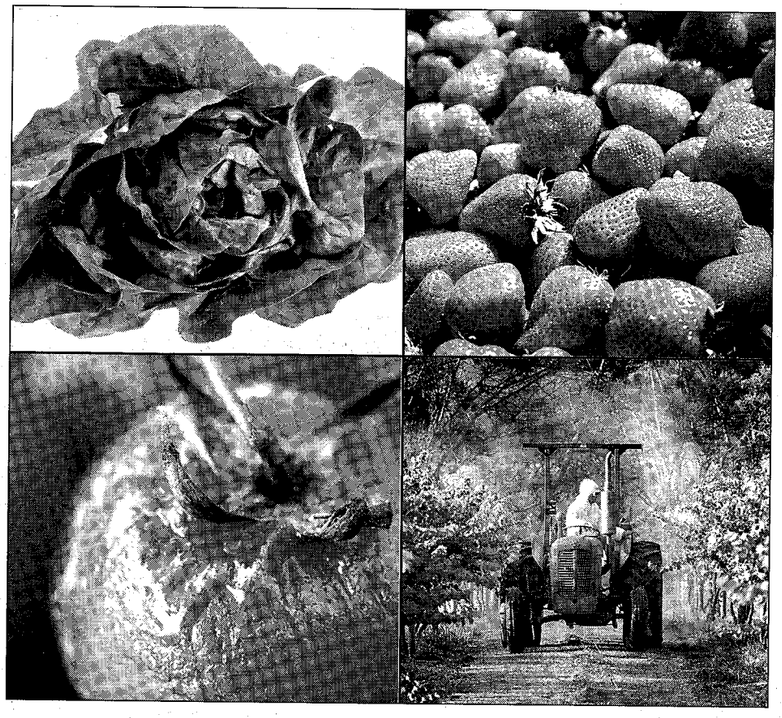
The Sydney Morning Herald

Chemical reactions

After a major *Herald* investigation that found industrial waste is widely sold as fertiliser, **Berwyn Lewis** looks at the chemical count in food and the long-term effects.



TODAY'S food looks good, but is it doing good? Are today's hunters and gatherers eating their way to bad health as they graze across shops, takeaway outlets and supermarkets? Can you be sure about a strawberry? When is a lettuce less of a lettuce and more of a chemical cocktail?

Billions of dollars worth of fertilisers, pesticides, herbicides and fungicides are poured and sprayed over plants, animals and soils worldwide each year. They seep into rivers, waterways, the seas and water supplies.

There are gatekeepers, however. The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) sets levels at which residues of chemicals are considered safe enough to remain in food.

Known as maximum residue limits (MRLs), they are normally set at levels well below those that would cause an adverse health effect.

But a recent paper, "Risk Assessment of Chemical Mixtures", prepared by Brian Priestly, the scientific director of the chemicals unit at the Commonwealth Department of Health, highlights a concern.

"Most risk assessments use databases developed under circumstances in which only the toxicity of the chemical acting alone can be determined," Priestly says. Although regulators do not ignore the potential problems of chemical interactions, Priestly says "risk assessment procedures for multiple chemical exposures are so complex that a meaningful solution is not apparent at this time".

We encounter chemicals at home, at school, at work, in water and the air. At this stage, no-one knows what the cumulative effects of toxic mixtures are. Priestly believes that safety factors are based on a presumption that "must remain speculative".

Scientists are not ignoring this potential problem. There are many tests involving rats and mice under way in the United States, Canada and Britain. In Australia, the Australia New Zealand Food Authority (ANZFA) is also developing a computer model which will include a database for chemical concentrations, pesticide residues and contaminants in food. It will make it possible to calculate the risks of chemical reactions when someone indirectly consumes up to 15 pesticides in one day.

Priestly quotes American studies which conclude that "there is unlikely to be any imminent danger to public health" but "in view of possible toxicological interactions that can occur as a result of pesticide mixtures, development of knowledge on combined toxic effects should be encouraged".

Some food scientists argue that the likelihood of human poisoning is much greater from microbiological contamination of inadequately prepared or stored food rather than from the presence of low levels of pesticide residues.

"We are satisfied that our food is safe. We're confident it's among the safest in the world," says ANZFA spokesperson Michael Dack.

The World Health Organisation listed 21,000 deaths from pesticides and 3 million cases of severe pesticide poisoning in 1996, when figures were last compiled. Every two years ANZFA's Total Diet Survey estimates Australians' dietary exposure to pesticides and contaminants and sets "acceptable" levels.

For instance, the latest one, the 19th survey, in 2001, found "safe" average levels in 27 composite samples of lettuce.

The survey also found that the dietary exposure of Australians to pesticides was 1 per cent of the acceptable daily intake (ADI) or less for endosulfan, iprodione and procymidone. For methamidophos, the dietary exposure was 2-3 per cent of the ADI.

At very high levels of exposure, endosulfan is highly toxic to humans. It affects co-ordination and balance and can cause vomiting and difficulty in breathing and has been shown to have mutagenic effects on mammals.

Procymidone is classified as a carcinogen by the Environmental Protection Authority in the US and methamidophos is linked to hormonal problems and to cardiac failure, central nervous system impairment, eye problems and gastrointestinal problems.

"A question mark hangs over the combined effects. We don't know what the cocktail represents," says Ben Cole, of the Total Environment Centre in Sydney.

According to Cole, almost 40 chemicals that have been deregistered in European countries are still used in Australia. They include atrazine (a weed controller), carbaryl (registered as a Class 3 carcinogen by the International Agency for Research on Cancer and a known hormone disrupter), endosulfan (an organochlorine which can accumulate at each level of the food chain it passes through), paraquat (an eye and skin irritant toxic to mammals and banned in five European countries and the US), ziram (an endocrine disrupter and potential carcinogen) and zineb.

Registered as a potential carcinogen and endocrine disrupter, zineb mimics hormones in bodies and can create developmental and reproductive defects. Banned in five European countries and the US, it can cause thyroid defects and adversely affects sexual development in children.

The NRA has reviewed atrazine and its ongoing use is supported by Australia's health authorities. Carbaryl, endosulfan and paraquat are all being reviewed and the class of fungicides that includes ziram and zineb is priority-listed for NRA review.

"The potential for residues to occur in food is measured against the ADI. If it's over the ADI the products don't get registered," says Trevor Doust, the NRA's manager of chemistry and residues evaluations.

Some doctors believe that the increase in behavioural disorders among children can be linked to the use of pesticides. The effects are difficult to measure and may not become evident until later in life. There is also growing concern, mostly among some sections of the medical profession, about exposure to hormone-disrupting pesticides in early life.

Some medicos believe that trends in decreasing sperm counts, increasing rates of cancer, earlier puberty in girls and birth defects can be linked to the use of pesticides in agriculture.

Gary Deed, a Brisbane GP who works in nutritional and environmental medicine and medical herbalism, is concerned about a concept called "toxic load". He defines it as what happens when "children, those with immune deficiencies, the elderly or people who are exposed to high levels of chemicals in their domestic or work environments cannot adapt".

"Illness results from the whole load. Add nutrient deficiencies and you really aggravate the problems.

"If food is contaminated and also lacks nutritional content because of accelerated farm-to-market practices there are two paths of concern in one item, deficiency of nutrients and the toxic load."

Deed quotes research in the US which is examining links between mercury accumulation and autism and other behavioural disorders, the incidences of which have increased dramatically in recent years.

Mark Donohoe, a Sydney GP who specialises in environmental medicine, believes we "have gone overboard with pesticides".

One consequence is that we are growing crops that are not producing their own natural pesticides (salicylates), says Donohoe, who regularly lectures to GPs on the adverse health effects of pesticides and organic pollutants in programs that are approved by the Royal Australian College of GPs.

"Aspirin is basically salicylic acid. We're giving people that to prevent heart disease, strokes, cancer. People are not getting salicylates in food. They are needed by humans to prevent heart disease, strokes, arthritis and cancer," he says.

"The regulatory side deals adequately with one pesticide at a time but it doesn't deal with complex mixtures," says Donohoe. He says one group of pesticides known as organophosphates are a greater threat to children because they tend to eat a less varied diet and more food per kilo of body weight.

The Environmental Protection Agency in the US estimates 27,000 tonnes of organophosphates are applied to US agricultural crops every year.

A review last year by a Boston doctors' group, "In Harm's Way – Toxic Threats to Child Development", reported that an estimated 17 per cent of children under 18 were suffering from one or more developmental, learning and behavioural disabilities. It called this "a problem of epidemic proportions" and linked it to "chemicals commonly encountered in industry and the home".

At the end of the food chain there are at least 14 petrochemical-derived food colourings used in Australia that are banned in other countries. "They have been found to cause tumours and cancer in laboratory animals as well as a host of other problems," claims Bill Statham, the author of *The Chemical Maze*.

"For example, amaranth is linked to hyperactivity in some children. It was banned in the US in 1976."