury levels were below the maximum permitted concentration. There is an important lesson to be learnt there in effluent control standards.

There is room for improvement in relation to contamination with lead in foods marketed in Australia.

The 1990 Australian Market Basket Survey data showed that higher lead levels in canned foods were associated with lead soldered cans and the acidity of those foods. In particular beetroot, tomatoes, pineapples, peaches and pears had high levels. This survey estimated that 9% of the total adult dietary lead intake was from canned pineapple.

Following that survey a comprehensive survey of Lead in Canned Foods has recently been carried out in Western Australia. Samples included a wide variety of foods such as fruits, vegetables, baby foods, meat, fish, pickles and gourmet foods. Our emphasis was placed on collecting as many lead soldered canned foods as possible. Of the lead soldered cans collected, 79% were imported. The results of this survey show that of the 184 samples analysed:-

- six samples exceeded the current maximum permitted concentration of lead in foods which is 2.5mg/kg - all these samples were in lead soldered cans - samples up to 9.4mg/kg were found
- a total of 14 samples exceeded 1.0mg/kg of lead
- the mean level of lead in food in soldered cans was almost nine times the mean level of lead in foods packaged in welded cans.

The current maximum permitted concentration of lead in canned foods is 2.5mg/kg whereas for infant foods the mean level for lead is 0.3mg/kg with no single sample unit to exceed 0.8mg/kg.

This survey showed that of all foods packaged in welded cans could comply with this requirement. It also shows that the current limits are far too high and could be significantly reduced without impacting on the Australian industry.

Lead ingestion represents a significant risk to infants and young children and because of the neuro toxicity of lead particularly in children it imperative to minimise contamination from all sources. Following this survey it has been recommended that the maximum permitted concentrations for lead in foods as specified in standard A12 of the Food Standards Code should be reviewed with a view of setting the lowest practical limits for lead in foods and the current limit for lead in infant foods is considered appropriate for all canned foods. Again it is clear that Australian industry can produce a good clean product and is using technology appropriate to the 1990s whereas some of our trading partners are not.

IV CADMIUM

Cadmium is a potentially toxic metal contaminant in food. It has no useful physiological function, it concentrates in the kidney and liver, and has a biological half life of approximately 20 to 30 years. There it is desirable to keep exposure levels as low as reasonably achievable. It enters the food chain from natural sources and from human activity. Uncultivated soils vary in their cadmium content which occur naturally as a minor component of many metals. Cadmium is often associated in nature with zinc.

Cadmium in unprocessed food arising from a number of possible sources, first natural contamination of the soil in which crops are grown, second, pollution from mining or industry adjacent to agricultural areas, third, the addition of phosphate base fertilisers concentrated organic fertilisers or sewerage sludge.

Our monitoring shows that cadmium levels are high in offal particularly kidney and liver, of older animals, in molluscs such as oysters from the Derwent River and in oysters in Shark Bay far removed from industrial sources we find extremely high levels of cadmium yet low levels of zinc.

But the 1990 Market Basket Surveys show that 56% of our dietary cadmium is consumed through potatoes. Whilst the maximum permitted concentration of cadmium in potatoes is 0.05mg/kg and the limit for cadmium in kidney is 2.5mg/kg some fifty times greater, it is the humble potato that contributes significantly to the potential daily intake. Recent surveys of cadmium in potatoes in Western Australian show that the average level of cadmium in Western Australian potatoes is 0.03mg/kg which is below the maximum permitted concentration as specified in the Australian Food Standards Code. However, 16.6% did not comply with the current limit.

It is relevant to note that Australia is one of the few countries which sets limits on cadmium in foods and monitors for compliance of these limits.

V. NATURAL TOXICANTS

There are a range of natural contaminants in food which do pose significant health risks. For example aflatoxins are potent liver carcinogens.

Apart from the aflatoxin in peanut saga in 1979-80 when very high levels of aflatoxins were found in the Australian product, levels of aflatoxins in Australian foods are very low, in fact usually not detectable.

Similarly in the case of the other mycotoxins such as patulin in apple juice, levels are very low. Patulin is a potential contaminant in apple juice and is an indicator of the use of stored damaged and mouldy apples. Western Australia is a major apple producer and in a recent survey no samples were found to contain significant levels of patulin.

The Market Basket Survey, National Residue Survey and State Programs show that mycotoxin contamination in Australian foods is not a problem whereas it is a major public health issue in some of our close neighbours.

The natural toxicants in food can present problems such as hydrocyanic acid in apricot kernels and solanine in green potatoes. This year we found apricot kernels on sale in the Perth Metropolitan Area with hydrocyanic levels three hundred times the limit for HCN fruit kernels. These levels were significant enough to kill a child and seriously poison an adult.

So from the above you may feel somewhat confident that the statements of Mr Crean that our foods are clean and green are justified and if time permitted we could demonstrate the lack of contamination of our foods with PCBs, dioxins etc.

VI. MICROBIOLOGICAL CONTAMINANTS

But there is in fact no room for complacency because there is still significant micro-biological contamination of our food supply. In fact food hygiene, inadequate attention to food safety, lack of knowledge on food micro-biology by persons working in the food industry and in the community account for the majority of our food poisoning cases in Western Australia and in other jurisdictions.

The following table gives you an indication of the problem. It shows the clinical food poisoning cases for the 1991-1992 year in WA in which there were 718 cases of salmonella reported, 1440 of campylobacter and 10 of listeria. These only scratch the surface because they only deal with the notifiable diseases and they only represent those cases reported to the State Health Laboratory Services.

We do know that the number of salmonella cases is largely concentrated in the north west of WA but the notified cases of campylobacter are throughout the state. *Campylobacter* is not only transmitted through foods but it is present in most meats and there is a 90% carrier rate in poultry.

Listeria is another contaminant in our food supply of particular relevance to pregnant women and the immuno compromised. We know it can be present in smallgoods, soft cheeses, cooked diced chicken, pat*, salads and health authorities throughout Australia have

intensified their food monitoring programs accordingly to minimise listeria contamination in our food supply.

The direct and indirect costs to the Australian community are not directly available but recognising that many food poisoning causes are not reported we have a great deal of work to do in terms of improving food safety in our industry and in the community.

VII. REAL AND PERCEIVED RISKS

Unfortunately many consumers perceiving the risks of our Australian food supply as follows:-

- food irradiation
- food additives
- pesticide residues
- environmental contaminants
- natural toxicants
- unbalanced diet
- microbiological contamination.

Whereas the data shows that the risks are in the reverse order.

This paper has only provided a pin prick of the whole picture of the safety of the Australian food supply but it does illustrate that contamination of Australian foods is minimal, it is clean and green - but there is room for some improvements in the microbiological quality of some of our foods.