THE DOSE MAKES THE POISON?

Friends of the Earth

TOP 20 AUSTRALIAN FOODS WITH MOST PESTICIDE DETECTIONS 2000 - 2011

APPLES	15.2%	**CANOLA**	1.1%
WHEAT	13.2%	**FLOUR**	1.1%
STRAWBERRIES	10%	**CARROTS**	0.8%
PEARS	9.5%	**PLUMS**	0.8%
GRAPES	6.4%	**GREEN BEANS**	0.8%
LETTUCE	4.1%	**OTHER**	20%
NECTARINE	3.7%		
PEACHES	2.3%		
BREAD	2.1%		
BRAN	1.8%		
BISCUITS	1.6%		
TEA (IMPORTED)	1.6%		
BARLEY	1.4%		
TOMATOES	1.3%		
APRICOTS	1.2%		

DUE TO THE FACT THAT TESTING FOR PESTICIDE RESIDUES IS CARRIED OUT "SPORADICALLY ", AND NOT ACROSS A FULL RANGE OF FOOD GROUPS, THIS LIST SHOULD BE SEEN AS AN APPROXIMATION ONLY.

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Friends of the Earth (FoE) Melbourne has long lobbied for organic food and pesticide free farming practices. Thirty years ago FoE established one of the first organic Food Co-ops in Melbourne. However, in recent years it has become difficult for FoE to provide up to date information about the risks of eating non-organic food to shoppers in the Co-op and residents in the City of Yarra, as FoE simply did not have the resources to conduct this important research.

This situation changed in late 2011, when FoE obtained a grant from the City of Yarra to produce an organic food guide, which outlined the main food groups most likely to contain pesticide residues and the latest scientifically based research regarding the dangers of pesticide exposure.

FoE began this project to update its understanding regarding the potential impacts of pesticide residues on non-organic fruit and vegetables consumed in Australia. FoE assessed various publicly available pesticide residue reports produced by various Australian government agencies over the past decade and also assessed the findings of a number of scientific reports that have been released over the past 2-3 years regarding the impacts of pesticides on human health.

1. FINDINGS

According to scientists, pesticides regularly detected on Australian Food have been linked to possible problems with human endocrine function, ADHD (Attention Deficit Hyperactivity Disorder), learning and behavioural problems, lower IQ and possible increases in Lymphoblastic Leukemia in children. Longer term exposure to pesticides have also been linked with development of Parkinsons Disease.

Of particular concern is the possible impact of pesticides on the development of the human foetus, cancer, hypothyroidism and autism.

Of the 125 types of pesticides detected on Australian fruit and vegetable surveyed, 45% are suspected endocrine disruptors, with 62% of all detections related to suspected endocrine disrupting pesticides. A number of health issues can be related to endocrine disruption.

Testing of food for pesticide residues in Australia is haphazard and not properly co-ordinated between states and federal government authorities.

Current testing does not extend to all pesticides sprayed on food and for all food types across all market types.

Current pesticide regulation does not properly take into account impacts on the endocrine system, immunotoxicity and the synergistic impact of a cocktail of pesticides that people may be exposed to, nor does it properly take into account chronic exposure of pesticides over an extended period of time.

Current pesticide regulation has not yet evolved to keep up with recent scientfic research that reveals pesticides can have significant impact at very low doses, well below the levels currently regarded as being safe. The 'dose makes the poison philosophy' needs to be overhauled to include the full impacts of pesticides and chemicals that can, for example, impact on endocrine function.

In 2009, The American Medical Association and The Endocrine Society both called for new policies to decrease public exposure to endocrine disrupting chemicals. Such calls have not occurred in Australia.

Food imported from India and China is of concern. The insecticide Chlorpyrifos and the sterilising gas Ethylene Chlorohydrin having been detected most frequently in food products from these countries.

The most 'at risk' foods in Australia due to pesticide exposure include: apples, wheat, strawberries, pears and grapes.

Also of concern is potential for pesticide residues in; lettuce, nectarines, peaches, bread, bran, biscuits, imported tea, barley, tomatoes, apricots, canola, flour, carrots, plums and green beans.

The most commonly detected pesticides on Australian food products are Organophosphorus insecticides (OP's), representing 28% of all detections. Most concerns are associated with residues of Chlorpyrifos, Chlorpyrifos methyl, Fenithrothion, Pirimiphos Methyl and Dimethoate. The most commonly detected pesticide is the fungicide Iprodione.

The insecticide Propargite could lead to potential health problems in children who eat large quantities of apples and quinces.

Insecticides accounted for 49.5% of all pesticide detections, followed by fungicides 32%, synergists 6% and herbicides 4%.

Recent scientific research highlights the following concerns;

More than one quarter of food eaten by young children in the United States contains pesticides, meaning that non-organic food is the main source of chemical exposure for these children.

Children up to the age of 7 may not be able to produce a detoxifying enzyme - Paraoxnase 1 - making them more susceptible to the risks of pesticide exposure, particularly from Organophosphates.

Exposure to Organochlorine pesticides may be linked to autism. 5.8% of all pesticide detections on Australian produce were Organochlorines.

Up to 200 chlorinated pesticides used in Australia may contain traces of dioxins, created as a by-product of the manufacturing process. Dioxins are some of the most toxic substances known and are currently not adequately tested for by Australian regulators.

Exposure to Organophosphate Pesticides by young children may reduce a child's IQ by 7 percentage points and lead to behavioural and learning problems including most significantly ADHD.

Pesticides interfering with hormones may lead to weight gains and development of Type 2 Diabetes.

Exposure to a number of pesticides is increasingly being associated with Parkinson's Disease.

Pesticides publicly regarded as being less dangerous, such as Roundup/Glyphosate, are increasingly being found to have serious environmental and health risks.

2. INTRODUCTION

It is impossible to categorically state what pesticide residues are being consumed in Australia

This guide is the result of Friends of the Earth (FoE) obtaining a grant from the City of Yarra's 2012 Community Grants Program. Friends of the Earth would like to thank City of Yarra for their generous assistance.

The concept behind this report has been on the 'backburner' for some time. Anthony Amis has been conducting research for FoE since the late 1990's and has been concerned about the impacts of pesticides, particularly in water supply catchments. Anthony has been involved with a number of environmental campaigns since 1988. He has been a member of the APVMA's (Australian Pesticides and Veterinary Medicines Authority) Community Consultative Committee since September 2009 and was a member of the Victorian Agricultural Chemicals Advisory Committee – Department of Primary Industries (DPI) between 2004 and 2009.

FoE Food Co-op has long recognised the need for research into pesticides in food, but hasn't had the resources to do so.

It was also clear from conversations with the Food Co-op that shoppers were requiring more up to date information about the risks associated with non-organic food.

This guide aims to provide such information in order to keep abreast of current pesticide issues. Most information was sourced from an email list compiled by Lourdes Salvador from MCS (Multiple Chemical Sensitivity) America. http://www.mcs-america.org/. Almost all of the articles compiled in the health section of this booklet were sourced from articles sent through the MCS email list 2009-2012.

Initially FoE wanted to assess only the most current produce information for the years 2010 and 2011, but soon found that this data existed only within the limited Australian Quarantine and Inspection Service (AQIS) Failing Food Reports. The methodology used in this FoE report was to analyse as many publicly available reports as possible pertaining to the monitoring of pesticide residues in food, undertaken by Federal and State Government agencies. These sources included Food Standards Australia New Zealand (FSANZ) National Residue Surveys 2008-2010, FSANZ Total Diet Surveys 2003 and 2011 and AQIS Failing Food Reports 2010-11. Victoria's Department of Primary Industries (DPI) Produce Monitoring Reports 2007/8 – 2008/9 - 2009/2010 were assessed as well as other state based monitoring programs such as Food Watch WA.

Choice Magazine also carried out testing on imported tea in 2003 and strawberries in 2003 and 2008 and this information was also included in the report. Positive detections were cumulated to compile the lists; 'Foods with the Most Pesticides Detected' and 'Snapshot of Commonly Detected Pesticides'. Pesticide safety data was compiled from the Pesticide Action Network (PAN) Pesticide Database http://www.pesticideinfo.org/Search_Chemicals.jsp .

This report does not purport to be a scientific analysis of the risks associated with eating non-organically grown food, but rather is a guide to help people who want to eat organic food make informed decisions. Testing for pesticide residues on food in Australia is haphazard and is done to detect only a limited number of pesticides. A small range of food items are tested whilst some foods are not tested at all. Therefore it is impossible to categorically state what pesticide residues are being consumed in Australia. It is regrettable that more rigorous food testing is not carried out in this country. Such complacency from governmental regulators is placing susceptible groups of people in the population at risk.

3. WHAT TO DO

Babies and children do not have the defensive enzymes at levels present in sexually mature adults ...When parents in the study fed their children an organic diet—organic foods are those grown without synthetic pesticides—for as little as one week, the levels of chlorpyrifos metabolites in their urine dropped more than four-fold to undetectable levels. This study demonstrated that an organic diet provides a dramatic and immediate protection against exposures to organophosphate pesticides commonly used in agricultural production.' (1)

Eating organically grown produce is the safest way to reduce exposure to pesticides. Organically produced food requires less chemical inputs than industrial agriculture and also uses less energy and water and adds far less waste to landfills. Organic food is reputed to contain more anti-oxidants, nutrients, minerals and vitamins. It does not contain pesticide residues which current scientific research reveals to be harmful at doses which government and industry groups consider to be safe.

The safest and cheapest option of all is to start a vegetable garden, and grow much of the produce that you eat yourself. Even the smallest available space can be utilised to grow your own food. You can also become involved in joining or starting a community garden project in your area. http://communitygarden.org.au/ However many people do not have the time, space or inclination to do this, hence the need to source organically grown produce.

The price of organically grown food is often more expensive than non-organic produce. Therefore, if you are running a tight budget, it would be beneficial to avoid purchasing the 'worst offending' food items in terms of pesticide residues, eg apples, strawberries, pears and stone fruit. It is also valuable to be aware that the foods most likely to contain pesticide residues are wheat products, fruit and vegetables.

If you are interested in limiting your exposure to pesticides, buying organic food is a sensible option.

You may want to buy your organic produce at markets where the costs can be cheaper. Shopping at farmers markets http://www.whitehat.com.au/victoria/markets/MarketsV.asp and wholesale food markets can also save you money. (see appendices for a list of organic food suppliers within the City of Yarra). Organic home delivery services are also a viable option.

If you are interested in limiting your exposure to pesticides, buying organic food is a sensible option. The main beneficiaries will be your children, particularly if they are younger than seven years old. There is little doubt that buying organic will reduce a persons total pesticide burden and that consumers wanting to buy organic food can safely eat organic produce. A Victorian Government Survey in 2003 showed that *"...100% of certified organic and biodynamic produce met national standards for acceptable levels of residues and heavy metals on produce. The results prove that organic and biodynamic produce is as clean as promised with more than 99% of [organic] tested produce showing no detectable contamination from chemical residues" (*2)

If you buy produce that is non-organic, washing the fruit/vegetables may not remove pesticides. Many pesticides used on food are designed to adhere to plants so that they don't wash off in rain. Other pesticides, such as organophosphate insecticides (the key problem pesticides in terms of this study) are also known as systemic pesticides, meaning that they penetrate through the food, often through the roots of the plant. *"Systemic insecticides are incorporated by treated plants. Insects ingest the insecticide while feeding on the plants."* (3)

Peeling fruit or vegetables can help remove residues that are on the surface, but will do little to lessen the impact of systemic pesticides. However, peeling of fruit and vegetables is often not a desirable option as many healthy nutrients can also be contained in the skin. It can also be helpful to remove the outer leaves of some vegetables such as lettuce and cabbage. Cooking may also breakdown some pesticide residues.

What's On My Food' http://www.whatsonmyfood.org/ is a US based website that provides a wealth of information on the types of pesticides detected on various foodtypes in the United States and is a useful tool in determining which food types contain pesticide residues.

The top 15 highest ranking foods based on pesticide residues found by USDA Pesticide Data Program (excluding pesticide detections In water) according to 'What's On My Food' are: celery 64, peaches 62, greens kale 55, strawberries 54, blueberries 52, lettuce 51, sweet bell pepper 49, spinach 48, greens

collard 46, green beans 44, apples 42, cherries 42, spinach frozen 42, summer squash 41, peaches single serve 40. A full list of foods on this website can also be found in the appendices of this booklet.

In November 2011, FSANZ (Food Standards Australia New Zealand) published the 23rd Total Diet Survey providing useful information concerning which pesticides are of more risk than others in regards to Acceptable Daily Intakes (see section on ADI's).

We would suggest that consumers avoid non-organically grown apples and quinces, particularly for young children. Propargite, an insecticide, has recently [Nov 11] been found to be the highest dietary exposure to an agricultural pesticide in Australia. Dietary exposures to propargite ranged from 20% of the ADI for people aged 17 years and above, up to 60% of the ADI for 2-5 year old children.

... the highest reported propargite concentration was apples, with a mean concentration of 0.12mg/kg. The major food group contributor to propargite exposure across all age groups was apples and quinces, accounting for greater than 90% of the estimated dietary exposure. (4)

According to the 23rd Total Diet Survey published by FSANZ in November 2011, children between the ages of 2-7 have greater exposure to pesticides than other age groups in regards to the Acceptable Daily Intake to the following pesticides; Chlorpyrifos, Dieldrin, Diphenylamine, Iprodione and Propargite. In light of this information when purchasing products for children between the ages of 2-7, avoid purchasing the following non-organically grown food. apples, breakfast cereal, broccoli, cabbage, cauliflower, celery, cucumber, dried apricots, grapes, nectarines, oranges, peach juice, pumpkin, strawberries, and yoghurt containing fruit.

Consumers above the age of 17 should also avoid non organically grown capsicums, chillies and spices. "The only food group contributor to methamidophos exposure for all age groups was capsicum, chillies and spices". (4)

Consumers above the age of 17 should also avoid non organically grown capsicums, chillies and spices

4. WHAT IS A PESTICIDE?

The Food and Agriculture Organisation define a pesticide as: *"any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit. Also used as substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport." (6)*

Subclasses of pesticides include: herbicides, insecticides, fungicides, rodenticides, pediculicides and biocides.

MODERN AGRICULTURE

Modern agricultural systems are based on obtaining the highest yield as possible and at the same time obtaining the highest economic benefit. The pillars holding up this system include, intensive tillage, monoculture, application of usually inorganic fertilisers, irrigation, chemical pest control, and genetic manipulation.

"About 300 different pesticides are registered in Australia for use on fruit and vegetable crops. Some are applied on crops when they're growing; others are used to protect produce after its harvested." (7)

Chemical pest control is usually used to reduce 'pest' competition on the crop in question. Pests can include insects that may eat the crop, weeds that may lessen crop growth and compete for nutrients, and diseases which may slow down crop growth or lead to death of a crop. The chemicals can be applied by farmers themselves, workers or contracted sprayers. Pesticides are applied with the use of ground based spray systems or can be aerially applied.

OFFSITE IMPACTS/SPRAY DRIFT

Aerial spraying can lead to higher incidents concerning spray drift which are of concern to residents in regions where agricultural activities are more commonplace. Spray drift can also occur with ground based operations or in urban areas where spraying may occur on recreational grounds such as golf courses. Monitoring for spray drift is usually non-existent in most parts of Australia and is a legal can of worms if you are a victim of spray drift. Civil action is the only option in most cases and Agricultural Legislation usually protects the interests of property and not human health.

Pesticides can also impact on species which the pesticide has not been intended for. For instance in January 2012 it was revealed that the pesticide imidacloprid makes bees more vulnerable to infections from the deadly parasite, nosema. *"Researchers found that bees deliberately exposed to minute amounts of the pesticide were, on average, three times as likely to become infected when exposed to a parasite called nosema as those that had not. The findings, which have taken more than three years to be published, add weight to concern that a new group of insecticides called neonicotinoids are behind a worldwide decline in honey bees, along with habitat and food loss, by making them more susceptible to disease."* (115)

OFFSITE POLLUTION

Spray drift is not the only way that pesticides can cause problems away from their intended place of use. Water pollution can also occur, particularly if pesticides are applied before heavy rain or in sensitive waterway environments. In January 2011, scientists published information that the Upper Yarra River catchment, above the offtake to one of Melbourne's reservoirs, had traces of over 40 pesticides in it. Some of the pesticides had not been used in the catchment for 20 or more years. [99] Sampling for pesticides in drinking water across Australia is haphazard, with water authorities testing for only a fraction of the substances which could be used within their water supplies. This is of particular concern to many smaller rural communities. Pesticides running offsite into waterways can also affect the ecological health of the receiving streams and a number of pesticides are now suspected as being endocrine disruptors leading to the feminisation of wildlife through hormone interference.

5. REGULATORY ENVIRONMENT OF PESTICIDES

The Australian pesticide regulatory system uses both a Federal and State based approach. The Federal regulator, The Australian Pesticides and Veterinary Medicines Authority (APVMA), exists within the Ministry for Agriculture, Fisheries and Forestry. The APVMA carries out assessments and registration of pesticide products and is responsible for pesticides up to the point of sale. Companies wanting to register a pesticide product for use in Australia must have it approved by the APVMA. The states have responsibility for control of use of pesticides. (also see section of Testing of Food/MRL's). The APVMA website can be found here: http://www.apvma.gov.au/ .

The responsibility for monitoring pesticide residues in food is shared between the states and the federal government, however the types and quantities of foods and pesticides tested is not indicative of the variety of foods available to the public.

In 2006 Choice Magazine summarised the issue and little has changed since then.

"...Testing for pesticide residues is mostly left to the states. Regular testing is beyond the resources of the smaller states and territories and most of the testing that's done by the larger states is on local produce only. Imported fruit and vegies mostly escape the net altogether.

The ACT and Tasmania do no testing at all. The NSW Department of Primary Industry has a new testing program with funding for five years, but it looks only at local produce. There's no regular testing of produce at the point of entry or from retail outlets, so imported produce isn't tested. The NT Department of Primary Industry tests locally grown produce. The Queensland Department of Primary Industry regularly tests samples from suppliers (and occasionally farmer's markets), but does no testing of produce from retail outlets. SA tested locally produced fruit and vegetables in 2003 but isn't currently doing any testing at all. Victoria regularly tests locally produced fruit and vegetables but doesn't take samples from retail outlets. The WA Department of Health has an ongoing testing program and does surveys of fruit and vegetables every two to five years. The current survey is sampling from retail outlets, including the big supermarket chains...Our national regulator, Food Standards Australia New Zealand (FSANZ), has checked foods for pesticide residues in the past as part of the National Residue Survey, but the program is aimed at foods for export and the only fruit and vegetables tested are locally produced apples, pears, blueberries and onions that are for both local and export consumption." (7)

In terms of the Federal Government's responsibilities to Food Testing;

"The Commonwealth Government, through the Department of Agriculture, Fisheries and Forestry—Australia, conducts two further programs that collect information on the levels of pesticide residues, contaminants and other substances in foods:

- *the National Residue Survey;*

- *the Imported Food Program, conducted by the Australian Quarantine and Inspection Service (AQIS), which undertakes the surveillance of imported foods to ensure that they comply with the Imported Food Control Act 1992 and the Food Standards Code.*

The main aim of these programs is to monitor pesticide residues, contaminants and other substances in food commodities in export and import trade respectively. In contrast, the Australian Total Diet Survey aims to estimate the level of dietary exposure to pesticide residues, contaminants and other substances in the overall Australian diet, including both locally produced and imported foods which are prepared to 'table ready' form.

In addition to these programs, State and Territory health and agriculture authorities carry out surveys of specific contaminants, pesticide residues or other substances. These surveys usually investigate specific concerns and determine whether primary producers are complying with the law. They are a valuable source of supplementary information on the contaminant, pesticide residue and other substance status of foods." (8)

6. THE DOSE MAKES THE POISON?

"All substances are poisons; there is none which is not a poison. The right dose differentiates a poison...." Paracelsus (1493-1541).

This quotation essentially defines how our society deals with the issue of toxicants. The quote means that the body will experience a harmful event only when one is exposed to a high enough dose of a particular substance. The toxic effect of a substance will increase depending on the amount that one is exposed to. For example caffeine or alcohol consumed in high enough quantities will kill a person, yet millions of people drink varying amounts of caffeine or alcohol 'safely' every day.

On a dose response curve, chemicals typically reveal a graded effect between no effect and a toxic effect. The theory states that even a highly toxic substance will not cause an unhealthy response if the exposure level is small enough and a practically non toxic substance can cause an unhealthy response if a person is exposed to enough of it. The potency of a chemical is therefore determined by the dose that one is exposed to.

Public Health Authorities use the Paracelsus philosophy as the basis of their various health standards which specify how much of a particular substance is safe in food, water and the environment. To do this, a substance must first be tested, usually by a pesticide registration applicant, for its short term, or acute toxicity. This is done with toxicity (dose response) experiments, where the amount of physically impaired, sick or dead laboratory organisms (usually mice, rats, rabbits and dogs) are counted after they are exposed to differing concentrations of a particular substance.

A dose refers to the organism's exposure via inhaling, eating and absorption through the skin. It can include a single dose, or doses which resemble the effects of a lifetime exposure. Response refers to the changes to animals as a result of the exposure. Normally as the dose increases, the amount of death or health impairment in the test animals will also increase. Threshold concentrations are then set which then take into account acute toxicity and also a search for evidence of long term effects of exposure to low level doses either in humans or animals. A safety factor of between 10 and 1000 is then applied based on the degree of confidence of existing information that provides an accurate estimate of the effect of the substance on human health. From this process, regulators determine an Acceptable Daily Intake.(ADI) which is effectively the health standard.

"Assessment of individual toxicity studies includes the determination of a no-observable-effect level (NOEL), which is the highest administered dose which does not cause any detectable (usually adverse) effect in the study. The overall NOEL for a chemical, determined in the most sensitive species, is then used to estimate the acceptable daily intake. The acceptable daily intake (ADI) for humans is considered to be a level of intake of a chemical that can be ingested daily over an entire lifetime without any appreciable risk to health. It is calculated by dividing the overall NOEL from the animal studies by a safety factor. The magnitude of the safety factor is selected to account for uncertainties in extrapolation of animal data to humans, variation between humans, the completeness of the toxicological data base and the nature of the potential adverse effects." (9)

For sometime in Australia there has been scientific controversy regarding the inappropriate use of NOEL's in toxicity studies. In late 2011 this issue was again raised in a scientific journal. (110)

The theory "The Dose Makes the Poison" does not properly define modern toxicology. Firstly it assumes that people react in the same way to chemical exposure and that tests carried out in animals also cross over to humans. It also does not factor in sensitivities at different life ages (eg young children and foetuses react differently to chemicals than adults do), nor does it factor in issues concerning disease sensitivities of people suffering diseases such as Multiple Chemical Sensitivity.

Tests on laboratory animals to determine effects do not adequately measure chronic (long term) toxicity, or the effects of average chemical exposure per day over many years, nor do they factor in the synergistic impact of a cocktail of pesticides that a person may be exposed to, as tests are carried out on individual chemicals only. It also does not properly take into account the impacts on endocrine disruption or the toxicity of substances on the immune system.

Synergism can lead to additive effects where the overall impact of the chemicals can vastly outweigh the effects of the single chemicals. Synergism has been known since 1975, yet pesticides continue to be assessed as individual substances. Synergism therefore could be described as the sum is greater than the parts.

Scientists have also recently found that some chemicals react differently at low doses than they do at high doses. The lower doses can cause more problematic effects than the same chemical at a higher dose. This is of particular concern in regards to chemicals that mimic hormones. These chemicals, also known as endocrine disruptors, can disrupt crucial life functions particularly in young children and foetuses. Hormones regulate body functions such as digestion, growth and sexual function, so any disruption of proper hormonal function can create health problems. The body uses very low dose effects for hormones to carry out their normal functions. It has been argued in terms of endocrine disruption that "no dose is low enough".

With 'dose makes the poison' thinking dominating toxicology, traditional toxicologists didn't pursue the possibility that there might be effects at levels far beneath those used in standard experiments. No health standards incorporated the possibility. Over the past 15 years, however, as scientists began to explore the impacts of endocrine disrupting compounds - compounds that behave like hormones or interfere with hormone actions - many examples of non-monotonic dose response began to be published in scientific journals. (98)

A list of endocrine disrupting chemicals (including pesticides) can be found at this link. http://www.ourstolenfuture.org/basics/chemlist.htm . Most worrying is that many of the endocrine disrupting substances on this list are commonly detected on food in Australia including some of the most commonly detected pesticides including; Iprodione, Procymidone, Fenithrothion, Endosulfan, Permethrin, Pyrimethanil, Dicofol, Carbaryl, Cypermethrin, Fenvalerate, Vinclozolin, Fipronil, Dieldrin, Malathion are all regarded as suspected Endocrine Disruptors by the Pesticide Action Network.

The relatively recent discovery of non-monotonic response curves, where the shape of the dose response curve can reverse as the contamination level goes up and the true impact of endocrine disrupting pesticides has led scientists to call for an overhaul regarding how toxicological assessment for a range of chemicals is currently carried out. This paradigm shift is already occurring, however regulators may take longer to adopt these changes. (see the section Pesticides and Health – Endocrine Disruption).

"We recommend that procedures to establish acceptable exposure levels for endocrine-disrupting compounds incorporate the inability for high-dose tests to predict low-dose results. Setting acceptable levels of exposure must include testing for health consequences at prevalent levels of human exposure, not extrapolations from the effects observed in high-dose experiments. Scientists trained in endocrinology must be engaged systematically in standard setting for endocrine-disrupting compounds." (10)

In the United States there is pressure building to alter the current assessment of chemicals, which emphasises toxicity, whilst not thoroughly taking into account more subtle issues, such as endocrine disruption.

"Groups representing 40,000 researchers and clinicians are urging federal agencies responsible for the safety of chemicals to examine the subtle impact a chemical might have on the human body rather than simply ask whether it is toxic. In an open letter to the Food and Drug Administration and the Environmental Protection Agency to be published Friday in the journal, Science, the scientists say the regulatory agencies need to tap into genetics, developmental biology, endocrinology and other disciplines when they analyze the safety of chemicals used in everyday products. "Although chemical testing and risk assessment have long been the domain of toxicologists, it is clear that the development of improved testing guidelines and better methods of assessing risks posed by common chemicals to which all Americans are exposed requires the expertise of a broad range of scientific and clinical disciplines," said the letter, which was signed by eight scientific societies. (11)

"We need to move beyond attacking one chemical at a time through specific legislation," vom Saal says. "We're trying to move so that the process of assessing risk of all chemicals is changed because there are a hundred thousand chemicals in commerce....That's just not going to work."We need a regulatory system that is set up to accurately assess risk associated with chemicals and a regulatory system that works for the public and not for the few corporations that manufacture the chemicals."Vom Saal says regulatory structures in many countries incorporate a "revolving door," which brings people in and out along with influence from the industry. When members of the FDA assess chemical risks in this country, they usually rely entirely on studies delivered by the chemical industry itself." (117)

7.MRL'S

In Australia, the Federal Pesticide Regulator, the APVMA, determines the level of pesticide residues likely to remain on a plant at time of harvest. The APVMA recommend Maximum Residue Limits (MRL's) which are advised to FSANZ (Food Standards Australia New Zealand) who consider the MRL's under their legislation and publish them in the Food Standards Code. http://www.foodstandards.gov.au/foodstandards/foodstandardscode.cfm

The MRL sets the legal levels for residues in food. It can also be referred to as the tolerance level. *"The MRL is the maximum residue which should result in a food item when the pesticide is used according to good agricultural practices". (12)*

Pesticide residues vary with the type of pesticide and the type of food. They also rely on the amount of time that a particular pesticide takes to break down. Any residues that do occur should not breach the MRL.

The MRL concentration is expressed in milligrams of residue per kilogram of food (mg/kg) or parts per million, (ppm) (which is numerically the same). For example, the MRL for the pyrethroid insecticide fenvalerate in celery, is 2 mg/kg. (to visualise one part per million, think of one minute in two years).

MRL's are not health standards but are a reflection of the legal use of a pesticide. MRL's are also set with an estimation of daily intake of a pesticide over a lifetime.

"In setting an MRL, a conservative estimation of daily intake of the chemical residue in all over a lifetime is made, which assumes that all foods will contain residue at the MRL if the acceptable daily intake (ADI) were exceeded in the estimation of daily intake, the product would not be registered. The safety of eating foods containing residues is determined at registration, where dietary intake estimations are carried out. The estimate assumes the worst case, that all crops/animals that could be treated with the chemical are treated and contain residues at the MRL. A chemical product would not be registered by the APVMA if the estimated intake were likely to exceed the health standard, the Acceptable Daily Intake (ADI)". (13) According to the APVMA*: "Dietary intake estimates assume a worst-case, all-of-life consumption of foods with residues occurring at the MRL level. Consuming a food with residues above the MRL should not be a health hazard, because it is not an all-of-life exposure but a single event. It should also be remembered that most of our food does not contain any detectable residues." (13)*

The ADI list for different food items can be found at the following website: http://www.health.gov.au/internet/main/publishing.nsf/content/E8F4D2F95D616584CA2573D700770C2A/$File/ADI-sept11.pdf

With these methodologies in place, Australian Government Authorities are confident that non-organic food consumed in Australia is safe. But amongst many people, concern about pesticide exposure continues, particularly in relation to long term (chronic) exposure and this can be seen in the increasing demand for organic food and organic farming being placed in the top two growth industries in Australia. (111)

Given the estimated dietary exposures for all 46 agricultural and veterinary chemicals were below respective ADIs at the 90th percentile, there are no public health and safety issues associated with current dietary exposures to agricultural and veterinary chemical residues in food for the Australian population. This finding is consistent with the results of the 19th and 20th ATDS (FSANZ, 2001; FSANZ, 2003)". (14)

"When officials assess pesticides, they follow specific paths of enquiry. Great reliance is placed on the results of animal tests. Epidemiological studies are also considered, but are given less weight due to uncertainties about dose and exposure. Clinical studies and community experience of exposure are rarely considered, since Australia has no system to facilitate post-exposure surveillance. This latter deficiency is one the system's greatest shortcomings". (12)

8.EXPOSURE & CONTAMINANTS

Exposure to pesticides can occur both acutely and chronically. Measurement for pesticide toxicity is measured by the LD50 (LD refers to Lethal Dose). The LD50 is the dose required to kill half of a healthy population of test animals. The lower the LD50, the more toxic the chemical is. LD's can be calculated by the amount of the substance that is swallowed or the amount of chemical that is absorbed on the skin. Depending on the dose and potency of a pesticide that a person is exposed to, this will determine how quickly the person will show signs of symptoms such as *"salivation, tear formation, sweating, urination, vomiting, muscle weakness, muscle fatigue, twitching, cramps, breathlessness and respiratory paralysis, as well as tension, anxiety, restlessness, insomnia, headache, slurred speech, tremor, convulsions, coma, death". (12)* Symptoms can occur quickly or can take slightly longer to occur. Effects of acute pesticide exposure can generally be measured scientifically.

However, chronic exposure is much more difficult to quantify. The effects of chronic exposure may not take place for months or years after exposure and can be caused by small exposures over a long period of time – or a lifetime. Chronic exposure lies mostly outside the realm of modern toxicology because the effects of chroncially acting pesticides may have impacts at levels lower than the threshold dose, *"or the level below which no harmful effect is possible"*. In relation to pesticides on food, it could be said that regulators are better set up to deal with the acute exposure risk rather than the chronic long term risk of eating small amounts of pesticide residues.

Regulatory agencies do not always take into account all the risks associated with impurities of pesticides which can be a result of the manufacturing process, or from additives used on pesticides such as spray adjuvants, surfactants, anti-foaming agents, wetting agents, emulsifers, stickers and spreaders. *"In the aggregate, registered pesticides contain nearly 900 active ingredients, many of which are toxic. Many of the inert ingredients in pesticides also are toxic, but are not required to be tested for causing chronic diseases such as cancer. For example, xylene is used as the inert ingredient in almost 900 pesticides and has been associated with increased risk of brain umors, rectal cancer, and leukemia." [104] "Some of these chemicals are used in several different pesticides; for example, chromium trioxide, an IARC Class 1 carcinogen (carcinogenic to humans), is used in 14 different pesticide products from five different companies." [104]*

In 2009 Australian researchers found that over 20 chlorinated pesticides, most of which were registered for use in Australia, contained impurities of the dioxins PCDD/F – one of the most toxic substances known. The dioxins were formed as a by-product of the pesticide manufacturing process. Some pesticides containing impurities included pesticides commonly used on food, most notably Chlorpyrifos and Chlorothalonil. [102] The Federal Regulator, the APVMA ran their own tests and suspended all registrations and approvals for one of the the pesticides, Quintozene in April 2010.

However it remains unclear about how the regulator deals with the possibility of dioxins in relation to MRL's in food.

"Australia has no regulatory limits for PCDD/F levels in current use pesticides and no regulatory monitoring and reporting is undertaken." [102] This issue may only be the tip of the iceberg as "researchers estimate approximately 200 pesticides have the potential to contain dioxins". [103] "The pesticides are used on crops including cotton, potatoes, lettuce, tomatoes, beans and peanuts, as well as in parks and recreation areas, at turf farms and plant nurseries." [103]

9. IMPORTED FOOD

In 2009-10 Australia imported $10.1 billion in food products. Fruit and vegetables contributed about 14% of our total food imports. The country Australia imports most of its food from is New Zealand, followed by the United States, Vietnam Thailand and China. (15) (FoE has recently been made aware that some foods originating in Asia, may be shipped into Australia via New Zealand, thereby getting around stricter quarantine regulations).

Approximately 5% of imported food products are tested for pesticides residues by the Australian Quarantine and Information Service (AQIS). Each month AQIS publishes Failing Food Monthly Reports which are defined under the Import Food Control Act 1992. (16) Reasons for failing, can include chemical, composition, microbiological and contaminant. Chemical failures are defined under Australian New Zealand Food Standards Code 1.4.2. Maximum Residue Limits (Australian Only). (17)

AQIS responsibilities lie with the implementation of quarantine concerns (Quarantine Act 1908) and Imported Food Control Act 1992 which provides for inspection and control of food using a risk based border inspection program. The states also have some responsibility with food imports and can work closely with AQIS and FSANZ. FSANZ also monitor food safety incidents worldwide and provide advice to AQIS and also state regulators.

AQIS carry out surveillance on 5% of foods. Food that fails inspection will then be inspected at a rate of 100% of consignments until a history of compliance is demonstrated. Foods deemed to be at risk are tested at 100%.

In 2003 Choice Magazine tested imported teas coming into Australia and *"found residues in 21 samples – seven out of 17 green teas, eight out of 20 black teas and six out of 18 herbal infusionsn ... Seven of the brands contained one pesticide (cypermethrin) above the maximum residue limit for tea, with three products (the Formosan green and black teas and Red Seal Green Tea) having more than 20 times the MRL. Twelve products contained other pesticides for which there are MRLs for tea in the Food Standards Code (these include ethion, fenitrothion, endosulfan and dicofol), but all were below the MRL".* (18) All organic brands were found to be free of residues.

Imported food from China is certainly of concern with reports from that country showing an increase in pesticide use over the past few years. *"It seems incredible that farmers would shun the vegetables they send to the cities. But that is the case in Xundian where 100 hectares of greenhouses provide vegetables for Kunming, about 50 kilometers away. Farmers next door will not eat them due to health concerns ...Use of pesticides grew nationwide from about 700,000 tons in 1990 to 1.7 million tons (about 30 kg a hectare) in 2008, said Jiang Gaoming, an Institute of Botany researcher at the Chinese Academy of Sciences. Average use of pesticides per hectare in China is three to five times higher than in most other countries ... And nearly 90 million hectares of crops are polluted every year ... According to the most recent statistics available from the Ministry of Health, more than 17,000 pesticide poisoning cases in rural areas were reported in 2000, and more than 1,000 people died. About a quarter of the poisoning cases happened during farmwork..." (19)*

Imported food products from India may also be of concern as India has increased its use of pesticides with worrying effects on the local population.

The Kerala government has decided to detoxify Kasaragod district which has been bearing the brunt of indiscriminate spraying of the highly toxic endosulfan in cashew plantations for the last two decades..."(20)

"Excessive use of pesticides on farmlands in two villages of Dhamrai upazila caused death of at least three children last month. It also killed a number of calves, dogs and fowls. Besides, 13 more children, all aged below seven, were hospitalised, while some farmers fell sick during the same period...During investigation, the IEDCR committee gathered that the farmers in the villages used furadan or carbofuran (recently banned in Kenya for being used in killing lions and other predators) on paddy fields. Besides, some villagers were using organophosphate insecticides like cypermethrin, malathion and chlorpyrifos many times the recommended dose. Local Agricultural Officer Khairul Alam said the farmers in Malancha and Naogakaith spray pesticides in amounts way more than what is safe...Asked why the children are more prone to pesticide poisoning, he said, "It's their weaker resistance to pesticides." (21)

TOP TEN IMPORTED FOODS BREACHING MRL

***PEANUT PRODUCTS** (CHINA)	16%
BLACK PEPPER	8%
OLIVE OIL	7%
SPICE MIXES	7%
PASSIONFRUIT JUICE	5%
HOT PEPPERS	4%
PEPPER LEAVES	4%
CURRY PRODUCTS	4%
RICE	4%
CHILLI PRODUCTS	4%
OTHER	37%

*** MOST OF THE PEANUT PRODUCTS BREACHING MRL WERE FOR PEANUT BUTTER IMPORTED IN THE LAST 6 MONTHS OF 2011**

TOP TEN COUNTRIES BREACHING CHEMICAL MRL 2010-11

INDIA	26%
CHINA	22%
THAILAND	9%
ITALY	8%
KOREA	7%
USA	5%
TURKEY	5%
EGYPT	4%
MEXICO	3%
OTHER	13%

MOST DETECTED PESTICIDES* ON IMPORTED FOOD BREACHING MRL 2010-2011

CHLORPYRIFOS	40%
ETHYLENE CHLOROHYDRIN*	29%
CAPTAN	5%
ENDOSULFAN	5%
DIFENOCONAZOL	4%
OXYFLUORFEN	4%
PROCYMIDONE	3%
MALATHION	2%
OTHER	8%

*** ETHYLENE CHLOROHYDRIN IS A STERILISING GAS, NOT A PESTICIDE**

10. FOODS WITH MOST PESTICIDE DETECTIONS

In the United States chemical residues are tested by the Department of Agriculture and the US Food and Drug Administration and published in thousands of pesticide reports. These reports are analysed by the Environmental Working Group who publicly release a list called the dirty dozen. Such detailed reports are not published in Australia, but nevertheless do provide a useful guide in terms of other at risk foods which consumers in Australia may also avoid.

The Dirty Dozen for 2010 (see website: http://green.yahoo.com/blog/daily_green_news/332/the-new-dirty-dozen-12-foods-to-eat-organic-and-avoid-pesticide-residue.html): *"1. celery, 2. peaches, 3. strawberries, 4. apples, 5. domestic blueberries, 6. nectarines, 7. sweet bell peppers, 8. spinach, 9. kale and collard greens, 10. cherries, 11. potatoes, 12 imported grapes"*

The Clean 15 for 2010: *"onions, avocados, sweet corn, pineapples, mango, sweet peas, asparagus, kiwi fruit, cabbage, eggplant, cantaloupe, watermelon, grapefruit, sweet potatoes, sweet onion." (22)*

The Dirty Dozen for 2011: (see this website: http://www.thedailygreen.com/healthy-eating/eat-safe/dirty-dozen-foods#fbIndex1): *"1. apples 2. celery 3. strawberries 4. peaches 5. spinach 6. nectarines (imported) 7. grapes (imported) 8. sweet bell peppers 9. potatoes 10. blueberries 11. lettuce 12. kale/collard greens."*

The Clean 15 for 2011: *"1. onions 2. corn 3. pineapples 4. avocado 5. asparagus 6. sweet peas 7. mangoes 8. eggplant 9. cantaloupe (domestic) 10. kiwi fruit 11. cabbage 12. watermelon 13. sweet potatoes 14. grapefruit 15. mushrooms" (23)*

http://www.whatsonmyfood.org/ also provides useful information regarding pesticides detected on food. Although this is a US based website, it provides a wealth of information on the amounts and types of pesticides applied to various foodtypes in the United States. The Top 15 Highest ranking Foods based on Pesticide Residues found by USDA Pesticide Data Program (excluding water) are: *"celery 64, peaches 62, greens kale 55, strawberries 54, blueberries 52, lettuce 51, sweet bell pepper 49, spinach 48, greens collard 46, green beans 44, apples 42, cherries 42, spinach frozen 42, summer squash 41, peaches single serve 40."*

THE FOLLOWING TABLE WAS COMPILED BY FOE OVER THE PERIOD 2000 - 2011 AND REVEALS WHICH FOODS ARE LIKELY TO BE OF MOST RISK IN TERMS OF PESTICIDE DETECTIONS.

TOP 20 AUSTRALIAN FOODS WITH MOST PESTICIDE DETECTIONS 2000 - 2011

APPLES	15.2%	**CANOLA**	1.1%
WHEAT	13.2%	**FLOUR**	1.1%
STRAWBERRIES	10%	**CARROTS**	0.8%
PEARS	9.5%	**PLUMS**	0.8%
GRAPES	6.4%	**GREEN BEANS**	0.8%
LETTUCE	4.1%	**OTHER**	20%
NECTARINE	3.7%		
PEACHES	2.3%		
BREAD	2.1%		
BRAN	1.8%		
BISCUITS	1.6%		
TEA (IMPORTED)	1.6%		
BARLEY	1.4%		
TOMATOES	1.3%		
APRICOTS	1.2%		

DUE TO THE FACT THAT TESTING FOR PESTICIDE RESIDUES IS CARRIED OUT "SPORADICALLY ", AND NOT ACROSS A FULL RANGE OF FOOD GROUPS, THIS LIST SHOULD BE SEEN AS AN APPROXIMATION ONLY.

11.CASE STUDY: STRAWBERRIES.

I*n 2003 and 2008 Choice Magazine found that strawberries stood out as the fruit with the high levels of pesticide residues.*

"We found the following in one or more samples: boscalid, captan, carbaryl, chlorpyrifos, dimethoate, endosulfan-beta, iprodione, pirimicarb and pyrimethanil ... Three of the strawberry samples contained pesticide residue levels that exceed the MRL, or pesticides that the regulations don't allow on strawberries. Another two samples were under the Australian limit for captan, but contained more of this fungicide than is permitted under more stringent EU regulations. Seventeen of the conventionally grown strawberries had residues of more than one pesticide; four came with a cocktail of no less than four different chemicals, though all below the MRL." (97)

In surveys assessed during this project it is clear that strawberries are again clearly at the top of the list in terms of pesticide residues. In 2010 local residents near Silvan in the Yarra Valley, sent FoE a list of pesticides commonly used on strawberries in their area, the list included 9 fungicides, 7 insecticides, 3 miticides, 3 herbicides and soil fumigants.

Strawberries are pesticide dependent and the soft skin easily absorbs pesticides which may be applied on a crop. The strawberry industry near Silvan in the Yarra Valley caused controversy in 2007-8 after Managed Investment Scheme funds were being used to quickly expand the industry. *"They have been spraying two to three times a week for eight months using turbo sprays that can send the pesticide drifts up to 10 kilometres away, and this is part of the Melbourne water catchment," Mr Baines said." (24*)

Few people realise that strawberry runner growers have been heavily dependent on the use of Methyl Bromide as a soil fumigant. Methyl Bromide or bromomethane, is recognised as an Ozone Depleting Chemical, and has been marked for phaseout under the 1987 Montreal Protocol. Without the use of Methyl Bromide strawberry crops would come under serious pest, weed and disease infestations. Almost 30 tonnes of Methyl Bromide has been sought to be used in Australia by strawberry growers, largely based in the Yarra Valley in 2012. The rice industry also wants to use 3.6 tonnes of Methyl Bromide in 2012 as a fumigant in rice silos. (25) (Methyl Bromide is also used on a variety of foods as a means of controlling pesticides such as fruit fly. Fruit transported into Tasmania can also be fumigated with Methyl Bromide, unless it is sold as organic). Methyl Bromide can be of serious concern to workers, particularly in enclosed areas.

In environmental investigation revealed the potential for Methyl Bromide to accumulate in enclosed areas during the transportation and storage of fumigated grapes. MeBr is a colorless and odorless multisystem toxicant, producing severe and sometimes permanent nervous system effects. (26)

Other soil fumigants being investigated are also of concern, possibly leading to many other problems amongst workers and potentially consumers of strawberries using Methyl Iodide. *"Toolangi Certified Strawberry Runners Growers Cooperative and the VicDPI have, however, also researched the efficacy of other fumigants such as chloropicrin and iodomethane. Iodomethane (IM; methyl iodide) products, which also contain chloropicrin (Pic), are currently being trialled under permit in commercial scale up trials." (25)*

California pesticide regulators plan to approve a new agricultural chemical to sterilize the soil of strawberry fields, but state records and interviews with scientists raise questions about whether workers and nearby communities can be adequately protected from the highly toxic chemical. Currently, strawberry growers use a fumigant called methyl bromide, which is being phased out around the world because it damages the ozone layer. But the alternative, methyl iodide, a carcinogen and neurotoxin that can cause miscarriages and other medical problems, is considered far more toxic than methyl bromide. (27)

But while methyl iodide is safe for the ozone, lab tests show it causes cancer and miscarriages in rabbits. Earlier this year, Slotkin and the other panel members issued a report warning that methyl iodide is too toxic to be used safely outside of a laboratory. Agreeing with the assessment by staff scientists at the regulation department, they said that exposure to more than 0.8 parts per billion of methyl iodide over an eight-hour work day could cause cancer or miscarriage in farm workers. (28)

12. SNAPSHOT OF CURRENTLY DETECTED PESTICIDES

Totals based on pesticide monitoring and food undertaken by Federal and State Government agencies, including FSANZ (National Residue Surveys 2008-2010, FSANZ Total Diet Studies 2003 and 2011 and AQIS Failing Food Reports 2010-11, Victoria's DPI Produce Monitoring Reports 2007/8 – 2008/9 2009/2010 and other state based monitoring programs where possible, such as Food Watch WA. Choice Magazine has also carried out testing on imported tea in 2003 and strawberries in 2003 and 2008.

In July 2010 National Toxics Network (NTN) and World Wildlife Fund (WWF) published a report entitled *'Australia's Most Dangerous Pesticides'* (116). The report compiled a list of over 120 pesticides currently used in Australia – with 80 of these pesticides *"prohibited in the United Kingdom, France, Germany and the other 24 member countries of the European Union."*. If one compares the NTN/WWF list with the list of pesticides detected in Australian pesticide monitoring studies conducted between 2000-11, 47% of the pesticides listed in the NTN/WWF report have been detected in Australian food produce surveys – representing 60% of all detections.

According to the online database of the Pesticide Action Network (PAN) http://www.pesticideinfo.org/ of the 125 pesticides detected on Australian foods 2000-11, 21% could be possible carcinogens, 20% are carcinogens, 29% are cholinesterase inhibitors, 12% are developmental or reproductive toxins and 48% are suspected endocrine disruptors. However many of the pesticides were detected many times more than other pesticides. If you collate the 125 pesticides as well as the total detections of pesticides (over 1600 detections), 23% of the pesticide could be classed as possible carcinogens, 28% could be classed as being carcinogenic, 29% could be linked with cholinesterase inhibition, 10% with development or reproductive issues and 60% of all detections being associated with pesticides having a suspected endocrine disrupting ability. Clearly then the issue of endocrine disruption is the major issue confronting consumption of foods treated with pesticides.

KEY FOR TABLE ON FOLLOWING PAGE

F - Fungicide
PGR - Plant Growth Regulator
I - Insecticide
N - Nematicide
S - Synergist
OP - Organophosphorus
OC - Organochlorine
CHOL - Cholinesterase inhibitor
EDC - Endochrine Disruptor

TOP 20 PESTICIDES DETECTED ON AUSTRALIAN PRODUCE 2000-2011

Pesticide	Detections	Chemical Type	Acute Toxicity	Carcinogen	Chol	Reproductive Toxin	EDC
Iprodione	11.7%	Dicarboximide F		Yes			Susp
Chlorpyrifos	7.5%	OP I	Mod		Yes		Susp
Piperonyl Butoxide	5.6%	S	Mod	Poss			Susp
Chlorpyrifos Methyl	5.5%	OP I			Yes		
Procymidone	4.4%	F		Yes			Susp
Fenitrothion	2.9%	OP I	Mod		Yes		Susp
Dithiocarbamates	2.8%	Carbamate F					
Diphenylamine	3.9%	Amine F/I/PGR	Mod				
Endosulfan	2.3%	OC I	High				Susp
Permethrin	2.2%	Pyrethroid I	Mod	Yes			Susp
Carbendazim	1.9%	Benzimidazole F		Poss			Susp
Pyrimethanil	1.7%	Pyrmidine F		Poss			Poss
Dicofol	1.7%	OC I	Acute	Poss			Susp
Pirimiphos Methyl	1.7%	OP I			Yes		
Dimethoate	1.6%	OP I	High	Poss		Yes	Susp
Bifenthrin	1.9%	Pyrethroid I	Mod	Poss		Yes	Susp
Ethylene Chlorohyrdrin	1.9%	Gas Steriliser	High				
Captan	1.5%	Thiophthalimide F	High	Yes			
Carbaryl	1.5%	N-MethylCarbamate I/N/PGR	Mod	Yes	Yes	Yes	Susp
Cypermethrin	1.5%	Pyrethroid I		Poss			Susp
Other	33.6%						

* SOURCED FROM PESTICIDE ACTION NETWORK DATABASE

MOST FREQUENTLY DETECTED PESTICIDES ON AUSTRALIAN FOOD

INSECTICIDES	49.5%
FUNGICIDES	32.1%
SYNERGISTS	5.6%
HERBICIDES	4.1%
OTHER	8.6%

TOP TEN TYPES OF FREQUENTLY DETECTED PESTICIDES ON AUSTRALIAN FOOD

ORGANOPHOSPHORUS INSECTICIDES	28%
DICARBOXIMIDE FUNGICIDE	12.6%
PYRETHROID INSECTICIDE	8.2%
ORGANOCHOLORINE INSECTICIDE	5.8%
FUNGICIDE	5.8%
SYNERGIST	5.6%
CARBAMATE FUNGICIDE	3.3%
AZOLE FUNGICIDE	2.7%
N- METHYL CARBAMATE INSECTICIDE	2.1%
BENZIMIDAZOLE FUNGICIDE	2.1%
OTHER	23.7%

13. PESTICIDES AND HEALTH ISSUES

The following issues have been published on various media and scientific websites and journals over the past two years (October 2009 – December 2011). The health issues are varied yet pesticides are implicated in all of these studies/reports. Many of the problems that continue to be highlighted are not new. The impacts of OP (Organophosphorus) pesticides for example have been of concern since the early 1960's. By highlighting research from the past 2 years it is hoped that this provides the reader with insights into where the current science is heading and what issues are surfacing as being of significance in regards to pesticides and human health.

13.1 PESTICIDES AND HEALTH. THE UNBORN AND CHILDREN.

Scientists in the United States are now claiming that chemicals have replaced bacteria and viruses as the main threat to human health in western countries, claiming that between 70 to 90 per cent of cancers are caused by exposure to chemicals. (29) However cancer is not the only concern in regards to the pesticides and health. A range of other health concerns are now being linked to pesticide exposure.

Human foetuses are exposed to a chemical cocktail inside the womb. A recent study has found that 43 banned and currently used chemicals "including PCBs, organochlorine pesticides, PFCs, phenols, PBDE flame retardants, phthalates – were detected in 99-100% of more than 250 pregnant women."(30) Researchers know that this chemical cocktail is just the tip of the iceberg and that health problems can result from this exposure. Pinpointing which chemical is the exact cause of any disease, is however extremely complicated, as is determining how a mixture of pesticides react to one another and the cumulative impacts of such exposures.

Another recent study found an average of 232 chemicals in the cord blood of 10 babies born in late 2009. "They are chemicals found in a wide array of common household products - shampoos and conditioners, cosmetics, plastics, shower curtains, mattresses, electronics like computers and cell phones, among others. (31)

The vast majority of these substances have as yet unknown effects on the brain development of unborn children, the reproductive system, other developing organs and the immune system. With such chemical burdens present in the unborn, it is difficult to single out health problems being caused specifically by pesticides for example. However some scientists are conducting research on this and their conclusions are worrying.

"Perhaps most important, based on laboratory rodent studies, exposures to atrazine (and other pesticides) may have their greatest effects, before individuals are even born. Several studies in laboratory rats and even in humans are now showing that exposure to pollutants in the womb can contribute to diseases such as cancer, immune suppression and learning disabilities later in life." (32)

Australia's second most "popular" herbicide, Atrazine, is now being linked to birth defects depending on when the most spraying occurs. Although in recent Australian food surveys Atrazine has had few detections, it is ubiquitous in the environment, even being found in rainwater. Recent research regarding the herbicide highlights concerns that could arise with a whole range of pesticides and other substances, particularly Endocrine Disruptors.

For people living in atrazine sprayed regions: *"We found that women who conceive their babies in the months between April and July, are the most likely to have birth defects," (33) Atrazine exposure in people living near farms may also increase the risk of developing gastroschisis. "where part of the intestines bulges through a separation in the belly."*

Other recently published studies have linked atrazine to gastroschisis. *"Atrazine, ... upped the risk of nine birth defects in babies born to mothers whose last menstrual period was from April to July -- that is, when surface water levels of the pesticide were highest." (34)* Smaller babies has also been associated with atrazine exposure in drinking water during their mothers conception, *"the scientists linked relatively high atrazine concentrations in the drinking water to which a woman had access late in pregnancy with an elevated chance that her baby would be born especially small for its gestational age."(35)*

Pesticides are also linked to problems in brain development. *"Children with prenatal exposure from their mothers' greenhouse work had deficits related to motor speed and coordination, visuospatial performance, and visual memory. These were associated with a developmental delay of 1.5 to two years. Prenatal exposure was also linked to higher systolic blood pressure and lower body mass index. The present study suggests that the current level of protection may well be adequate to avoid pesticide toxicity in the worker herself, but insufficient to prevent lasting adverse effects in the offspring." (36)*

After birth the child is exposed to even more toxic substances, including pesticides in food. Children are more susceptible to the harmful effects of chemical exposure because their bodies are still growing and are more vulnerable to hormone interference. Infants also crawl on the floor and are exposed to a variety of chemicals that adults may not be exposed to.

New research indicates that children cannot produce a detoxifying enzyme that helps adult bodies get rid of organophosphate chemicals *"children have low levels of paraoxonase 1 – one-third or less that of their mothers – far longer into childhood than previously thought. Whereas it was thought the levels of enzyme approached adult levels by age 2, the new research suggests children remain uniquely susceptible until age 7... Current EPA standards of exposure for some pesticides assume children are three to five times more susceptible than adults, and for other pesticides the standards assume no difference... Our study is the first to show quantitatively that young children may be more susceptible to certain organophosphate pesticides up to age seven." (37)*

If children have lower levels of paraoxonase 1, it may be possible that the food they eat could be causing them health problems. Again in the US, researchers have recently found that *"More than one-quarter of the food eaten by a small number of U.S. children contained pesticides, confirming again that food is a source of chemical exposures for youngsters.....Nearly one-fifth of the food samples measured had at least one pesticide. Of those, more than one-quarter contained multiple pesticides in the same food sample. In total, the food contained varying amounts of 14 different pesticides, including different organophosphates and pyrethroid insecticides." (38)*

Eating pesticide laden food is not the only pathway that children can be exposed to pesticides. Exposure to pesticides in home environments is also of concern. *"Toddlers whose mothers breathed more of a chemical often present in insecticides during pregnancy had slower brain development, according to a study from New York City. On average, women breathing the highest amounts of piperonyl butoxide, or PBO, had babies who scored 3.9 points lower on a mental development test at age three (85 points and above is considered normal). "It means that these kids might not do as well in school"...Baby brains are extra vulnerable to toxic chemicals, because they are not fully formed. "If you alter the blueprint, there may be lasting long-term consequences," (39)*

Pesticides are also linked to problems in brain development.

A glimpse of the possible effects of pesticides can be shown by studies published in 2010 which show that children with higher levels of organophosphate metabolites (metabolites are formed through the breakdown/degradation of the pesticide), were more likely to be diagnosed with ADHD (Attention Deficit Hyperactivity Disorder) *"...the risk of having ADHD increases in children who have higher concentrations of dialkyl phosphate metabolites. The metabolites indicate exposure to organophosphates, pesticides that affect the nervous system ... Researchers found that 93.8% of the children in the study had at least one detectable metabolite". (40) "Residential pesticide use is common, but the major source of exposure to pesticides for infants and children would be the diet, according to the National Academy of Sciences". [105]*

Experts are also concerned that toxic chemicals such as lead, mercury and other neurotoxic chemicals may be having a profound impact on the developing brain, possibly causing autism. *"Maternal conditions could partially result from chemicals in the environment." (41) "Researchers found a sixfold increase in risk factor for autism spectrum disorders (ASD) for children of women who were exposed to organocholorine pesticides, this study was one of the first to link in utero pesticide exposure to ASD". (42)*

Another concern identified in three studies published in April 2011, showed that prenatal exposure to organophosphate pesticides, sprayed on agricultural crops on the Salinas Valley in California and used as cockroach controls in the New York environments of Harlem and the South Bronx, can lead to a reduction of a child's IQ by up to 7 points.

Such a reduction can cause behavioural problems in the child and also affect reading and maths skills. An explantation can be found here: *"...consistent evidence of the pesticides' effects on cognitive skills and short-term memory ... organophosphate pesticide exposure can impair development of the brain's prefrontal cortex.*

Such damage actually shrinks this area of the brain and can lead to behavioral problems that include ADHD and later-life learning and social problems ... This is also the part of the brain where short-term memory and instant gratification responses lie ...We found there was no threshold or base limit of exposure that did not produce an effect. This is important to consider since it's now known that organophosphate pesticides can cross the placenta and that prenatal development is very vulnerable to disturbance, including by synthetic chemicals." (43)

Another insecticide, Permethrin, is also being linked to learning problems if a baby is exposed to this pesticide in the womb. The learning problems are in the same magnitude as children exposed to lead. [Lead was phased out in petrol in Australia in 2002 and lead levels in paint were reduced to 0.1% in Australia in 1997. Will Permethrin also suffer a similar fate?] Pregnant women from New York were also exposed to this insecticide after spraying of cockroaches. Children exposed to the highest pesticide levels before birth were three times as likely to have a mental delay compared to children with lower levels, the study says. Children with the highest prenatal exposures also scored about 4 points lower on an intelligence test, the Bayley Mental Developmental Index. (44)

It is generally known that organochlorine pesticides, many of which are known as POP's (Persistent Organic Pollutants), are eliminated slowly and that they can accumulate in the body fat of mammals including humans. They can also persist for decades in the environment with the result that mothers can transfer the body burden via their breast milk to their children. It is of concern that parents (or grandparents) exposed to organochlorines such as DDT (and its metabolite DDE) up to 60 years ago, may still be impacting on aspects of the health of their offspring. The inter-generational aspect of pesticide exposure may not just be restricted to organochlorines. Pesticides are being linked to other health issues such as Obesity and Type 2 Diabetes. According to one recent study, one quarter of babies born to mothers with relatively high concentrations of a DDT breakdown product – DDE, grew unusually fast in their first year or life.

"...some type of fetal reprogramming maybe to neural wiring, maybe in switches affecting the activity of particular genes has altered the way these children metabolize their. In fact, a growing body of data has been indicating that some pollutants — known colloquially as obesogens can trigger the body to put on the pounds... Many obesogens including DDE have a hormonal alter ego. In the body, DDE can either turn on or block the activity of natural estrogens, female sex hormones. This pollutant also can block the activity of male sex hormones. Such properties lead scientists to describe this pesticide derivative as an endocrine disrupter. (45)

Other researchers have also found that "*Chemicals that affect our hormone system — often called endocrine-disrupting chemicals are playing some role in the global epidemic of excessive weight...the obesity epidemic roughly correlates with the rise in the use of industrial chemicals, including plastics and pesticides, following World War II. Bisphenol A (BPA), Phthalates, Atrazine, Perflurooctanoic Acid (PFOA) [PFOA is used in Teflon, a non-stick cookware]...* (46)

Another study suggests that chemical pollutants impair the body's ability to regulate blood sugar. Other studies also confirm correlations between PoPs (Persistent Organic Pollutants) such as DDT, PCBs and Dioxins with Type-2-Diabetes *"which found people with the highest levels of exposure to six POPs were 38 times more likely to have diabetes than those with the lowest exposure (Turyk et al. 2009)", a study by Lee herself (Lee et al. 2010) and a further study of Swedish women (Rignell-Hydbom et al. 2009)... her findings have two profound implications: firstly, that current type-2 diabetes epidemiology may be badly confounded by POPs exposure; and secondly, that extremely low concentrations of pollutants are sufficient to initiate diabetes in obese people..." (47)*

Pesticides can lead to a reduction of a child's IQ by up to 7 points.

Pesticides and other chemicals are being linked to birth defects in males and problems in later life such as testicular cancer and falling sperm counts. *"In repeated experiments, testosterone-disrupting chemicals found in pesticides, drugs, plastics and household products created symptoms of TDS in laboratory animals. Some of the experiments showed that the chemicals work in combination - causing problems at doses where the individual chemicals should be harmless....Chemicals shown to cause problems include pesticides such as DDT, fungicides such as vinclozolin; a group of chemicals called PCBs used in electrical circuits, paints, flame retardants and glues; and phthalates, which are used to soften plastics."* (48) Exposure to organochlorine pesticides (including Polychlorinated Biphenyls (PCB's) and p,p' DDE (the main metabolite of DDT), also appear to impact on male reproduction.

"They looked for sperm disomy, which occurs when sperm cells have an abnormal number of chromosomes. While all men have a certain number of sperm with such abnormalities, researchers found that men with higher levels of DDE and PCBs had significantly higher rates of sperm abnormalities. "This research adds to the already existing body of evidence suggesting that environmental exposure to certain chemicals can affect male fertility and reproduction. We need to further understand the mechanisms through which these chemicals impact sperm," said Dr. Perry."(114).

Thyroid disease has recently been linked to pesticides *"...12.5% of the women who were exposed to the pesticides developed thyroid disease, compared to 1-to-8% in the general population ... this shows there is an association between one of the fungicides and hyperthyroidism...Certain insecticides, herbicides and fungicides have been previously reported to be endocrine disrupters, which can interfere with the endocrine hormone system." (49)*

When they looked at 44 different pesticides, they found that women married to men who had ever used organochlorine insecticides -- such as aldrin, DDT, and lindane -- were 1.2 times as likely to have hypothyroidism. The risk of hypothyroidism for women exposed to fungus killers was 1.4-fold greater. Specifically, they found that chlordane, an organochlorine pesticide, was associated with a 1.3-fold hypothyroid risk. The fungus killers benomyl and maneb/mancozeb were associated with tripled and doubled risk, respectively, and the herb killer paraquat nearly doubled the likelihood of hypothyroidism. Maneb/mancozeb exposure increased women's risk of hyperthyroidism more than two-fold; it was the only chemical studied that upped the risk of both hypothyroidism and hyperthyroidism." (50)

Arthritis and Lupus are now been associated with exposure to insecticides. Long term exposure to insecticides has also been linked with an increased risk of developing autoimmune diseases such as lupus and rheumatoid arthritis. *"The risk of developing these diseases was higher for women who reported more insecticide use, whether they had ever lived or worked on a farm. And those who had personally mixed or applied insecticides were at the greatest risk of developing rheumatoid arthritis or lupus. For example, compared to women who reported no insecticide exposure, disease risk was more than doubled in those who reported using insecticides six or more times per year and in women who had used them less frequently but over longer time period – for 20 or more years." (51)*

People suffering from Multiple Chemical Sensitivity have long been arguing that pesticides are associated with their disease. *"According to Dr. Martin L. Pall, there are seven classes of chemicals that are implicated in Multiple Chemical Sensitivity (MCS), and these seven classes of chemicals can produce indirectly a common response in the body, and that is, increased NMDA activity. As a matter of fact, animal studies have shown that the toxic responses of the members of all seven classes of chemicals, can be lowered by using NMDA antagonist. So, this not only clearly demonstrates that they produce such an increased activity, but that these increases play a quite important role in producing toxic responses to the chemicals." (52)*

Thyroid disease has recently been linked to Pesticides

13.2 PESTICIDES AND HEALTH – BRAIN NERVOUS SYSTEM FUNCTION [ORGANOPHOSPHATES]

Organophosphate (OP) and Carbamate pesticides are known as Cholinesterase Inhibitors. They damage an enzyme called Acetylecholinesterase. OP's were intensively researched by the German Military in World War 2. OP pesticides are the most commonly detected group of pesticides found on Australian food. Twenty eight OP pesticides have been found on Australian produce over the past decade in Australian food surveys. OP's were developed as an alternative to Organochlorine pesticides. OP's were not supposed to bioaccumulate in body fat, however the extent of bioaccumulation of OP's is being scientifically debated and has been since the 1960's.

The OP insecticides Dimethoate and Fenthion have been used for years in a range of produce applications (including fruit dipping) and the post harvest treatment of fruit in fruit-fly areas of Australia (where fruit would be dipped in the insecticide). On the 6th of October 2011, the APVMA suspended the use of Dimethoate on a number of crops due to potential dietary risks. This followed a 2010 recommended revision of the ADI from 0.02mg/kg/day to 0.001mg/kg bw/day (A reduction of 95%). This brings into question how many Australians have been consuming dimethoate on fruit and vegetables at unsafe levels for several decades and why it has taken so long to reduce the ADI so significantly? Ceasing use of Dimethoate could also lead to an increase in food irradiation as an alternative food treatment. This has already been raising concerns in New Zealand. [106]

"...Exposure to the same organophosphate by multiple routes or to multiple organophosphates by multiple routes can lead to serious additive toxicity..."[100]

"Some organophosphates (-thions) are metabolised in the liver to much more active metabolites (-oxons). These poisons (e.g. parathion, fenthion, chlorpyrifos) are also usually highly lipid soluble. Thus the slow conversion of these substances, which are widely distributed into fat, may lead to delayed and/or prolonged cholinesterase inhibition and toxic effects." [101]

Acetylcholine (a neurotransmitter) is a chemical involved in the transmission of nerve impulses. Acetylcholinesterase is an enzyme in the nerve endings which is essential for the normal functioning of the nervous system. In a normal situation, Acetylcholinesterase breaks down acetylcholine which is a chemical messenger for the nerves. But with Acetylecholinesterase damaged, the Acetylcholine builds up resulting in the muscles of the body become over-stimulated, leading to paralysis and death of the insect. OP pesticides have long been associated with health problems and recent research is confirming the worst about these nerve poisons.

By 1984, numerous studies both in the United States and eastern Europe showed that repeated low level exposure to OP pesticides could cause the following problems: *¨decline in muscle strength, fatigue, drowsiness, and apathy, decreased vigilance, forgetfulness, language defects, mood changes and impaired attention, problem solving and calculation". (12)*

"How bad is chlorpyrifos? So bad that EPA cancelled all residential uses in 2001, except contained ant and roach baits, to prevent hazardous exposures to children. It causes headaches, nausea, muscle spasms, and can cause seizures and even death at high doses. Even low doses that occurred in people's homes (before the residential ban) from using chlorpyrifos to treat pest problems were enough to be associated with measurable cognitive deficits and developmental delays in children exposed during early fetal and infant development (Rauh et al, Pediatrics, 2006; Lovasi et al, AJPH, 2010). In 2002 the Center for Disease Control and Prevention (CDC) reported that 82% of randomly sampled Americans had chlorpyrifos metabolites in their urine, indicating regular exposure (NHANES III, Series 11, No 4A, Sept 2000). (53)

Impacts of OP insecticides should be of major concern, however the concerns are not leading to a ban on all applications to food for many dangerous OP pesticides. In regards to Chlorpyrifos, the APVMA restricted use of the insecticide in home and garden products only in 2001-2002. *"Chronic exposures have been linked to neurological effects, developmental disorders and autoimmune diseases. Neurological effects on fetuses and children at low doses.Impacts of ADHD. TCPy is a Chlorpyrifos metabolite found in the urine of people exposed to Chlorpyrifos. In 2008 it was found that the amount of TCPy in children greatly reduced after they started an organic diet." (54)*

It has also recently been determined that pyrethroid insecticides can produce a larger toxic effect than each chemical on its own. *"This study is important because it confirms the prevailing assumption that pyrethroid mixtures produce additive toxicity by converging on electrical channels in brain cells. The pyrethroid compounds tested – deltamethrin, B-cyfluthrin, cypermethrin, permethrin, bifenthrin, esfenvalerate, A-cyhalothrin, tefluthrin, fenpropathrin, resmethrin and S-bioallethrin – are mainly used to control pests on food crops." (55)*

13.3 PESTICIDES AND HEALTH – PARKINSONS DISEASE

Parkinson's Disease is a chronic neurological disorder. People with the disease have low levels of dopamine because some of the nerve cells in the brains have died. This then affects the way that the brain co-ordinates the movement of muscles in the body. Parkinsons Disease was originally called "Shaking Palsy" in the early 19the century. There appears to be a genetic predisposition to inheriting Parkinsons, but scientists have not ruled out exposure to neurotoxins as a contributing factor. It has been summised since the 1970's that people living in agricultural regions may be at higher risk of contracting Parkinsons.

Recent studies link exposure to the herbicides rotentone and paraquat. *"This study provides the evidence that oxidative stress, possibly due to sustained exposure to environmental toxins, may serve as a primary cause of Parkinson's,' said assistant professor Zezong Gu. 'This helps us to unveil why many people, such as farmers exposed to pesticides, have an increased incidence of the disease.'"Scientists already knew that the disease was associated with oxidative stress, which is when electronically unstable atoms or molecules damage cells. However, the latest study reveals how oxidative stress causes parkin, a protein responsible for regulating other proteins, to malfucntion"(56)*

"...Rotenone and paraquat are two specific chemicals now linked to increased risk of Parkinson's disease, and both are lipophilic, meaning they resist breaking down in water and accumulate in your fat. Both are also known to cross your blood-brain barrier...The problems will all these pesticides... doesn't come from just one apple or carrot that may have been sprayed. The real problem is something called bioaccumulation...These man-made neurotoxic chemicals also bioaccumulate in the human body, as they resist breaking down in water and also accumulate and store in fat, where they can remain for long periods of time. In short, this means your body has a very hard time getting rid of them once they enter it. The link to Parkinson's disease is no doubt caused by a bioaccumulation in brain cells, specifically in the neurons charged with producing dopamine. This is why you don't get Parkinson's disease from eating one piece of pesticide-laden fruit. And why it is so difficult to link this and other degenerative neurological diseases to a single source... once enough of these toxic chemicals get into a cell, they disrupt its function. Rotenone inhibits mitochondrial function, while Paraquat increases production of oxygen derivatives. In other words, once enough of these chemicals get into your bloodstream, they deposit in the fat inside your brain and begin causing brain damage ..." (57)

Paraquat and the fungicide Maneb has recently been associated with Parkinsons. Maneb has been linked with Parkinsons since the early 1990's. http://www.ncbi.nlm.nih.gov/pubmed/7801076. Maneb was phased out in Australia in 1990, but Paraquat is still widely used across Australia in cropping, grazing, stone fuit, vegetables and vineyards.

"The scientists found that people who live within 500 metres of a field sprayed with the pesticides maneb and paraquat in combination, but not individually, had a 75 percent risk of Parkinson's disease relative to controls. Being exposed to the mixture at a younger age resulted in an even higher risk. Individuals potentially exposed to these pesticides when they were 60 years old or younger were 5 times more likely to be diagnosed with Parkinson's disease." (58)

"In 2009, researchers in California found that exposure to the mixture of maneb and paraquat also significantly increased the risk of Parkinson's disease in people. The study found that individuals who were exposed to both chemicals within 500 meters (547 yards) of their homes had a 75 percent higher risk than those who were not exposed." (59)

"This study suggests that individual's with a particular genetic make-up may be particularly sensitive to the neurodegenerative effects of certain pesticides...Because both genetic susceptibility and use of maneb and paraquat are common, this could have important implications for residents of agricultural communities." (60)

"In addition, in April 2009, scientists at the University of California, Los Angeles (UCLA), published a provocative study connecting the disease not only to occupational pesticide exposure but also to living in homes or going to schools that were close to a pesticide-treated field...The riskiest pesticides were found to be some of those most commonly used in American agriculture, among them Paraquat and Trifluralin..." (61)

Another recent study is linking one of Australia's most commonly used herbicides, 2,4-D with Parkinsons disease. It appears that people exposed to high amounts of these substances are at higher risk. "Three compounds -- an organic (2,4-dichlorophenoxyacetic acid), an herbicide (paraquat), and an insecticide (permethrin) -- were associated with a more than threefold increased risk of Parkinson's, the study found. Laboratory tests have shown that all three compounds have effects on dopaminergic neurons, which are affected by Parkinson's disease." (62)

Pesticides in drinking water wells in the United States are being implicated as a part of the cause of Parkinsons, adding more evidence that some pesticides may impact on developing brains, leading to the development of Parkinsons in later age. Once again those living in agricultural regions appear to be more at risk. *"The new study of more than 700 people in California's Central Valley found that those who likely consumed contaminated private well water had a higher rate of Parkinson's. The risk was around 90 percent higher for those who had private wells near fields sprayed with the widely used insecticides propargite or chlorpyrifos. People with Parkinson's "were more likely to have consumed private well*

water, and had consumed it on average 4.3 years longer" ... The strongest link to the disease was for propargite. Those who had wells near fields sprayed with the chemical had a 90 percent higher risk of having Parkinson's, according to the study...Other strong links were found for the insecticides methomyl and chlorpyrifos, which increased the risk of Parkinson's by 67 percent and 87 percent." (63)

13.4 PESTICIDES AND HEALTH - ENDOCRINE DISRUPTION

Endocrine disruptors (EDCs) are chemicals that interact with and disrupt human and animal hormones which regulate reproduction, metabolism, development behaviour, immune function, stress and growth. An increasing body of scientific research is finding endocrine disruptors in a range of materials including pharmaceuticals, components in plastics such as bisphenyl A, Dioxins and some pesticides, Polychlorinated Biphenyls, Perflurooctanoic Acid (PFOA) and phthalates. Everyday items such as plastic bottles, non-stick cookware, metal food cans, detergents, flame retardants, food additives, toys, cosmetics and pesticides may act as endocrine disrupters. The interference can cause problems with natural hormones in regards to synthesis, secretion, transport, activity, or elimination for natural hormones. This interference or hormone blocking/mimicking in turn can alter hormone signaling. (For more information on impacts of Bisphenyl A, go the FoE Australia website: http://dev.foe.org.au/bisphenol) (118)

In June 2009 The Endocrine Society released its influential report 'An Endocrine Society Statement. Endocrine Disrupting Chemicals', (64) stating that: *" The evidence for adverse reproductive outcomes (infertility, cancers, malformations) from exposure to endocrine disrupting chemicals is strong, and there is mounting evidence for effects on other endocrine systems including thyroid, neuroendocrine, obesity and metabolism, and insulin and glucose homeostasis" and "Effects of endocrine disrupting chemicals may be transmitted to further generations through germline epigenetic modifications or from continued exposure of offspring to the environmental insult."* The American Medical Association adopted the Endocrine Society Resolution in October 2009, calling for new policies to decrease public exposure to endocrine disrupting chemicals. (65)

In late October 2009, the US EPA then announced *"the first test orders for pesticide chemicals to be screened for their potential effects on the endocrine system...EPA made available the battery of scientific assays and test guidelines for conducting the assays, as well as a schedule for issuing test orders to manufacturers for 67 chemicals during the next four months".*

This list was then expanded by 134 pesticides in November 2010. (67) The screening program will determine if the pesticides alter estrogen, androgens or thyroid hormones.

Political pressure is increasing in the United States to legislate against EDC's, The Endocrine-Disrupting Chemicals Exposure Elimination Act of 2011. (68)

Perhaps the most controversial herbicide over the last few years in regards to EDC is Atrazine and related Triazine herbicides such as Simazine (Simazine also continues to be registered for use in swimming pools in Australia). Atrazine is one of the most commonly applied herbicides in the world. In Australia, its popularity is second only to Glyphosate. In Australia, Atrazine is registered for use primarily in many cropping situations and some tree plantations. Research conducted by many scientists is finding that Atrazine infereres *"with the hormone systems that guide development in fish, birds, rats and frogs. In many cases, the result has been "feminized" males, with behaviours or body parts more like those of females...When they were tadpoles, he put them in water tainted with 2.5 parts per billion of atrazine -- still within the EPA's drinking water standards. About 10 percent of the frogs that developed in the water became "functionally female..."* (69)

In 2011, the Australian Drinking Water Guideline for Atrazine was reduced from 40 parts per billion, to 20 parts per billion. Essentially Atrazine inhibits the production of testosterone and induces estrogen production which upsets the natural balance between these hormones. Atrazine has been seen to cause immune failure in animals. *"It's been shown that it increases production of (the stress hormone) cortisol. It's been shown that it inhibits key enzymes in steroid hormone production Iwhile increasing others. It's been shown that it somehow prevents androgen from binding to its receptor." The review also consolidates the evidence that atrazine undermines immune function in a variety of animals, in part by increasing cortisol.* (70)

Thyroid hormones, testosterone, estrogens, and stress hormones are identical in all animals including humans and serve similar functions regardless of species. The brain neurohormones are also identical and the sequence of prolactin is very similar in all animals. Therefore if animals have been found to be having problems after being exposed to these pesticides, then it is also likely that humans will be impacted if they are exposed.

Similar problems that have been observed in animals are being replicated in humans, with some pesticides linked to the blocking of testesterone. A recent study conducted by the University of London found that 30 out of 37 pesticides tested pesticides, altered male hormones. *Sixteen of the 30 had no known hormonal activity until now, while there was some previous evidence for the other 14, ... Fetuses and infants may be particularly at risk when exposed in the womb or through breast milk because the hormones control masculinization of the reproductive tract. Some linked pesticides to abnormal genitals in baby boys, such as cryptorchidism and hypospadias, and decreased sperm counts in men...*

....Of the tested compounds, the most potent in terms of blocking androgens was the insecticide fenitrothion, an organophosphate insecticide ... Others with hormonal activity include fludioxonil, fenhexamid, dimethomorph and imazalil, which are all fungicides. Fungicides are often applied close to harvest, so they are frequently found as residue in food... Due to estimated anti-androgenic potency, current use, estimated exposure, and lack of previous data, we strongly recommend that dimethomorph, fludioxonil, fenhexamid, imazalil, ortho-phenylphenol and pirimiphos-methyl be tested for anti-androgenic effects in vivo." For the first four pesticides, they called it "a matter of urgency." They are used on strawberries, lettuce, grapes and other fruits and vegeztables. (71)

13.5 PESTICIDES AND HEALTH - CANCER

In animal studies, many pesticides have been found to be carcinogenic, however studies in humans are limited due to the small number of studies that have been conducted on individual chemicals. *"Epidemiologic studies, although sometimes contradictory, have linked phenoxy acid herbicides or contaminants in them with soft tissue sarcoma (STS) and malignant lymphoma; organochlorine insecticides are linked with STS, non-Hodgkin's lymphoma (NHL), leukemia, and, less consistently, with cancers of the lung and breast; organophosphorous compounds are linked with NHL and leukemia; and triazine herbicides with ovarian cancer. Few, if any, of these associations can be considered established and causal...". (72)*

"Some pesticides have been classified as carcinogens. Chlordane and dichlorodiphenyltrichloroethane (DDT) are possible human carcinogens. General studies of people with high exposures to pesticides, such as farmers, pesticide applicators, manufacturers, and crop dusters, have found high rates of blood and lymphatic system cancers; cancers of the lip, stomach, lung, brain, and prostate; as well as melanoma and other skin cancers..." (73)

"In the past two decades medical researchers have come to suspect that various combinations of factors give rise to lymphoma -- a weakened immune system, exposure to certain kinds of chemicals, and perhaps exposure to one or more viruses. Studies seem to implicate one particular class of chemicals -- chlorophenols. Chlorophenols are chlorine-containing chemicals that include dioxins, PCBs, DDT, and the so-called "phenoxy herbicides," including the weed killers 2,4,5-T, and 2,4-D". (74)

According to the 2008-9 President's Cancer Panel Reducing Environmental Cancer Risk *"Nearly 1,400 pesticides have been registered (i.e., approved) by the Environmental Protection Agency (EPA) for agricultural and non-agricultural use. Exposure to these chemicals has been linked to brain/central nervous system (CNS), breast, colon, lung, ovarian (female spouses), pancreatic, kidney, testicular, and stomach cancers, as well as Hodgkin and non-Hodgkin lymphoma, multiple myeloma, and soft tissue sarcoma....Approximately 40 chemicals classified by the International Agency for Research on Cancer (IARC) as known, probable, or possible human carcinogens, are used in EPA-registered pesticides now on the market." (75)*

Pesticides have also been linked to breast cancer, however it is almost impossible to pin-point the cause of cancer – if environmentally caused – when there are so many factors which could also be at play. *The report catalogs the growing evidence linking breast cancer to, among other factors: synthetic hormones in pharmaceuticals, cosmetics and meat; pesticides in food; solvents in household cleaning products; BPA in food containers; flame retardants in furniture; and radiation from medical treatments ... The report dedicates several chapters to pesticides, focusing on various studies linking triazine herbicides (atrazine, simazine), rganochlorines (aldrin, dieldrin, DDT, heptachlor) and the phenoxy herbicide 2,4-D, o as well as the link between hormones used in meat production to breast cancer." (76)*

exposure either prior to conception, during pregancy or during childhood can increase the risk of childhood cancer

A recent study in Washington DC has linked lymphoblastic leukemia to the use of organophosphate pesticides in houses to kill insects. Two organophosphate metabolites (DETP) and (DEDTP) were higher in children with ALL. *"Children with lymphoblastic leukemia (ALL) and their mothers were more likely to have higher levels of organophosphates and their metabolites in their urine than healthy pairs, and mothers who reported household use of chemicals were more likely to have children with ALL." (77)*

The herbicide Atrazine has recently been linked to prostate cancer and breast cancer. *If you feed a female rat Atrazine – her pups that she is suckling, her male pups, can develop prostate disease. So those effects of Atrazine are transferable even from the mother to the suckling pup. There's also studies showing that prostate cancer was increased in men who worked in a factory that produced Atrazine." (78)*

Another recent report again raises the fact that pesticide exposure, either prior to conception, during pregancy or during childhood can increase the risk of childhood cancer. *"Furthermore, the report notes that several studies indicate that farmers are at greater risk of developing certain cancers than the general population. In particular, several studies strongly suggest that pesticide exposures are associated with some cases of non-Hodgkins Lymphoma (NHL), leukemia, prostate cancer and other hormone related cancers." (79)*

One's chances of getting skin cancer has been recently linked to pesticides. *"...It found the risk of developing skin cancer doubled for those exposed to four chemicals maneb, mancozeb, methyl parathion and carbaryl....suggests exposure to farm chemicals "may be another important source of melanoma risk". (80)*

Children living in agricultural regions, who are exposed to agricultural pesticides applied near their homes have up to twice the likelihood of developing acute lymphoblastic leukemia (ALL) according to a recent study. *"The study shows an elevated risk of ALL associated with moderate exposure, but not high exposure, to pesticides classified as organophosphates, (odds ratio (OR) 1.6), chlorophenoxy herbicides (OR 2.0), and triazines (OR 1.9), and with agricultural pesticides used as insecticides (OR 1.5) or fumigants (OR 1.7). Examples of the 22 organophosphate pesticides the study identified include chlorpyrifos, diazinon, malathion and triclorfon. The four chlorophenoxy herbicides linked to ALL in the study include 2,4-D diclofop-methyl, MCPA and MCPP ..The five triazine pesticides in the study include the commonly used agricultural pesticide atrazine, as well as simazine, cyanazine, prometryn, and pyrmetrozine". (81)*

Another recent study is now linking two commonly used herbicides, Pendimethalin and EPTC to pancreatic cancer. This is the ninth study since 1993 which has linked pesticides to pancreatic cancer. *"After controlling for age, smoking and diabetes, the study finds a three-fold increased risk with life time use of EPTC when compared to those that never used the chemicals." (82)*

In Australia, the recent controversy involving the fungicide carbendazim (used on nearby macadamia plantations) and deformed fish at a fish hatchery have also been linked to a cluster of cancers. *"At least four Boreen Point residents living on Cooloothin Creek - which flows into the popular Lake Cootharaba - have all been diagnosed with cancers since deformities were first found at the fish hatchery. One of the four people, Bernard Gevers, worked for five years at the Sunland Fish Hatchery and was being treated for suspected bowel cancer.Two other fish hatchery neighbours have allegedly died from cancer" (83)*

Children living in agricultural regions, who are exposed to agricultural pesticides applied near their homes have up to twice the likelihood of developing acute lymphoblastic leukemia (ALL) according to a recent study.

"So those effects of Atrazine are transferable even from the mother to the suckling pup"

13.6. PESTICIDES AND HEALTH – MULTIPLE CHEMICAL SENSITIVITY

People who suffer from MCS are extremely sensitive to a number of pollutants, including solvents, volatile organic compounds, petrol, perfume, smoke, diesel, chemicals in general and a range of other substances. The disease is not properly understood as a mechanism for causation has not been widely accepted to date. Many sufferers cannot tolerate eating non-organic food. Sufferers of MCS exhibit the following symptoms;

"the patient exhibits problems - often an allergy-like reaction - to both large - often extremely low levels of irritants/toxicants/triggers : other individuals present at the same time may be unable to detect anything at all or anything unusual or out of the ordinary. the problem is ongoing, ie. chronic, and not a "one-off" event. The same symptoms are reproducible with repeated exposure to the same triggers. the patient is affected by many different triggers. the patient improves when triggers are absent." (95)

In light of people suffering from this disease and their extreme senstivity to substances such as pesticides, it appears strange that the medical and scientific community are having difficulty in finding a cause of the disease which could effect 6% of the Australian population (~1.3 million people).

"Surveys conducted" by the Department of Health in SA in 2002 and 2004 suggest that 0.9 percent of the population may have MCS, while an estimated 16.4 percent may experience some chemical sensitivity. Interstate and overseas research has shown that up to 6 percent of the population may have MCS, with between 10-25 percent experiencing sensitivity to chemicals." (96)

How does the 'dose makes the poison' philosophy and the setting of ADI's by regulatory bodies, work in regards to people suffering from MCS? MCS is not a defined medical condition in Australia, making MCS arguments difficult to accept by government regulators. This point was picked up in the Inquiry Into Multiple Chemical Sensitivity held by the South Australian Government in 2004. Recommendation 10.3 stated *'lobbies the Federal Government to consider undertaking a review of the adequacy of the current chemical regulatory structure and assessment processes in addressing issues raised by people with MCS with regard chemical use, including the adequacy of health and safety labelling information on chemicals associated with Pesticides, particularly Glyphosate, are known as one of the triggers of the disease. MCS."*

In its submission, the Australian Chemical Trauma Alliance lists the following chemicals as those predominantly associated with initiating MCS: *"Organophosphate insecticides; other pesticides including organochlorines; herbicides including 2,4-D and Glyphosate; solvents; sterilants, including formaldehyde and Glutar Aldehyde; and cleaning products particularly those based on Glycol Ethers".* (96)

"In setting national safety standards for human pesticide exposure the Australian Pesticides and Veterinary Medicines Authority relies on technical data provided by the Office of Chemical Safety (OCS) within the Commonwealth Department of Health and Ageing (DoHA). Neither OCS nor APVMA have any agreed mechanism by which a pesticide or combination of pesticides can be assessed for their potential to initiate or exacerbate symptoms of MCS." (96).

14. AGRICULTURAL WORKERS

Many problems concerning pesticides are related to the amount of the extent of pesticides received through exposure events. In terms of these events, the highest risk groups are pesticide factory workers, agricultural workers and farmers. More emphasis needs to be placed on the health and well being of Australian farmers and workers, often forced to produce food under trying conditions. Consumers of non-organic produce should also consider the impacts of their food purchases on agricultural workers *"Australian farmers and their families are being exposed to some of the most dangerous chemicals available, with little training or regulation, a workplace cancer forum was told on 10 December... According to Dr Hanna, the level and frequency of chemicals use was extremely high, with 84 per cent of farmers applying chemicals at least weekly during the high season. Other findings* of *concern included: 70 per cent of farmers worked closely enough to get chemicals on their skin and/or inhale fumes. 64 per cent sometimes, rarely or never wore protective clothing when applying chemicals. 86 per cent had spray drift on their skin and clothes from other people using chemicals. Chemicals also got into the water supply via spray drifting on to roofs with water tanks, or seeping into aquifers supplying bore water." (84)*

High Pesticide Exposure Events (HPEE) are more common amongst people who use the chemicals.*"...agricultural workers who had at least one HPEE involving pesticides that contain organophosphate scored lower on cognitive tests compared to agricultural workers who never had an HPEE..."We know that if a person suffers pesticide poisoning there may be long-term cognitive consequences, but our study shows that you don't need to be poisoned to have effects..." (85)*

Often farmers have to contend with the implications of long term pesticide exposure where diseases such as Alzheimers may also be a result. Long-term exposure to pesticides was associated with worsening of cognitive function in a large cohort of agricultural workers ... *¨Vineyards typically are high users of pesticides, and the participants all had at least 20 years of work experience. Workers who mixed or sprayed pesticides or cleaned the equipment were considered to be directly exposed, while those who worked with the vines or in vineyard buildings were classified as indirectly exposed... They also noted that particularly strong effects of pesticide exposure were seen among workers who were considered to have characteristics likely to be protective of cognitive performance, including being highly educated and female. "The mild impairment we observed raises the question of the potentially higher risks of injury in this population and also of possible evolution towards neurodegenerative diseases such as Alzheimer's disease or other dementias." (86)*

Workers on farms, including pickers may be exposed to high amounts of pesticides in poor working conditions. Many farm workers are new arrivals to Australia, with little experience working in farm environments and with no knowledge regarding safety of agricultural pesticides. Pesticide labels for instance are only printed in English. *"92 percent of respondents had been exposed to pesticides through a combination of aerial spraying, wind drift, touching plants still wet with pesticides, or inhaling pesticides. They reported arthritis, throat problems, diabetes, persistent coughing, recurring rashes, miscarriages, birth defects, and childhood developmental difficulties—all conditions that research studies have linked to chemicals applied in the area." (87)*

Immigrant families are also at risk of health problems. A recent study from Salinas California found Immigrant families are also at risk of health problems. *"... that at age 2, the children of mothers who had the highest levels of organophosphate pesticide metabolites in their blood had the worst mental development in the group. They also had the most cases of pervasive developmental disorder. At age 5, the children whose mothers were most exposed during pregnancy had poorer attention spans compared to those born to a mother who had lower levels of pesticide metabolites in their urine. Metabolites, as referred to here, are compounds that are formed as a chemical breaks down in the body... "We have very, very high reports by the mother of behaviors consistent with pervasive developmental disorder ... These include signs like the child is afraid to try new things, can't stand anything out of place, and avoid looking others in the eye. This is considered to be autism spectrum behavior..." (88)*

It appears that Rhinitis, the inflammation of the mucous lining of the nose, can also be associated with exposure to pesticides. *"... The authors hypothesize that exposure to pesticides may contribute to rhinitis by a number of mechanisms. First, organophosphates (OPs) inhibit the enzyme acetylcholinesterase,*

leading to an accumulation of acetylcholine, which stimulates nasal mucosa resulting in increased nasal secretion and congestion...Further research is needed to determine a mechanism or mechanisms, as well as to determine whether a synergistic effect occurs in the upper airway with use of glyphosate and 2,4-D. (89)

"High Pesticide Exposure Events (HPEE) are more common amongst people who use the chemicals"

"More emphasis needs to be placed on the health and well being of Australian farmers and workers, often forced to produce food under trying conditions"

15. FOOD IRRADIATION

The largest food irradiation company in Australia is likely to be Steritech Pty Ltd. Steritech is already using arguments that because of regulatory restrictions on insecticides *"there is growing interest in the benefits of chemical-free alternatives to treating food"*. [107]. Steritech irradiate food using Gamma irradiation, with Cobalt 60 used as the most common source of Gamma Radiation. According to the US EPA food irradiation *"does not eliminate dangerous toxins that are already there; it masks the aging of fruits and vegetables, it kills bacteria that produce smells that warn us food is spoiling, and it disqualifies food from being labeled "organic."* [108].

At the 1987 US Congressional Hearings Into Food Irradiation, a number of experts spoke out against food irradiation. Concerns included; increases in polypoloid cells in the bone marrow of rats and mice fed with freshly irradiated wheat, increased polypoloid (abnomal) cells in monkeys fed with freshly irradiated wheat, intrauterine mutations in mice fed with freshly irradiated wheat, the small number of studies supporting irradiation, unexplained deaths and abnormalities in test rats, reduced vitamin and nutrient value of irradiated food, increases in free radicals in irradiated food, the formation of new molecules in irradiated food, conversion of nitrate to nitrite in irradiated food, increases of peroxides in irradiated polyunsaturated fats and the chemical transformation of foods, mutagens, carcinogens and cytoxic substances in food or food components which have been irradiated. [109]

16. ROUNDUP/GLYPHOSATE & INERTS

Roundup is the most commonly used herbicide in Australia. Studies are uncovering some worrying aspects about this supposedly 'safe' pesticide. These recent findings show how fraught the use of pesticides actually is. Roundup is often perceived as being safe to use in the community with few side effects. It is used widely throughout Australian urban and rural areas, however how many of its regular users are may be unaware of its dangers.

...researchers have found that one of Roundup's inert ingredients can kill human cells, particularly embryonic, placental and umbilical cord cells... Nearly 4,000 inert ingredients are approved for use by the U.S. Environmental Protection Agency... But in the new study, scientists found that Roundup's inert ingredients amplified the toxic effect on human cells—even at concentrations much more diluted than those used on farms and lawns. One specific inert ingredient, polyethoxylated tallowamine, or POEA, was more deadly to human embryonic, placental and umbilical cord cells than the herbicide itself – a finding the researchers call "astonishing."... The research team suspects that Roundup might cause pregnancy problems by interfering with

hormone production, possibly leading to abnormal fetal development, low birth weights or miscarriages... Last month, an environmental group petitioned Argentina's Supreme Court, seeking a temporary ban on glyphosate use after an Argentine scientist and local activists reported a high incidence of birth defects and cancers in people living near crop-spraying areas. Scientists there also linked genetic malformations in amphibians to glysophate. In addition, last year in Sweden, a scientific team found that exposure is a risk factor for people developing non-Hodgkin lymphoma. Inert ingredients are often less scrutinized than active pest-killing ingredients..." (90)

In January, well-known plant pathologist and retired Purdue University professor Don Huber sent a letter to U.S. Agriculture Secretary Tom Vilsack warning of tests that indicated glyphosate could be contributing to spontaneous abortions and infertility in pigs, cattle and other livestock. Scientists in Argentina last year published a study saying glyphosate caused malformations in frog and chick embryos....Another study being looked at by the EPA cited detectable concentrations of glyphosate in the urine of farmers and their children in two U.S. states. Higher levels were found in farmers who did not wear protective clothing when they used glyphosate or who otherwise improperly handled it...The agency also said it is looking at a study partly sponsored by the EPA and the National Institutes of Health (NIH) that found some users of glyphosate were observed to have a higher risk of multiple myeloma, a cancer affecting bone marrow, than people who never used the chemical. (91)

Very low doses of some types of the herbicide Roundup can disrupt human liver cell function; the formulations' toxicity may be tied to their "inactive" ingredients rather than the active weed-killing ingredient glyphosate. French scientists report that a number of Roundup formulations tested at very dilute concentrations can alter hormone actions and cause human liver cells to die within 24 hours of treatment... In the study, exposure of a single gene regulated by either estrogen or androgen hormones demonstrated that all formulations disrupt hormone function more efficiently than purified glyphosate. The findings show that the formulations act against the hormones to produce anti-estrogenic and anti-androgenic effects. (92)

"... the widely-used herbicide Roundup causes birth defects as well as "endocrine disruption, damage to DNA, reproductive and developmental toxicity, neurotoxicity, and cancer" at amounts similar to pesticide residue found on produce... Research dating back to 1980 showed that glyphosate, the active chemical in Roundup, caused birth defects in laboratory animals....More recently, a new pathogen that causes miscarriages in animals was discovered in genetically-modified crops treated with Roundup. Don Huber, professor emeritus at Purdue University, has written to US Secretary of Agriculture Tom Vilsack, asking for a moratorium on the deregulation of Roundup Ready crops. Dr. Huber also cited that glyphosate causes plant diseases and alters plants, which can lead to animal disorders." (93)

"...the main active ingredient in Roundup causes malformations in frog and chicken embryos at doses far lower than those used in agricultural spraying and well below maximum residue levels in products presently approved in the European Union. The Carrasco group was led to research the embryonic effects of glyphosate by reports of high rates of birth defects in rural areas of Argentina where Monsanto's genetically modified "Roundup Ready" (RR) soybeans are grown in large monocultures sprayed from airplanes regularly." (94)

"...The conversion of US agriculture to monochemical herbicide practice has resulted in the extensive use of glyphosate herbicides. Coincidentally, farmers have been witnessing deterioration in the health of corn, soybean, wheat and other crops, and epidemics of diseases in small grain crops. All are associated with the extensive use of glyphosate, which has increased further since the introduction of glyphosate-tolerant, Roundup Ready (RR) crops.

Glyphosate immobilises nutrients required to maintain plant health and resistance to disease. This weakening of the plants defence could explain the infestation of GM crops with the new pathogen, which has now been observed in horse, sheep, pigs, cows, chicken, multiple animal tissues including reproductive parts (semen, amniotic fluid), manure, soil, eggs, milk, as well as the common fungal pathogen that is currently infesting RR crops, Fusariumsolani fsp glycines mycelium. All are coming into contact with glyphosate either through direct exposure or consumption through animal feed. It is also highly abundant in crops suffering from plant Goss' wilt and sudden death syndrome..." (112)

"...the main active ingredient in Roundup causes malformations in frog and chicken embryos..."

17. APPENDICES

http://www.whatsonmyfood.org/index.jsp Pesticide Residues Found by USDA Pesticide Data Program. This list is very useful in determining what foods are likely to have higher concentrations of pesticides and which are likely to have lower residues. This will be of benefit to shoppers on low budgets who can avoid the produce with the higher number of detections.

CELERY 64
WATER UNTREATED 63
PEACHES 62
WATER FINISHED 59
GREENS, KALE 55
STRAWBERRIES 54
BLUEBERRIES 52
LETTUCE 51
SWEET BELL PEPPER 49
SPINACH 48
GREENS, COLLARD 46
GREEN BEANS 44
WATER GROUNDWATER 44
SUMMER SQUASH 41
APPLES 42
CHERRIES 42
SPINACH, FROZEN 42
PEACHES, SINGLE SERVE 40
POTATOES 37
CUCUMBERS 35
TOMATOES 35
GRAPES 34
BROCCOLI 33
NECTARINES 33
APPLE SAUCE 28
PEARS 28
WATERMELON 28
WINTER SQUASH 28
CANTALOUPE 27
CARROTS 26
RAISANS 26
GREEN ONIONS 24
POTATOES, FROZEN 24
BLUEBERRIES, FROZEN 21
PLUMS 21
EGGPLANT 18
GREEN BEANS FROZEN 18
CAULIFLOWER 16
ORANGES 16
WHEAT FLOUR 16
CORN GRAIN 15
STRAWBERRIES, FROZEN 15
WHEAT GRAIN 15
APPLES – SINGLE SERVINGS 14
MUSHROOMS 14
CRANBERRIES 13
GRAPE JUICE 13
RICE 13
APPLE JUICE 12
BANANAS 12
HONEY 12
MILK 12
PLUMS, DRIED PRUNES 12
SWEET PEAR, FROZEN 12
BUTTER 11
GRAPEFRUIT 11
HEAVY CREAM 11
PEAR JUICE CONCENTRATE/ PUREE 11
WATER BOTTED 11
SOYBEAN GRAIN 10
ASPARAGUS 9
ALMONDS 9
ORANGE JUICE 9
PEANUT BUTTER 8
SPINACH, CANNED 8
SWEET POTATOE 8
TOMATO PASTE 8
BARLEY 7
PEARS, SINGLE SERVINGS 7
OATS ROLLED/BRAN 6
PINEAPPLES 6
WINTER SQUASH FROZEN 6
GREEN BEANS CANNED 5
PEARS, CANNED 5
TOMATOES, CANNED 5
PEACHES, CANNED 3
ASPARAGUS, CANNED 2
ONIONS 1
SWEET CORN 1

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19. ORGANIC FOOD SUPPLIERS WITHIN THE CITY OF YARRA

FRIENDS OF THE EARTH FOOD CO-OP
312 Smith Street, Collingwood 3066.
http://www.melbourne.foe.org.au/?q=co_op/home
9417 4382

The Friends of the Earth Food Co-op was started over 30 years ago by committed people highly concerned about the safety of the food that they were eating. The FoE Food Co-op provides affordable, low packaged (bulk) food, fruit and vegetables, health and eco-cleaning products. The Co-op's particular emphasis is to provide natural, organic produce that is grown and prepared locally - preferably by small companies and producers.

Friends of the Earth strongly believes that eating healthy food is the key to having a healthy life and society. Friends of the Earth has long resisted the arguments put forward by the agricultural and chemical industries, that pesticides are a necessity of modern day agriculture. People have the right not to put pesticides into their body, nor to rely on agricultural processes that often pollute the environment with pesticides and other toxic substances.

The Co-op fosters a different relationship to food. It also supports alternative forms of production, ownership and employment. Many foods are unpackaged, meaning that the buyers bring in their bags or jars – which in turn eliminates the need for most packaging. The Co-op wherever possible sells only organic or biodynamic foods. Most foods are also sold in their raw form.

By shopping at the Co-op, people are supporting a co-operative form of ownership and management, and undermining the power and dominance of large supermarket chains, the food processing industry, and the global chemical corporations that stand behind them. Profits generated through purchasing at the Co-op support the running of other Friends of the Earth environmental and social justice campaigns.

You can contact the Friends of the Earth Food Co-op on (03) 9417 4382

OTHER SUPPLIERS OF ORGANIC FOODS (MAINLY) WITHIN THE CITY OF YARRA

SOUTH MELBOURNE COMMONS
(FRIENDS OF THE EARTH)
Fruit and Veg Boxes Home Delivery
Bank and Montague Street
217 – 239 Montague Street,
South Melbourne
eco.market@foe.org.au
9682 5282

ORGANIC WHOLEFOODS
277 Smith Street, Fitzroy, 3065

THE ORGANIC GROCERY
318 Bridge Road, Richmond

ORGANIC ANGELS
Organic Food Home Delivery within 30km
radius of Melbourne
1300 792 775
www.organicangels.com

CLAY FINE FOOD HEALTH STORE
Shop 719 Rathdowne Street, Carlton North
9349 3957

EARNEST BEAR COMPANY
16 Robert Street, Collingwood
8415 1379

JASPER COFFEE (WHOLESALE)
Collingwood, 3066
wholesale@jaspercoffee.com
9416 1960

MOUNTAIN GOAT BEER PTY LTD
Warehouse 1, 18 River Street, Richmond, 3121
goat@goatbeer.com.au
9428 1180

TEA TONIC (HERBAL TEA)
Richmond, 3121
lisahilbert@ozemail.com.au
9328 8100

TOURON PTY LTD (WINE)
chapouteir.mtbenson@bigpond.com
9429 8301

THE KING ISLAND COMPANY CHEESE PROCESSING
Richmond North, 3121
9421 0155

BURRA FOODS AUSTRALIA DAIRY PRODUCTS
Burnley
traceyj@burrafoods.com.au
8416 0300

COLLINGWOOD CHILDREN'S FARM FARMERS MARKET
2nd Saturday Every Month [8am - 1pm]
St Heliers Street, Abbotsford
www.mfm.com.au

FRITZ GELATO RICHMOND
334 Bridge Road, Richmond, 3121

SUPPLIERS OF ORGANIC FOODS CONTINUED

SLOW FOOD MELBOURNE FARMERS MARKET
4th Saturday Every Sunday

ABBOTSFORD CONVENT
St Heliers Street, Abbotsford
www.mfm.com.au

FATTO A MANO ORGANIC BAKERY
228 Gertrude Street
Fitzroy 3065
ph/fax: 9417 5958
fattomano@optusnet.com.au

NATURAL TUCKER
809 Nicholson Street,
Carlton North 3054
naturaltuckerbakery.com

HAPPY PUMPKIN
763 Nicholson Street,
Carlton North 3054

DELICIOUSLY ORGANIC
123 Queens Parade,
Clifton Hill

LOAFER BREAD
146 Scotchmer Street,
Fitzroy North, 3068
9489 0766
loafer_bread@yahoo.com

GULLY GREENGROCER
Shop 2, 101 Station Street,
Fitzroy, 3065

THOMAS DUX
153 Bridge Road, Richmond

THE GREEN GROCER
217 St Georges Road, Fitzroy North
http://www.thegreengrocer.com.au
9489 1747

CERES
Cnr Roberts and Stewarts St Brunswick East
9389 0100 www.ceres.org.au

LOCAL HARVEST
localharvest.org.au

ORIGINAL FOODS PTY LTD
Collingwood, 3066
sam@originalfoods.com.au
9419 5100

20.GLOSSARY

ADHD: Attention Deficit Hyperactivity Disorder

ADI: Acceptable Daily Intake

ALL: Acute Lymphoblastic Leukemia

APVMA: Australian Pesticides and Veterinary Medicines Authority

AQIS: Australian Quarantine and Inspection Service

ASD: Autism Spectrum Disorders

ATDS: Australian Total Diet Study

BPA: Bisphenyl A

DDE: Dichlorodiphenyldichloroethylene

DDT: Dichlorodiphenyltrichloroethane

DOHA: Department of Health And Aging

DPI: Department of Primary Industries

EDC: Endocrine Disrupting Chemical

EPA: Environment Protection Agency

FoE: Friends of the Earth

FSANZ: Food Standards Australia New Zealand

PCB: Polychlorinated Bifenyl

PFOA: Perflurooctanoic Acid

POEA: Polyethoxylated Tallowamine

POPs: Persistent Organic Pollutants

STS: Soft Tissue Sarcoma

IQ: Intelligence Quotient

LD50: Lethal Dose 50

MCS: Multiple Chemical Sensitivity

MRL's: Maximum Residue Limits

NHL: non-Hodgkins Lymphoma

NMDA: N-Methyl-D-Aspartic Acid

NOEL: No Observable Effect Level

OC: Organochlorine Pesticide

OP: Organophosphate Pesticide

PAN: Pesticide Action Network

HPEE: High Pesticide Exposure Events

IARC: International Agency For Research On Cancer


Friends of
the Earth