Organochlorines Research in New Zealand
A Bibliography

Public Health Intelligence
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**Introduction**

Publications about organochlorines in New Zealand are listed chronologically in this bibliography beginning with the most recent, and categorised according to whether they are journal articles or a report and related more to health or the environment. An abstract or summary has been provided for most of the publications that are concerned with human health and in some instances for those about the environment. A more comprehensive list and abstracts of publications about organochlorines in the New Zealand environment up to 1996 is contained in a bibliography prepared by the Ministry for the Environment\(^1\).

**Abbreviations**

2,4-D 2,4-dichlorophenoxyacetic acid  
2,4,5-T 2,4,5-trichlorophenoxyacetic acid  
ACC Accident Compensation Corporation  
CI confidence interval  
DDT dichlorodiphenyltrichloroethylene  
DSIR Department of Scientific and Industrial Research  
HCH hexachlorocyclohexane  
HpCDD heptachlorodibenzodioxin  
HxCDD hexachlorodibenzodioxin  
IARC International Agency for Research on Cancer  
IWD Ivon Watkins Dow  
OCDD octachlorodibenzodioxin  
OR odds ratio  
PCB polychlorinated biphenyl  
PeCDD pentachlorodibenzodioxin  
PCDD polychlorinated dibenzodioxin  
PCDF polychlorinated dibenzofuran  
PCP pentachlorophenol  
SIR standardised incidence ratio  
SMR standardised mortality ratio  
TEQ toxic equivalent  
TCDD tetrachlorodibenzodioxin  
TCDF tetrachlorodibenzofuran

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\(^1\) Buckland S. Organochlorines in the New Zealand environment: a bibliography of publications. October 1996.
Health

Journal articles


Breast milk samples from 38 women in New Zealand were analysed for organochlorine pesticides, PCBs, PCDDs, and PCDFs as part of a World Health Organization collaborative study. The women were recruited from two urban areas (Auckland and Christchurch) and two rural areas (Northland and North Canterbury). Maternal age was the best predictor of breast milk contaminant concentrations. Regional differences were found for hexachlorobenzene, dieldrin and pp-DDE, reflecting historical use patterns. On a whole-milk basis urban-rural differences were found for several PCBs, and PCDD/Fs. These differences could be attributed to variation in breast milk fat rather than rural mothers. Evidence suggests that infant breast milk consumption is regulated by caloric intake, almost all of which is in the fat fraction. This suggests that breast milk contaminant levels, calculated on a whole milk basis do not necessarily reflect the relative levels of exposure of infants.


This case study explores some of the reasons why guidelines to clean up land contaminated by PCP use in timber treatment occurred relatively quickly in comparison to lingering controversy over PCP exposed workers’ health. Reasons include New Zealand’s legislative environment and cultural values. It suggests that symbols of national identity in particular New Zealand’s clean green image can play an important role in the resolution of controversy as they provide a strong impetus for action.


This study presents the findings of the individual assessments of workers recommended by the PCP Expert Medical Panel (Beasley et al 1995). This was undertaken on behalf of the ACC to assess them for compensation. Sixty-two self-selected PCP exposed timber workers were interviewed, examined and assessed by laboratory and psychometric investigations for clinical syndromes that could be related to PCP exposure. A likelihood test of poisoning developed by the Royal Australasian College of Physicians for use in circumstances of uncertainty was used. Three groups were identified: an acute complex of fever, headaches, upper and lower respiratory tract and eye irritation, skin disease and foul smelling and discoloured sweat; a chronic fatigue syndrome; and a delayed encephalopathy. Neither of the chronic syndromes was considered characteristic of PCP poisoning. There was no statistically significant correlation between exposure index and test-of-poisoning score.


Blood samples from 28 self-selected adults in a single region of New Zealand were analysed for PCDD/Fs. Plasma concentrations for males and females were similar and increased with increasing age.


This letter to the editor discusses the evidence for an association between phenoxy herbicide exposure and soft tissue sarcoma and malignant lymphoma from Swedish studies, and encourages action to prevent future excessive occupational 2,4,5-T
exposure in New Zealand and prompt notification of cancer cases to the cancer registry.

A response to this letter followed from AH Smith (NZ Med J 1980; 91(658): 318–9) encouraging prompt notification of soft tissue sarcoma cases and announcing a case-control study.


This study was a historical cohort study of mortality of 21,863 workers exposed to phenoxy herbicides, chlorophenols and dioxins in 12 countries including New Zealand. Subjects were followed from 1939 to 1992. Excess mortality from soft tissue sarcoma and slight elevations from all cancers, non-Hodgkin’s lymphoma and lung cancer were seen among workers exposed to phenoxy herbicides contaminated with TCDD or higher chlorinated dioxins. Risks for all cancers, for sarcomas, and for lymphomas increased with time since first exposure. Statistically significant excess mortality was seen for all cancers, other respiratory cancers, and kidney cancer.


Eleven soft tissue sarcoma and 32 non-Hodgkin’s lymphoma cases occurring within an international cohort were matched for age, sex, and country of residence. Excess risk of sarcoma was associated with exposure to any phenoxy herbicide (OR = 10.3; 95% CI = 1.2-91) and to each of the three major classes of phenoxy herbicides (2,4-D, 2,4,5-T and 4-chloro-2-methylphenoxyacetic acid), to any PCDD or PCDF (OR = 5.6; 95% CI = 1.1-28) and to TCDD (OR = 5.2; 95% CI = 0.85-32). Associations were generally weaker in the non-Hodgkin’s lymphoma study.


A cohort of 8,456 workers employed for at least one year in three New Zealand pulp and paper mills between 1978 and 1990 were followed up until 1992 as part of an IARC international collaborative study of mortality and cancer incidence in pulp and paper workers. Overall mortality and total cancer mortality rates were lower than expected in the general population. There was a marginal increase in lung cancer mortality (SMR = 1.33, 95% CI 0.94-1.83), and a marginal increase in lung cancer incidence among those who had worked in the non-production department (SIR = 1.51, 95% CI 1.02-2.15). Numbers of cases were too small for detailed analyses of associations between disease and specific exposures.

Report to the Minister of Health of an investigation into allegations of an association between human congenital defects and 2,4,5-T spraying in and around Te Kuiti. *New Zealand Medical Journal* 91 (658): 314–5.
The Department of Health carried out an investigation in response to a medical practitioner linking the birth of two babies with fatal congenital abnormalities to 2,4,5-T exposure. One baby had biliary atresia and the other had cardiac defects. It was not established that either woman were significantly exposed to 2,4,5-T at any time during her pregnancy.


Data from the New Zealand case-control study of non-Hodgkin’s lymphoma were reanalysed by duration and frequency of phenoxy herbicide use to see if differences in frequency account for the differences in relative risk estimates found in New Zealand, United States and Swedish studies. There was little evidence of an association with duration or frequency of phenoxy herbicide use.


An earlier case-control study of non-Hodgkin’s lymphoma was expanded to include 183 male case and 338 male controls with other cancers matched for age and year of registration. No elevated risks were found for exposure to phenoxy herbicides or chlorophenols. The earlier finding of an excess risk associated with fencing work was weakly supported (1.4; 90% CI=1.0-2.0), and with employment in a meat works was more strongly supported. However the excess risk for meat workers was not confined to where potential chlorophenol exposure occurs (ie, the pelt department) suggesting an alternative hypothesis.


An earlier case-control study in New Zealand found an increased risk of non-Hodgkin’s lymphoma among agricultural workers. In this case-control study 83 cases of non-Hodgkin’s lymphoma were compared with 168 controls with other types of cancer and 228 general population controls.

There were no significant differences between cases and controls with respect to exposure to phenoxy herbicides or chlorophenols. Odds ratios for fencing work and/or employment in a meat works, in both of which there is potential exposure to chlorophenols, were significantly raised but the authors expressed caution with interpretation given the number of multiple comparisons involved.

An earlier case-control study in New Zealand found an increased risk of multiple myeloma among agricultural workers. No significant differences were found between 76 cases of multiple myeloma and 315 controls with other types of cancer for exposure to phenoxy herbicides or chlorophenols.


This study was a historical cohort study of mortality in an IARC register of 18,910 production workers or sprayers from ten countries including New Zealand. Exposure to phenoxy herbicides and/or chlorophenols was reconstructed through questionnaires, job histories, and factory or spraying records. No excess was seen in all-cause mortality for all cancers, for the most common epithelial cancers, or for lymphomas. An excess of soft tissue sarcomas was found among sprayers but did not seem to be specifically associated with those herbicides probably contaminated by TCDD. Risks appeared to be increased for cancers of the testis, thyroid, other endocrine glands, and nose and nasal cavity, based on small numbers of deaths.


This letter to the editor postulates that the birth of two babies with neural tube defects within one month of one another from adjacent Waikato farms was linked to aerial 2,4,5-T spraying during the first trimester of each woman’s pregnancy and contamination of roof drinking-water.


This letter to the editor debates the possible health effects of 2,4,5-T. The debate is generated by public identification of ‘clusters’ of spina bifida in agricultural areas.


A postal questionnaire survey was used to compare reproductive outcomes among pesticide applicators with those of agricultural contractors. Each outcome was classified according to whether or not the father sprayed 2,4,5-T during the year of the outcome or the preceding year. Relative risk estimates of 1.19 for congenital effects and 0.89 for miscarriages were not statistically significant. Both exclusion of smokers and exclusion of Māori from the analysis resulted in similar risk estimates.

A postal questionnaire survey was used to compare reproductive outcomes among pesticide applicators with those of agricultural contractors. Rates of congenital defects, stillbirths and miscarriages among pesticide applicator births did not differ from the rates among agricultural contractor births. The rate of congenital defects for each group was similar to those reported in other New Zealand studies.


The average TCDD serum level for nine professional 2,4,5-T applicators was almost 10 times that for the matched control subjects, while the average levels of all other congeners and isomers did not differ substantially. The variation in TCDD levels among the applicators was related to their duration of 2,4,5-T exposure. It was concluded that increased risks of cancer from brief exposure to phenoxy herbicide reported in other countries are probably not attributable to the TCDD that contaminates 2,4,5-T. It was not possible to determine from these results whether TCDD exposure from prolonged use of 2,4,5-T poses significant health risks.


A case-control study involving 82 subjects with soft tissue sarcoma and 92 controls with other types of cancer found estimates of relative risk of 1.3 (90% CI= 0.6-2.5) and 1.5 (90% CI= 0.5-4.5) for exposure to phenoxy herbicides and chlorophenols respectively.


This study was a historical cohort study of non-cancer mortality of 21,863 workers exposed to phenoxy herbicides, chlorophenols and dioxins in 12 countries including New Zealand. Subjects were followed from 1939 to 1992. Exposure to phenoxy herbicides contaminated with TCDD or higher chlorinated dioxins was associated with increased mortality from circulatory disease, particularly ischaemic heart
disease, and possibly diabetes. Risks tended to be higher 10 to 19 years after first exposure than for those exposed for 10 to 19 years.


This was a questionnaire-based study of 127 self-selected PCP workers who attributed their health problems to PCP exposure. Exposure was estimated from the work and task history of the participants. A dose-response relationship was observed between PCP exposure and reported fever/sweating, weight loss, fatigue, nausea, and a screening test for neuropsychological dysfunction (previously used in studies of solvent exposed workers).


Reports


Sawmill workers (n=79) listed on the PCP exposure register set up by the Engineering, Printing and Manufacturing Union were followed up by a group of medical students to seek information about whether they had sought and obtained accident compensation. Seventy-nine percent of the 54 workers with whom contact was made participated in a telephone survey. Occupational Safety and Health had referred 34 of these workers to the independent panel convened by ACC for examination. These workers had a significantly greater percentage of symptoms and significantly higher exposure than those not referred to the panel. Eleven of the 29 workers who were examined and another three from the register submitted a claim to ACC – five were successful. Almost three-quarters of the workers felt it was unclear how to make an ACC claim for their PCP-related health effects. The average year of discovery regarding the health risks associated with PCP among the workers was 1990; three percent were still unaware of the risks at the time of the study. Conclusions included criticism of the ACC compensation process and the lack of responsibility for PCP exposed workers shown by any government agency.


Analysis of breast milk samples from 18 rural and 20 urban women in 1987/88 for organochlorine pesticides, PCBs, PCDDs and PCDFs found levels of PCDD and PCDF congeners were at the lower end of the range of levels, and levels of pp-DDE were equal to or higher than levels found in comparable studies from other developed countries.

Breast milk samples from 18 rural and 35 urban women in 1998/99 were analysed for organochlorine pesticides, PCBs, PCDDs and PCDFs. Levels had declined by about 70 percent since the 1988 study. Levels were low compared to similar studies from other developed countries.


This literature review of the known health effects of PCP exposure was commissioned by Carter Holt Harvey Ltd, Tasman Lumber Ltd and Forestry Corporation of New Zealand in response to union and timber industry concerns as to whether previous PCP exposure was responsible for reported ill-health in present and past timber workers.


A Ministerial Committee of Inquiry was set up in 1986 to advise on the impact from the manufacture of 2,4,5-T on the health of residents in New Plymouth. The Committee concluded that there was no substantiated evidence that the manufacture of trichlorophenol and 2,4,5-T has had any ill effect on the health of residents of New Plymouth.

Its recommendations were:

- manufacture and use of 2,4,5-T continue for 12 months provided that the dioxin content in any new product manufactured after 30 June 1987 is reduced to 1 ppb
- a research programme be undertaken during the next 12 months comprising:
  - an independent study funded by IWD of the pharmacokinetics of 2,4,5-T in IWD employees and a selected group of farmers and the families of both groups
  - identification by IWD of the sources of domestic contamination of farmers and their families and development of measures to prevent future contamination
  - identification by IWD of the sources of contamination which have led to positive
• blood levels in employees and action to minimise this contamination.

The Committee in consultation with certain government agencies and other groups would supervise the research programme and evaluate its results.

• Use of 2,4,5-T be banned from school grounds, playing fields, parks and all built up areas until the results of the research are known.

• IWD to report on implementation of recommendations made by Dr Pitblado, Department of Chemical Engineering, University of Sydney on the plant by 30 June 1987.

• IWD be required to undertake a risk analysis for the Spotswood area of the risks associated with normal manufacture and with the possibility of accidents relating to fires, explosions and uncontrolled emissions.

• That an immediate investigation be carried out into the fate of dioxin emitted from engine exhausts burning leaded petrol and if deemed a significant hazard leaded petrol should be phased out within a year.


Following the initial Ministerial Committee of Inquiry report research was undertaken to determine blood and urine levels for 2,4,5-T before and after work-related exposure and contact with 2,4,5-T involving three farmers, their wives and two children, three spray contractors and their wives, and six IWD employees. Wipe testing for 2,4,5-T was also carried out in the factory and domestic farm environments to determine the extent of contamination. The results confirmed that 2,4,5-T is rapidly absorbed into the blood and then excreted in the urine. In most cases levels in the urine were very low within seven days of exposure. Environmental contamination was widespread.

Recommendations made were:

• the Pesticides Board review instructions for pesticides use and take appropriate steps to ensure applicators are aware of and understand the instructions.

• Department of Health undertake monitoring of the home and work environment of farmers and spray contractors for pesticides in use other than 2,4,5-T including any replacement introduced for 2,4,5-T.

• Department of Health fund a study of spray contractors and their families with the purpose of establishing whether or not their mortality is different from that of a control group.

• IWD be required to undertake a risk analysis in relation to the Spotswood area for all their manufacturing processes.

• Department of Health fund an ongoing monitoring programme of exterior house walls near to IWD for any pesticides that may be escaping from the plant.
that all new chemical manufacturing plants be located in areas remote from residential areas and that local authorities be restrained from allowing subsequent housing developments near such plants.


Individual serum samples from a cross-sectional survey of the New Zealand adult population were pooled on the basis of age, sex, ethnicity and geographic region. People who reported occupational exposure to organochlorines were excluded. For the PCDDs and PCDFs almost all congeners were detected in almost every stratum with concentrations increasing across age groups. Mean concentration for those aged 15 years and older was 12.8 ng TEQ/kg lipid. A large number of PCB congeners were below the limits of detection. Mean concentration for those aged 15 years and older was 3.33 ng TEQ/kg lipid. The most frequently detected organochlorine pesticides were pp’-DDE, dieldrin and β-HCH.

There were no consistent differences found by sex or ethnicity. PCDD, PCDF and PCB concentrations appeared to be slightly higher in the Northland/Auckland and Waikato/Bay of Plenty regions relative to the lower North Island and the South Island. Concentrations of pp’-DDE increased markedly in a north-south direction. Concentrations of PCDDs, PCDFs, PCBs and β-HCH were at the lower end of the range of concentrations found in other developed countries and pp’-DDE levels were similar.


Retail food samples representing 53 different types of food bought in five New Zealand towns and cities were made into 22 composite food groups for analysis. Model diets for adult and adolescent males (representing worst-case intakes for these age groups) were developed to assess dietary intakes.

For adult males with a median energy diet the intake is estimated as 0.37 pg TEQ/kg bw/day and for adolescent males with a high energy (90th centile) diet the intake is estimated as 0.84 pg TEQ/kg bw/day. The level is lower than exposures reported for any other country where a comparable study has been undertaken.


Residues of three of 21 organochlorine pesticides (total DDT, dicofol, total endosulfan) were detected in foods analysed in the 1997/98 Total Diet Survey. DDT was found in eggs which was unexpected and its main metabolite DDE was detected in a wide range of animal products and processed foods containing animal products, and some imported plant products. DDT residues were not detected in any plant-based foods of New Zealand origin. Comparisons with previous diet surveys
(1987/88 and 1990/91) indicated that the mean concentrations of total DDT in selected foods has declined. Dicofol was detected in fruit and endosulfan in vegetables. Estimated daily dietary exposures for each of the organochlorines detected was less than one percent of the Acceptable Daily Intake.


This report is a general review of the health effects of the manufacture and use of 2,4,5-T.


This report reviewed the toxicology and epidemiology of 2,4,5-T and investigation into three alleged clusters of neural tube defects in Waikato, Northland and Taranaki. No evidence was found to implicate 2,4,5-T as a causal factor.


Samples of milk and cream offered for retail sale in eight areas of New Zealand were analysed for dioxin during a one-month period in 1989. Dioxin was undetectable in milk packaged in glass or plastic bottles. Low levels of dioxin were found to leach from cardboard packaging into milk. The Department of Health did not consider the levels indicated a risk to health but stated that human exposure should be kept to a minimum. Action was taken by industry.


All congenital abnormalities in seven catchment areas of Northland during 1960-77 were compared with the densities of aerial spray application in the same areas and time period. No evidence of association was found between aerial 2,4,5-T spraying and central nervous system abnormalities, including neural tube defects. Aerial spraying was significantly associated with incidence of talipes independent of ethnicity.

A summary version of this report was published in *Science* 1981, 212(4492): 349–351.

The study data were subsequently reinterpreted by Professor RB Elliott, Department of Paediatrics, Auckland University Medical School as to imply a possible causal association and submitted to the Environmental Council in 1986 in support of a total
ban on 2,4,5-T. This resulted in the Department of Health seeking comment from Professor D Skegg, University of Otago and Professor A Smith, University of California. Both highlighted the limitations of ecological studies and the lack of consistency with more definitive studies.

Hannah DJ, Buckland SJ, Taucher JA. 1988. *Polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) in New Zealand sheep fat.* Chemistry Division, Department of Scientific and Industrial Research.


A telephone survey commissioned by the Ministerial Committee of Inquiry of 295 randomly selected residents aged 20 or more years living downwind and within 2 km of the plant found 46 percent believed 2,4,5-T was a health hazard. Reported illness attributed to living near the plant was higher among long-term residents and households where the fumes were noticeable. Seven percent believed living near the plant had contributed to illness in their household.


Analysis was undertaken for 2,4-D and 2,4,5-T in blood samples from 60 people including residents, IWD staff and farmers. Blood from eight of 10 IWD employees, and all six farmers and two farmers’ wives (four months after spraying ceased) were positive for 2,4,5-T and some for 2,4-D. None of the 34 people living or working in the Spotswood area, many of whom believed they were suffering ill-health attributed to pesticides, had positive results.


No phenoxy herbicide residues were found at detection limits of 5 ppb for 2,4,5-T, 10 ppb for its breakdown product 2,4,5-TCP, and 2 ppb for 2,4-D in sheep meat samples from six 2,4,5-T user and five non-user farms. No sheep fat samples had TCDD at detection limits in the range of 0.2 to 2 ppt. Low levels (ppt) of other dioxins were found in some fat samples, only one of which was confirmed by independent analysis. Contamination from other sources such as combustion is likely. Conclusions about the presence of phenoxy herbicide or dioxin in the food chain were limited by the study’s small sample size.

This report reviews the data concerning organic contaminants obtained from samples collected from New Zealand potable water supplies between May 1987 and May 1991 for analysis by the DSIR. The data included pesticides, polychlorinated biphenyls and for a limited number of samples, dioxins.


This report analysed cancer registrations (1990-97), cancer mortality (1988-97) and birth defects notifications (1988-99) for Moturoa (which includes Paritutu) in response to public concerns about health effects associated with living near the former IWD plant in Paritutu. No difference in cancer registrations, a lower rate of birth defects notifications and six percent (within the range of variation expected by chance) higher cancer mortality was found compared to the New Zealand population. The results do not exclude a small increased cancer risk.

Multiple sclerosis data were also obtained from the local Multiple Sclerosis Society, general practitioners and interview of cases identified by the Dioxin Investigation Action Group. Eight current or former residents of Paritutu were identified with multiple sclerosis two of whom were long-term residents. There was a fairly even spread between onset of symptoms before living there, while living there, and after leaving.


The inquiry’s main focus was the health status of the children of veterans including personnel who served in Vietnam during 1964–1972. There was a 60 percent survey response rate for the 2,240 (of 3,368) veterans for whom an address was available. Other limitations included the small number of people involved, the relative infrequency of health effects, lack of verification of the health effects, and lack of information about whether the incidence of health effects among veterans’ children was any different to what occurs in the general population.

The inquiry’s investigations did not convincingly demonstrate any causal connection between exposures to veterans and health effects in their children. Weight of
evidence suggested that those involved were never exposed to significant levels of chemical agents.

Recommendations included:
- children of Vietnam veterans whose present or future condition, as a result of their parent's exposure to chemicals during service, falls into the epidemiological categories of ‘sufficient evidence of association’ or ‘limited/suggestive evidence of an association’ (eg spina bifida) are provided with non-means tested medical treatment and social care
- a special assistance programme is established for the children of veterans managed within the proposed Office of Veterans' Affairs
- development and monitoring of the Register of Vietnam veterans' children
- establishment of a research capability to provide information on the health of veterans' children.


The current background exposure in New Zealand to dioxins and dioxin-like compounds has an insufficient margin of safety and steps should be taken to further reduce human exposure.

Recommendations were:
- a precautionary approach should be adopted
- a goal of ongoing reduction in population body burdens should be stated
- identifying a tolerable daily intake is not recommended
- a health exposure criterion should be established to regulate point sources of exposure
- application of the health exposure criterion should involve consideration of the plausible maximally exposed person from the point source activity
- the New Zealand population burden should be monitored periodically perhaps every 5–10 years
- policies and the health exposure criterion should be reviewed after consideration of trends revealed by future population monitoring.


The Task Force investigated 95 notifications of chronic pesticide poisoning, including 2,4,5-T, diagnosed using electroacupuncture according to Voll (EAV) by a medical practitioner, Dr M Tizard. In 82 percent of cases there was no evidence of exposure to the alleged pesticides and the patients’ symptoms followed no diagnostic
pattern. The Task Force was unable to establish a scientific basis for EAV and questioned the validity of the technique for the diagnosis of pesticide poisoning.


This report is a synopsis of three presentations made to the Royal Society of New Zealand annual meeting in 1980. Conclusions were that there are few grounds for regarding 2,4,5-T itself as having any important health hazards and the possible hazard represented by the contaminant dioxin appears negligible in the concentration currently present in 2,4,5-T distributed in New Zealand.


This report analysed hospital admission (1997) and mortality (1990-94) data for cancer and diabetes for the Whakatane District Council area in response to concerns among timber treatment workers about health effects from PCP exposure. There was no data on PCP exposure. The authors noted a high Māori population and high prevalence of tobacco smoking. Cancer mortality was higher for Māori, cancer hospital admissions were higher for Māori and non-Māori, and diabetes mortality and hospital admissions were higher for Māori and non-Māori compared to the New Zealand Māori and non-Māori population. The results do not confirm or exclude possible health effects from PCP exposure.

The Ministry of Health analysed data for all New Zealand territorial authority areas using the same methodology for standardisation as that used by Twitchin and Shoemack. This analysis also included cancer registration data. Cancer hospital admissions (1998) were higher for Māori and non-Māori in Whakatane District but also in the Far North, Gisborne, Grey, Kawerau, South Waikato, Waipa, Wairoa and Wanganui Districts and Hamilton City. Registrations for cancer (1990–94) were significantly lower than expected for each group.

Registrations for soft tissue sarcoma, hospital admissions for diabetes, mortality (1990-94) from soft tissue sarcoma and diabetes were not significantly different from that expected for these two groups. There was no difference from expected for cancer mortality for Māori and significantly lower mortality for non-Māori. Hospital admissions for soft tissue sarcoma were significantly higher for Māori whereas there was no difference from that expected for non-Māori.
Environment and Other

Journal articles

Buckland SJ, Ellis HK, Salter RT. 1996. Assessment of the New Zealand environment for levels of PCDDs, PCDFs, PCBs and other organochlorine contaminants. *Organohalogen Compounds* 28: 140–5.

A series of samples, including river water and soil were collected from throughout New Zealand and analysed for PCDDs, PCDFs and other organochlorine substances to determine background environmental concentrations of these contaminants. No PCDDs or PCDFs were detected at low pg L\(^{-1}\) limits of detection in composite samples collected from 13 river systems. No PCBs or organochlorine pesticides were similarly detected in these samples. Low to background levels of PCDDs, predominantly HpCDD and OCDD, and PCDFs were detected in a series of soil samples. Highest concentrations were found in samples collected from urban areas in provincial and metropolitan centres. Generally, the I-TEQ values were lower than those reported in soils from comparable European studies.


Samples of milks and cream packaged in glass, plastic and paperboard cartons were analysed for PCDDs and PCDFs. PCDDs and PCDFs were not detected in milk packaged in glass or plastic. The data confirms the source of TCDDs and TCDFs quantified in carton milks as coming from the paperboard packaging. TCDF isomers exhibit a greater ability to migrate than TCDD isomers. It has been found that the migration of these contaminants from the paperboard is not directly related to the fat content of the packaged dairy solution. Even though both brands of paperboard cartons investigated contained significant amounts of PeCDDs, HxCDDs, HpCDDs and OCDD, these congeners were not detected in any of the milks analysed. Process and papermaking additives have been identified as sources of these higher congeners.


The concentrations of PCP, PCDDs and PCDFs and organochlorine and organophosphorus pesticides in water, sediments and biota from a freshwater lake (Lake Rotorua) catchment were assessed and compared to evaluate the relative significance of the various contaminants and their sources.
PCP was detected in water, sediment and biota (fish and freshwater mussels). The highest concentrations in water (3.62 µg/L) and in sediments (400 ng/g dry weight) were found in and near a stream that had been affected by PCP contamination from a sawmill. PCDDs and PCDFs were found in water, sediment and biota. However, in all cases, except for the waters and sediments of the stream near to the sawmill, PCDD and PCDF concentrations were relatively low compared to values reported in the international literature for similar sites. Negligible pesticide contamination was found. Pesticides found included low concentrations of pp-DDE, pp-TDE and dieldrin in rainbow trout.


**Reports**


This report discusses structural and toxicological aspects of PCDDs and PCDFs, their formation during pentachlorophenol manufacture, and problems encountered in their analysis and presents the results of analysis for PCDDs and PCDFs of four sodium pentachlorophenate antisapstain formulations which have been commercially available in New Zealand.


Buckland SJ, Ellis HK, Salter RT. *Organochlorines in New Zealand: ambient concentrations of selected organochlorines in air*. Wellington: Ministry for the Environment.


This pilot study was undertaken by the Auckland Regional Council, Auckland District Health Board and the University of Waikato into the persistence of pesticides used previously on horticultural and agricultural sites. Soil samples were taken from cropping areas on 43 active or former horticultural properties in the Auckland region. The five contaminants most frequently detected above background levels included DDT and dieldrin. DDT (and/or its breakdown products) and dieldrin were only detected on properties developed before 1975. DDT and dieldrin levels exceed conservative guidelines for the protection of human health and/or the environment on 46 percent and 11 percent respectively of the 35 properties developed before 1975.


This pilot study was carried out at Waipa Mill near Rotorua to assess site contamination by PCP based timber treatment chemicals. Significant concentrations of PCP and PCDD/Fs were found in soils adjacent to areas where PCP was used during wood processing and where waste disposal had taken place. Concentration ranged from 0.35 mg/kg and 4710 mg/kg PCP and 0.3 µg/kg and 3300 µg/kg TEQ for PCDD/Fs. Soil concentrations were consistent with those reported internationally. Groundwater PCP contamination and elevated PCP and PCDD/Fs concentrations in fish, mussels and sediments in Lake Rotorua were also detected. There was no clear picture of significant adverse effects in Lake Rotorua’s aquatic ecosystems or of significant concerns to human health from fish consumption.


Taranaki Regional Council. 1995. *Investigation into PCBs and Organochlorine Discharges from Sites in the New Plymouth District, Technical Report 95–13*. This report details the results from a survey of 28 old and unofficial refuse disposal sites for residues of PCBs and organochlorine pesticides in leachate. Neither PCBs nor organochlorine pesticides were detected in the leachate from all 28 sites. Based on likely dilution of the leachate in the receiving waters, and on freshwater ecosystem protection criteria, it is considered highly unlikely that, if any PCBs or organochlorine pesticides are present, they are at concentrations high enough to cause or contribute to any observable environmental effects.


Thirty-six sites were identified for further investigation and sampling as a result of consultation with the public and interested parties about alleged disposal of agrichemical waste in New Plymouth. The sites were 11 currently or historically held sites by IWD all of which were known to and had been previously investigated by the Council; six sites where alleged historic surface contamination from storm water from the IWD plant; seven sites which were known municipal landfills and sewage discharge outfalls during the 1960s – 1980s; and 12 sites alleged to be substantial dump sites and contaminated seepages. Clean up and rehabilitation of five sites where historic disposal is known to have occurred was found to be effective with no evidence of additional unknown waste. There was no evidence of disposal at any of the other sites investigated. There was no evidence of environmental risk at any site, or in the marine environment in the vicinity of those sites that were on the coast.