

# National Chemical Contaminants Programme

Dairy Product Result Summary (July 2016 to June 2017)

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# 1 Summary

This National Chemical Contaminants Programme (NCCP) report provides a summary of results for dairy products sampled, without bias, over the full 2016/17 dairy season, spanning the period 1 July 2016 to 30 June 2017, and tested for a range of residues and contaminants.

The purpose of the NCCP is to:

- provide an assurance that not less than 99% of dairy products manufactured in New Zealand conform to New Zealand and international dairy processing requirements
- verify that dairy processors have effective self-monitoring plans in place under their risk management programmes
- establish baseline levels for specific constituents naturally present in milk and dairy products
- confirm the accuracy of attestations provided to other competent authorities, and
- investigate unexpected findings to ensure that controls remain effective and that emerging hazards are identified and appropriate regulatory measures applied.

This report sets out the sampling and testing of dairy products for a range of residues and contaminants. There were 199 individual dairy products analysed for more than 33,800 individual test results with 100% compliance. All results complied with action limits, or for compositional and naturally occurring substances, were within expected ranges.

Separate reports for the testing of milk powders for radionuclides, and dairy products and milk for dioxins, dioxin-like PCBs and indicator PCBs are also issued on the MPI website.

The dairy product summary results confirm that dairy products manufactured in New Zealand meet the limits for chemical residues and contaminants applied internationally and domestically. This indicates that the controls applied under the current regulatory framework are adequate and continue to ensure that New Zealand dairy products conform to both consumer expectations and international regulatory requirements.

In addition to the NCCP monitoring of dairy products, monitoring of raw milk and colostrum for chemical residues and contaminants is routinely undertaken. These two programmes combine to provide a high level of confidence in the safety and suitability of New Zealand dairy products. An NCCP monitoring plan is published each year and describes the monitoring of raw milk that is intended to occur over the dairy season. The monitoring plan also includes the rationale for inclusion or exclusion of particular compounds.

Further reports covering chemical residues and contaminants in milk and dairy products and the integrity of New Zealand milk and dairy products are available on the MPI website.

## 2 NCCP Sampling and Testing

### 2.1 WHAT WE SAMPLED

Routine monitoring samples are independently collected by recognised persons, who are part of an MPI recognised agency. The routine monitoring samples were collected over the period of 1 July 2016 through to 30 June 2017, without bias, from a range of dairy products manufactured in New Zealand, including milk, cream, cheese, butter, anhydrous milk fat (AMF), milk powders, milk protein concentrate, infant formula and other formulated products, whey products and casein.

Dairy products sampled included those:

- intended as ingredients and which are typically in a concentrated form;
- retail ready products intended for sale as foods in a concentrated form that will be reconstituted prior to consumption; and
- that are foods in the form that they will be consumed or used.

The products sampled are set out in Table 1.

Table 1: Summary of dairy products sampled in 2016/2017

Product Type	Proportion of Samples
Powders (Includes whole milk powder, skim milk powder, butter milk powder, dairy blend)	43%
Nutritional (Includes infant formula and ingredients, follow-on formula and growing up milk powder)	31%
Protein (includes milk protein concentrate, whey powder, whey protein concentrate, casein and sodium caseinate)	15%
Liquids (Includes pasteurised and UHT milk and cream)	3%
Fat (Includes AMF and butter)	4%
Cheese/yoghurt (Includes various soft, firm and unripened cheeses)	3%
Lactose	1%

### 2.2 WHAT WE LOOKED FOR

We looked for more than 500 compounds, elements and dairy components covering:

- antibiotics and other veterinary medicines
- pesticides
- compounds withdrawn or not permitted for use on or with food producing animals
- compounds not permitted for use in dairy products or food contact materials
- compounds with restrictions on their permitted use
- chemical contaminants
- chemical elements, including heavy metals and additives or ingredients added to fortified products
- compositional parameters naturally present in milk and dairy products
- compounds added as ingredients.

### 2.3 WHAT WE TESTED

We tested 199 product samples and obtained 30,378 individual test results for routinely monitored residues and contaminants (Table 3).

Some of the dairy product samples were also tested for naturally occurring elements and other compounds, as well as compositional attributes for survey purposes. The results of these tests continue to build a profile by dairy product type which may be used as a point of reference in the future for the assessment of product integrity and determination of adulteration or fraud (Tables 4, 5 and 6).

## 2.4 ACTION LIMITS

Action limits (ALs) are the maximum tolerable level of a particular compound detected in a specified matrix, before MPI action is taken. The action includes confirmation that regulatory limits for New Zealand and intended markets have been met and investigation to determine the reason for the finding. The nominated ALs are based on those established for raw milk unless:

- a. a product or food specific tolerance limit applies, or
- b. the compound is not permitted for use as a veterinary medicine or agricultural compound, and is not permitted for use or addition during the manufacturing process.

In assessing results against ALs, concentration factors have been taken into consideration, where permitted and where appropriate for the intended market(s) and New Zealand. The general principle applied is that if the raw milk used to manufacture a product conformed to all applicable limits, then the manufactured product is also expected to conform based on concentration factors.

If MPI becomes concerned that partitioning of a compound within a specific product stream is of concern, then a specific tolerance limit will be established for that compound and product. For example, some lipophilic compounds are expressed on a fat basis in accordance with Codex Alimentarius (Codex) conventions.

For compounds that are not permitted for use in or on milking animals, any confirmed detection is considered unacceptable.

## 3 Results

### 3.1 WHAT WE FOUND – RESIDUES AND CONTAMINANTS

Of the 30,378 individual test results for routinely monitored residues and contaminants, there were 174 reported detections (0.57%) above the method reporting limit. No result was above the action limit.

This represents a compliance rate of 100%.

A summary of the detections of residues and contaminants in dairy products is in Table 2. A full set of all the results including compounds and numbers of tests for routinely monitored residues and contaminants in dairy products is in Table 3.

### 3.1.1 Detections below action limits

**Table 2: Compounds detected in dairy products above the method reporting limits and below action limits**

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Arsenic	59	54	5	0	●
Benzyltrimethylammonium chloride (BDM-C12)	60	48	12	0	●
Bis(2-ethylhexyl) phthalate (DEHP)	60	53	7	0	●
Cadmium	59	56	3	0	●
Cyanuric acid	60	58	2	0	●
DDE (p,p')	60	56	4	0	●
Diphenylamine	60	57	3	0	●
Hexadecylpyridiniumammonium chloride (C16-Py)	60	59	1	0	●
N-benzyltrimethyltetradecylammonium chloride (BDM-C14)	60	56	4	0	●
Nitrate	60	1	59	0	●
Nitrite	60	1	59	0	●
Nitrofurazone (SEM)	60	49	11	0	●
Tin	59	55	4	0	●

#### Notes

- 1 Samples are counted as collected if results for the test are reportable. Reportable results are when all quality control criteria has been met to give results at the method reporting limit.
- 2 The number of detections reported at or below the action limit.
- 3 Non-complying results: detection of a compound above the New Zealand or export market maximum limit for the residue or contaminant, or detection at or above the limit of quantitation for a compound not permitted for food producing animals

#### 3.1.1.1 Nitrate and nitrite

Nitrate and nitrite occur naturally in raw milk, however, their presence in dried dairy products above ALs may indicate excessive exposure to heat, fouling or “burn-on” during processing or contamination of liquid milk with cleaning solutions.

60 samples were tested for nitrates and nitrite in butter milk powder, casein, cream, follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), milk protein concentrate, nutritionals, skim milk powder, sodium caseinate, whey powder, whey protein concentrate and whole milk powder.

Detections of nitrite were reported in 59 samples. Detections of nitrate were reported in 59 samples. All the detections were below the AL for nitrate and nitrite set for dairy products.

#### 3.1.1.2 Cyanuric acid

60 samples were tested for melamine and cyanuric acid in casein, cheese, follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), milk protein concentrate, nutritionals, skim milk powder, whey protein concentrate and whole milk powder.

Cyanuric acid is a known metabolite of several pesticides and agricultural compounds. Other sources of cyanuric acid may include feed additives or water treatment disinfectants.

Cyanuric acid was found in two whey protein concentrate samples, below the AL (on a raw milk basis). Both samples were also tested for melamine with no detection reportable above the method reporting limit, confirming that the detection is not associated with melamine.

MPI has previously investigated low level findings and has confirmed that these are not linked to any form of milk or feed adulteration.

#### 3.1.1.3 *Metals*

59 samples were tested for heavy metals in AMF, butter, casein, cream, follow-on formula, growing up milk powder, infant formula, nutritionals, skim milk powder, whey powder, whey protein concentrate and whole milk powder:

- **Arsenic** was detected in 5 samples (growing up milk powder, infant formula, whey protein concentrate and whole milk powder), well below the AL (on a raw milk basis) of 0.01 mg/kg
- **Cadmium** was detected in 3 samples (follow-on formula and growing up milk powder), well below the AL (on a raw milk basis) of 0.1 mg/kg
- **Tin** was detected in 4 samples (follow-on formula, growing up milk powder and infant formula), well below the joint Australia New Zealand Food Standards Code limit.

These detections of metals in processed, concentrated dairy products are well below ALs and are not of concern.

#### 3.1.1.4 *Semicarbazide (SEM)*

60 samples were tested for the metabolites of nitrofurans compounds, including nitrofurazone, in butter milk powder, follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), milk protein concentrate, nutritionals, skim milk powder, whey powder, whey protein concentrate and whole milk powder. SEM is a metabolite of the veterinary medicine nitrofurazone which is prohibited in some countries and not registered or available for use in, or on milking animals in New Zealand.

SEM was detected in 11 samples (butter milk powder, follow-on formula, growing up milk powder, infant formula, milk protein concentrate, nutritionals, whey powder, whey protein concentrate and whole milk powder).

These detections were below the action limit and do not represent a food safety concern and are not due to use of a withdrawn or prohibited medicine. The findings are consistent with previous studies that have demonstrated that SEM is an inherent component at very low levels of highly concentrated dried dairy products. This has been highlighted in the NCCP sampling plan over the last several years.

Internationally, SEM has been shown to be present from sources other than nitrofurazone. Screening for nitrofurans metabolites is generally considered to be more reliable than analysis for the parent drugs which are less stable in most animal products. However in the case of SEM in dairy products, confirmation of exposure to nitrofurazone requires detections of the parent drug (i.e. nitrofurazone). It is specifically noted that SEM will only be used as a trigger for further investigation and, on its own, is not a conclusive indicator of non-compliance.

#### 3.1.1.5 *Pesticides*

60 samples were tested for a wide range of pesticides in AMF, butter, casein, cheese, cream, dairy blend, follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), milk protein concentrate, nutritionals, skim milk powder, whey powder, whey protein concentrate and whole milk powder:

- **Diphenylamine** was detected in 3 samples (cream, milk mineral powder and whey protein concentrate). There are no products containing diphenylamine as the active ingredient, registered under the Agricultural Compounds and Veterinary Medicines (ACVM) Act 1997. Detections of diphenylamine are also reported in other MPI monitoring programmes and there is no identifiable common source. As well as use as a scald inhibitor in apples, diphenylamine is used in a range of industrial manufacturing processes, including rubberware and lubricants. It has also been associated with some dyes. The detection was below the AL (based on raw milk) and is of no food safety concern.
- **DDE (p,p')** was detected in 4 samples (butter, cream and whole milk powder). The detections were below the New Zealand Maximum Residue Level (MRL) of 1.25 mg/kg on a fat basis. The detections were also below the action limit of 0.50 mg/kg on a fat basis (0.02 mg/kg on a 4% milk fat basis) which is consistent with Codex limits. Periodic findings of DDE at low levels in the fat of dairy products are to be expected due to carryover from historical use. These findings are consistent with the raw milk programme and previous product monitoring results. There is active monitoring in place by dairy processors to ensure only milk that conforms to the DDE/DDT MRL requirements is collected for processing.

Metabolites of DDT are periodically identified very early in lactation from animals grazing land where DDT was historically applied to control grass grub (*Costelytra zealandica*). In 1970, New Zealand became one of the first countries in the world to ban the use of DDT on pastoral land. Most commonly residues of DDE, which can have a half-life in excess of 25 years in some soils under certain conditions, are identified, rather than the parent compound DDT. This confirms historic use rather than recent use of this pesticide in New Zealand.

#### 3.1.1.6 Phthalates

60 samples were tested for a range of phthalates in AMF, butter, butter milk powder, cheese, cream, dairy blend, follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), nutritionals, powder, skim milk powder, whey powder, whey protein concentrate and whole milk powder.

Phthalates were detected in 7 samples (butter, follow on formula, infant formula ingredients (paediatric grade) and infant formula). The detections were all below the AL (on a raw milk basis) of 1 mg/kg and do not represent a food safety concern.

Seven results were for **bis(2-ethylhexyl) phthalate (DEHP)**. This compound has been removed from use in the formulation of food contact materials. DEHP was included in the formulation of milk liners to provide the required flexing of the component during milking, and several years ago these milk liners were found to be the primary source of DEHP in milk products. As a consequence DEHP was removed from the formulation for milk liners. The detections of DEHP are likely to reflect legacy use of old formulation milk liners.

Contaminant migration standards for milk contact materials are applied through the Code of Practice: Design and Operation of Farm Dairies (NZCP1). All findings of phthalates of concern will be acted upon, and investigations will be undertaken where necessary to determine the root source of contamination so that remedial action can be taken.

### 3.1.1.7 Quaternary Ammonium Compounds (QACs)

60 samples were tested for a range of QACs in AMF, butter, butter milk powder, cheese, cream, follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), milk protein concentrate, nutritionals, powder, skim milk powder, whey powder, whey protein concentrate and whole milk powder.

QACs were detected in 17 samples (follow-on formula, growing up milk powder, infant formula, infant formula ingredients (paediatric grade), whey protein concentrate and whole milk powder).

**Benzyltrimethylammonium chloride (BDM-C12)** was detected in 12 samples and **N-benzyltrimethylammonium chloride (BDM-C14)** was detected in 4 of the 17 samples and **Hexadecylpyridiniumammonium chloride (C16-Py)** was detected in one of the 17 samples. The detections were all well below the AL (on a raw milk basis) of 0.1 mg/kg.

QACs are widely used as surfactants and disinfectants in food processing and several products have been approved for sanitising dairy equipment. More recently QACs have become compounds of interest in some markets, with studies suggesting that residues may carry over in many food products at levels of concern when exposed to QACs. This presents an added complication for trade, as many dairy products are highly concentrated ingredients and these concentrated forms usually only represent a minor portion of the final food. For a number of years, dairy maintenance compounds containing QACs have been approved in New Zealand with the condition that milk contact surfaces are to be rinsed after use.

### 3.1.2 Antibiotic screen responses

One presumptive response for the tetracycline group of compounds was reported in a nutritional dairy product. This analytical method is a microbial inhibition test. These highly formulated products may have inhibitory components that result in presumptive responses. There were no options for confirmation testing able to be reported with an accreditation body endorsed report.

All NCCP raw milk samples are tested for the tetracycline group of compounds along with a wide range of dairy products. The results, from both screening and confirmation testing, verify that milk and dairy products conform to expected requirements.

### 3.1.3 Dairy components

Samples of follow on formula, growing up milk powder, infant formula, milk, milk protein concentrate, nutritionals, skim milk powder, whey powder, whey protein concentrate and whole milk powder were tested for fat, protein, ash and moisture. The results complied with the Codex Standard for fat, protein and moisture for milk powders and cream powders<sup>1</sup>.

### 3.1.4 Naturally occurring elements and other compounds

Samples of AMF, butter, casein, cream, follow on formula, growing up milk powder, infant formula, milk protein concentrate, nutritionals, skim milk powder, whey powder, whey protein concentrate, and whole milk powder were tested for a range of endogenous and

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<sup>1</sup> CODEX STANDARD FOR MILK POWDERS AND CREAM POWDER (CODEX STAN 207-1999) - This Standard replaced the Standard for Whole Milk Powder, Partly Skimmed Milk Powder and Skimmed Milk Powder (A-5-1971) and the Standard for Cream Powder, Half Cream Powder and High Fat Milk Powder (A-10-1971). Adopted in 1999. Amendments 2010, 2013, 2014.

naturally occurring chemical elements and compounds, including hormones and resorcylic acids.

The results reported indicate that naturally occurring elements are present in dairy products within the levels expected. Likewise, where compounds have been added to fortify products, these are present at the levels expected or required.

## 4 Conclusion

Given the breadth of products sampled and compounds tested for, the number of detections are considered to be very low, which is consistent with monitoring results from previous years. This indicates that dairy processors are operating under risk management programmes that are effective and ensure that the dairy products manufactured are safe, wholesome and free from contamination.

## 5 Summary of Dairy Product Results for 2016/2017

### 5.1 REPORTING OF RESIDUES AND CONTAMINANTS IN DAIRY PRODUCTS

Table 3: Reported results of residues and contaminants in dairy products

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
2-phenylphenol	60	60	0	0	
Abamectin	26	26	0	0	
Acephate	59	59	0	0	
Acetamiprid	60	60	0	0	
Acetamiprid-N-Desmethyl	60	60	0	0	
Acetochlor	60	60	0	0	
Acibenzolar-S-methyl	36	36	0	0	
Acrinathrin	60	60	0	0	
Alachlor	60	60	0	0	
Alanycarb	60	60	0	0	
Aldicarb	60	60	0	0	
Aldicarb sulfone	60	60	0	0	
Aldicarb sulfoxide	60	60	0	0	
Aldrin	60	60	0	0	
Allidochlor	60	60	0	0	
Ametoctradin	60	60	0	0	
Ametryn	60	60	0	0	
Amoxicillin	60	60	0	0	
Ampicillin	60	60	0	0	
Anilofos	60	60	0	0	
Anthraquinone	60	60	0	0	
Arsenic	59	54	5	0	•
Atrazine	60	60	0	0	
Azaconazole	60	60	0	0	
Azamethiphos	60	60	0	0	
Azinphos-methyl	60	60	0	0	
Azoxystrobin	60	60	0	0	
Benalaxyl	60	60	0	0	
Bendiocarb	60	60	0	0	
Benfluralin	60	60	0	0	
Benodanil	60	60	0	0	
Benoxacor	60	60	0	0	
Bensulfuron-methyl	59	59	0	0	
Bensulide	60	60	0	0	
Benzyl butyl phthalate (BBP)	60	60	0	0	
Benzyl G Penicillin	60	60	0	0	
Benzyltrimethylammonium chloride (BDM-C12)	60	48	12	0	•

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
BHC (alpha)	60	60	0	0	
BHC (beta)	60	60	0	0	
BHC (delta)	60	60	0	0	
BifenoX	60	60	0	0	
Bifenthrin	60	60	0	0	
Bioresmethrin	60	60	0	0	
Bis(2-ethylhexyl) phthalate (DEHP)	60	53	7	0	•
Bis(2-ethylhexyl) adipate (DEHA)	60	60	0	0	
Bitertanol	60	60	0	0	
Boscalid	60	60	0	0	
Bromacil	60	60	0	0	
Bromobutide	60	60	0	0	
Bromophos	60	60	0	0	
Bromophos-ethyl	60	60	0	0	
Bromopropylate	60	60	0	0	
Bupirimate	60	60	0	0	
Buprofezin	60	60	0	0	
Butachlor	60	60	0	0	
Butafenacil	58	58	0	0	
Butamifos	60	60	0	0	
Cadmium	59	56	3	0	•
Cadusafos	60	60	0	0	
Cafenstrole	60	60	0	0	
Carbaryl	60	60	0	0	
Carbendazim	60	60	0	0	
Carbetamide	60	60	0	0	
Carbofuran	60	60	0	0	
Carboxin	60	60	0	0	
Carfentrazone-ethyl	60	60	0	0	
Carpropamid	60	60	0	0	
Ceftiofur	60	60	0	0	
Cephalexin	60	60	0	0	
Cephalonium	60	60	0	0	
Cephuroxime	60	60	0	0	
Chlorantraniliprole	60	60	0	0	
Chlordane (cis)	60	60	0	0	
Chlordane (trans)	60	60	0	0	
Chlorfenapyr	60	60	0	0	
Chlorfenvinphos	60	60	0	0	
Chloridazon	60	60	0	0	
Chlorimuron-ethyl	59	59	0	0	
Chlorobenzilate	60	60	0	0	
Chlorotoluron	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Chloroxuron	60	60	0	0	
Chlorpropham	60	60	0	0	
Chlorpyrifos	60	60	0	0	
Chlorpyrifos-methyl	60	60	0	0	
Chlorsulfuron	59	59	0	0	
Chlortetracycline	60	60	0	0	
Chlorthal-dimethyl	60	60	0	0	
Chlorthiophos	60	60	0	0	
Chlozolinat	60	60	0	0	
Chromafenozide	60	60	0	0	
Cinidon-ethyl	52	52	0	0	
Clodinafop-propargyl	60	60	0	0	
Clofentezine	60	60	0	0	
Clomazone	60	60	0	0	
Cloquintocet-mexyl	60	60	0	0	
Clothianidin	60	60	0	0	
Coumaphos	60	60	0	0	
Coumaphos oxon	60	60	0	0	
Crufomate	60	60	0	0	
Cyanazine	60	60	0	0	
Cyanophos	60	60	0	0	
Cyantraniliprole	60	60	0	0	
Cyanuric acid	60	58	2	0	•
Cyazofamid	60	60	0	0	
Cycloate	3	3	0	0	
Cyclosulfamuron	60	60	0	0	
Cyflufenamid	60	60	0	0	
Cyfluthrin	59	59	0	0	
Cyhalofop-butyl	60	60	0	0	
Cyhalothrin	59	59	0	0	
Cymoxanil	60	60	0	0	
Cypermethrin	60	60	0	0	
Cyproconazole	60	60	0	0	
Cyprodinil	60	60	0	0	
Cyromazine	4	4	0	0	
Daimuron	60	60	0	0	
DDD (o,p')	60	60	0	0	
DDD (p,p')	60	60	0	0	
DDE (o,p')	60	60	0	0	
DDE (p,p')	60	56	4	0	•
DDT (o,p')	60	60	0	0	
DDT (p,p')	60	60	0	0	
Deltamethrin	58	58	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Demeton-s-methyl	60	60	0	0	
Demeton-s-methyl-sulfoxide	60	60	0	0	
Desmedipham	60	60	0	0	
Diazinon	60	60	0	0	
Dichlobenil	60	60	0	0	
Dichlofenthion	60	60	0	0	
Dichlofluanid	60	60	0	0	
Dichlorvos	60	60	0	0	
Diclobutrazol	60	60	0	0	
Diclocymet	60	60	0	0	
Diclofop-methyl	60	60	0	0	
Dicloran	60	60	0	0	
Diclosulam	59	59	0	0	
Dicofol-BP	60	60	0	0	
Dicrotophos	60	60	0	0	
Dicyandiamide (DCD)	60	60	0	0	
Dicyclanil	60	60	0	0	
Didecyl phthalate (DDP)	60	60	0	0	
Dieldrin	60	60	0	0	
Diethofencarb	60	60	0	0	
Diethyl phthalate (DEP)	60	60	0	0	
Difenoconazole	59	59	0	0	
Diffubenzuron	60	60	0	0	
Diffufenican	60	60	0	0	
Dihexyl phthalate (DHXP)	60	60	0	0	
Dihydrostreptomycin	60	60	0	0	
Diisobutyl phthalate (DIBP)	60	60	0	0	
Diisodecyl phthalate (DIDP)	60	60	0	0	
Diisononyl-phthalate (DINP)	60	60	0	0	
Diisopropyl phthalate (DIP)	60	60	0	0	
Dimepiperate	60	60	0	0	
Dimethenamid	60	60	0	0	
Dimethoate	58	58	0	0	
Dimethomorph	60	60	0	0	
Dimethyl phthalate (DMP)	60	60	0	0	
Dimethylditetradecylammonium chloride (DM-DC14)	60	60	0	0	
Dimethylvinphos	60	60	0	0	
Di-n-butyl phthalate (DBP)	60	60	0	0	
Di-n-heptyl phthalate (DNHP)	60	60	0	0	
Di-n-octyl phthalate (DNOP)	60	60	0	0	
Di-n-pentyl phthalate (DNPP)	60	60	0	0	
Dioxabenzofos	60	60	0	0	
Dioxathion	27	27	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Diphenamid	60	60	0	0	
Diphenylamine	60	57	3	0	•
Disulfoton	60	60	0	0	
Dithiopyr	60	60	0	0	
Diuron	60	60	0	0	
Edifenphos	60	60	0	0	
Emamectin benzoate	59	59	0	0	
Endosulfan sulfate	60	60	0	0	
Endosulfan (alpha)	60	60	0	0	
Endosulfan (beta)	60	60	0	0	
Endrin	60	60	0	0	
Endrin ketone	60	60	0	0	
EPN	60	60	0	0	
Epoxiconazole	60	60	0	0	
EPTC	60	60	0	0	
Erythromycin	60	60	0	0	
Esprocarb	60	60	0	0	
Ethalfuralin	60	60	0	0	
Ethametsulfuron-methyl	59	59	0	0	
Ethiofencarb	60	60	0	0	
Ethion	60	60	0	0	
Ethiprole	60	60	0	0	
Ethofumesate	60	60	0	0	
Ethoprosfos	60	60	0	0	
Ethoxyquin	48	48	0	0	
Ethoxysulfuron	59	59	0	0	
Ethychlozate	60	60	0	0	
Etobenzanid	60	60	0	0	
Etoxazole	60	60	0	0	
Etridiazole	60	60	0	0	
Etrimfos	60	60	0	0	
Famoxadone	60	60	0	0	
Famphur	60	60	0	0	
Fenamidone	60	60	0	0	
Fenamiphos	60	60	0	0	
Fenarimol	60	60	0	0	
Fenbuconazole	60	60	0	0	
Fenchlorphos	60	60	0	0	
Fenhexamid	60	60	0	0	
Fenitrothion	60	60	0	0	
Fenobucarb	60	60	0	0	
Fenothiocarb	60	60	0	0	
Fenoxanil	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Fenoxaprop	36	36	0	0	
Fenoxaprop-ethyl	60	60	0	0	
Fenoxycarb	60	60	0	0	
Fenpiclonil	60	60	0	0	
Fenpropathrin	60	60	0	0	
Fenpropimorph	60	60	0	0	
Fenpyroximate	60	60	0	0	
Fensulfothion	60	60	0	0	
Fenthion	60	60	0	0	
Fenthion-ethyl	60	60	0	0	
Fenthion-oxon	60	60	0	0	
Fenthion-oxon-sulfone	60	60	0	0	
Fenthion-oxon-sulfoxide	60	60	0	0	
Fenthion sulfone	60	60	0	0	
Fenthion sulfoxide	60	60	0	0	
Fentrazamide	60	60	0	0	
Fenvalerate	57	57	0	0	
Ferimzone	60	60	0	0	
Fipronil	60	60	0	0	
Fipronil-sulfide	60	60	0	0	
Fipronil-sulfone	60	60	0	0	
Flamprop	1	1	0	0	
Flamprop-methyl	60	60	0	0	
Flazasulfuron	59	59	0	0	
Fluacrypyrim	60	60	0	0	
Fluazifop-p-butyl	60	60	0	0	
Flubendazole	60	60	0	0	
Flubendiamide	60	60	0	0	
Flucythrinate	59	59	0	0	
Fludioxonil	49	49	0	0	
Flufenacet	60	60	0	0	
Flumethrin	57	57	0	0	
Flumiclorac pentyl	60	60	0	0	
Flumioxazin	59	59	0	0	
Fluometuron	60	60	0	0	
Fluopicolide	60	60	0	0	
Fluopyram	60	60	0	0	
Fluquinconazole	60	60	0	0	
Fluridone	60	60	0	0	
Flusilazole	60	60	0	0	
Fluthiacet-methyl	60	60	0	0	
Flutolanil	60	60	0	0	
Flutriafol	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Fluvalinate	55	55	0	0	
Fonofos	60	60	0	0	
Forchlorfenuron	60	60	0	0	
Fosthiazate	60	60	0	0	
Fuberidazole	60	60	0	0	
Furalaxyl	60	60	0	0	
Furaltadone (AMOZ)	60	60	0	0	
Furametpyr	60	60	0	0	
Furathiocarb	60	60	0	0	
Furazolidone (AOZ)	60	60	0	0	
Gentamycin	60	60	0	0	
Glyphosate	30	30	0	0	
Halosulfuron-methyl	59	59	0	0	
Haloxyfop-etotyl	60	60	0	0	
Haloxyfop-methyl	60	60	0	0	
Heptachlor	60	60	0	0	
Heptachlor-endo-epoxide	60	60	0	0	
Heptachlor-exo-epoxide	60	60	0	0	
Heptenophos	60	60	0	0	
Hexachlorobenzene	60	60	0	0	
Hexaconazole	60	60	0	0	
Hexadecylpyridiniumammonium chloride (C16-Py)	60	59	1	0	•
Hexadecyltrimethylammonium chloride (TM-C16)	60	60	0	0	
Hexaflumuron	38	38	0	0	
Hexazinone	60	60	0	0	
Hexythiazox	4	4	0	0	
Imazalil	60	60	0	0	
Imazamethabenz-methyl	60	60	0	0	
Imazosulfuron	59	59	0	0	
Imidacloprid	60	60	0	0	
Imidacloprid-5-hydroxy	3	3	0	0	
Imidacloprid-olefin	28	28	0	0	
Inabenfide	60	60	0	0	
Indanofan	60	60	0	0	
Indoxacarb	55	55	0	0	
Iodofenphos	60	60	0	0	
Iodosulfuron-methyl	59	59	0	0	
Iprobenfos	60	60	0	0	
Iprodione	60	60	0	0	
Iprovalicarb	60	60	0	0	
Isazophos	60	60	0	0	
Isofenphos	60	60	0	0	
Isofenphos-methyl	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Isoprocarb	60	60	0	0	
Isoprothiolane	60	60	0	0	
Isoproturon	60	60	0	0	
Isopyrazam	60	60	0	0	
Isoxathion	60	60	0	0	
Kanamycin	60	60	0	0	
Karbutilate	60	60	0	0	
Kresoxim-methyl	60	60	0	0	
Lactofen	59	59	0	0	
Lasalocid	60	60	0	0	
Lead	59	59	0	0	
Lenacil	60	60	0	0	
Leptophos	60	60	0	0	
Lindane (γ-HCH)	60	60	0	0	
Linuron	60	60	0	0	
Maduramicin	60	60	0	0	
Malathion	60	60	0	0	
Mandipropamid	60	60	0	0	
Mefenacet	60	60	0	0	
Mefenpyr-diethyl	60	60	0	0	
Melamine	60	60	0	0	
Mepanipyrim	60	60	0	0	
Mepronil	60	60	0	0	
Mercury-(total)	59	59	0	0	
Mesotrione	4	4	0	0	
Metalaxyl	60	60	0	0	
Metamitron	60	60	0	0	
Metconazole	60	60	0	0	
Methabenzthiazuron	60	60	0	0	
Methacrifos	60	60	0	0	
Methamidophos	60	60	0	0	
Methidathion	60	60	0	0	
Methiocarb	60	60	0	0	
Methiocarb-sulfone	60	60	0	0	
Methiocarb-sulfoxide	60	60	0	0	
Methomyl	60	60	0	0	
Methoxychlor	60	60	0	0	
Methoxyfenozide	60	60	0	0	
Metobromuron	60	60	0	0	
Metolachlor	60	60	0	0	
Metominostrobin (E)	60	60	0	0	
Metominostrobin (Z)	60	60	0	0	
Metosulam	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Metrafenone	60	60	0	0	
Metribuzin	60	60	0	0	
Metsulfuron-methyl	59	59	0	0	
Mevinphos	60	60	0	0	
Mirex	60	60	0	0	
Molinate	60	60	0	0	
Monensin	60	60	0	0	
Monocrotophos	60	60	0	0	
Monolinuron	60	60	0	0	
Myclobutanil	60	60	0	0	
Napropamide	60	60	0	0	
Narasin	60	60	0	0	
N-benzyl dimethyldecylammonium chloride (BDM-C10)	60	60	0	0	
N-benzyl dimethylhexadecylammonium chloride (BDM-C16)	60	60	0	0	
N-benzyl dimethyloctadecylammonium chloride (BDM-C18)	60	60	0	0	
N-benzyl dimethyltetradecylammonium chloride (BDM-C14)	60	56	4	0	•
N-didecyl dimethylammonium chloride (DM-DC10)	60	60	0	0	
N-didodecyl dimethylammonium chloride (DM-DC12)	60	60	0	0	
Nicotine	58	58	0	0	
Nitrate	60	1	59	0	•
Nitrite	60	1	59	0	•
Nitrofen	60	60	0	0	
Nitrofurantoin (AHD)	60	60	0	0	
Nitrofurazone (SEM)	60	49	11	0	•
Nitrothal-isopropyl	60	60	0	0	
Norflurazon	60	60	0	0	
Novaluron	18	18	0	0	
Octhilinone	60	60	0	0	
Oleandomycin	60	60	0	0	
Omethoate	60	60	0	0	
Oryzalin	37	37	0	0	
Oxabetrinil	29	29	0	0	
Oxadiazon	60	60	0	0	
Oxadixyl	60	60	0	0	
Oxamyl	60	60	0	0	
Oxycarboxin	60	60	0	0	
Oxychlorane	60	60	0	0	
Oxyfluorfen	60	60	0	0	
Oxytetracycline	60	60	0	0	
Paclobutrazol	60	60	0	0	
Parathion	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Parathion-methyl	60	60	0	0	
Penconazole	60	60	0	0	
Pencycuron	60	60	0	0	
Pendimethalin	60	60	0	0	
Pentachlorobenzene	60	60	0	0	
Penthiopyrad	60	60	0	0	
Permethrin	60	60	0	0	
Perthan	60	60	0	0	
Phenmedipham	60	60	0	0	
Phenthoate	60	60	0	0	
Phorate	60	60	0	0	
Phorate sulfone	60	60	0	0	
Phorate sulfoxide	60	60	0	0	
Phosalone	59	59	0	0	
Phosmet	60	60	0	0	
Phosphamidon	60	60	0	0	
Phoxim	60	60	0	0	
Picolinafen	60	60	0	0	
Piperonyl butoxide	60	60	0	0	
Piperophos	60	60	0	0	
Pirimicarb	60	60	0	0	
Pirimiphos-methyl	60	60	0	0	
Pretilachlor	60	60	0	0	
Prochloraz	59	59	0	0	
Procymidone	60	60	0	0	
Profenofos	60	60	0	0	
Promecarb	60	60	0	0	
Prometryn	60	60	0	0	
Propachlor	60	60	0	0	
Propamocarb	59	59	0	0	
Propanil	49	49	0	0	
Propaphos	60	60	0	0	
Propaquizafop	60	60	0	0	
Propargite	60	60	0	0	
Propazine	60	60	0	0	
Propetamphos	60	60	0	0	
Propham	60	60	0	0	
Propiconazole	60	60	0	0	
Propoxur	60	60	0	0	
Propyzamide	60	60	0	0	
Proquinazid	60	60	0	0	
Prosulfocarb	60	60	0	0	
Prothiofos	60	60	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Pymetrozine	59	59	0	0	
Pyraclufos	60	60	0	0	
Pyraclostrobin	58	58	0	0	
Pyraflufen-ethyl	60	60	0	0	
Pyrasulfotole	4	4	0	0	
Pyrazophos	60	60	0	0	
Pyrethrin	57	57	0	0	
Pyributicarb	60	60	0	0	
Pyridaben	60	60	0	0	
Pyridaphenthion	60	60	0	0	
Pyrifenox	4	4	0	0	
Pyriftalid	60	60	0	0	
Pyrimethanil	60	60	0	0	
Pyrimidifen	59	59	0	0	
Pyriminobac-methyl (E)	60	60	0	0	
Pyriminobac-methyl (Z)	60	60	0	0	
Pyriproxyfen	60	60	0	0	
Pyroquilon	60	60	0	0	
Pyroxsulam	60	60	0	0	
Quinalphos	60	60	0	0	
Quinoclamine	49	49	0	0	
Quinoxifen	60	60	0	0	
Quintozene	60	60	0	0	
Quizalofop-ethyl	58	58	0	0	
Rimsulfuron	59	59	0	0	
Saflufenacil	59	59	0	0	
Salinomycin	60	60	0	0	
Sebuthylazine	60	60	0	0	
Semduramacin	60	60	0	0	
Sethoxydim	59	59	0	0	
Simazine	60	60	0	0	
Simeconazole	60	60	0	0	
Simetryn	60	60	0	0	
Sodium monofluoroacetate (1080)	60	60	0	0	
Spinetoram	60	60	0	0	
Spinosad	60	60	0	0	
Spiromesifen	53	53	0	0	
Spiromesifen-enol	60	60	0	0	
Spiromycin	60	60	0	0	
Spirotetramat	60	60	0	0	
Spirotetramat-enol	60	60	0	0	
Spirotetramat-enol-glucoside	4	4	0	0	
Spirotetramat-keto-hydroxy	59	59	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Spirotetramat-mono-hydroxy	60	60	0	0	
Spiroxamine	56	56	0	0	
Streptomycin	60	60	0	0	
Sulfentrazone	60	60	0	0	
Sulprofos	60	60	0	0	
Tebuconazole	60	60	0	0	
Tebufenozide	60	60	0	0	
Tebufenpyrad	60	60	0	0	
Tebuthiuron	60	60	0	0	
Tecnazene	60	60	0	0	
Tefluthrin	60	60	0	0	
Temephos	60	60	0	0	
Tepraloxymid	60	60	0	0	
Terbacil	60	60	0	0	
Terbufos	60	60	0	0	
Terbumeton	60	60	0	0	
Terbutylazine	60	60	0	0	
Terbutryn	60	60	0	0	
Tetrachlorvinphos	58	58	0	0	
Tetraconazole	60	60	0	0	
Tetracycline	60	60	0	0	
Tetradifon	59	59	0	0	
Tetrahydrophthalimide-1,2,3,6	60	60	0	0	
Thenylchlor	60	60	0	0	
Thiabendazole	60	60	0	0	
Thiacloprid	60	60	0	0	
Thiamethoxam	60	60	0	0	
Thiazopyr	60	60	0	0	
Thidiazuron	59	59	0	0	
Thiobencarb	48	48	0	0	
Thiometon	60	60	0	0	
Tiadinil	60	60	0	0	
Tin	59	55	4	0	•
Tolclofos-methyl	60	60	0	0	
Tolyfluanid	60	60	0	0	
Tralkoxydim	60	60	0	0	
Transfluthrin	60	60	0	0	
Triadimefon	60	60	0	0	
Triadimenol	60	60	0	0	
Tri-allate	60	60	0	0	
Triasulfuron	59	59	0	0	
Triazophos	60	60	0	0	
Tribenuron-methyl	49	49	0	0	

Compound	Samples collected <sup>1</sup>	Samples with no detections	Detections below the action limit <sup>2</sup>	Detections above the action limit <sup>3</sup>	Flag
Tribufos	60	60	0	0	
Trichlorfon	59	59	0	0	
Tricyclazole	60	60	0	0	
Trifloxystrobin	60	60	0	0	
Trifloxysulfuron-sodium	59	59	0	0	
Triflumizole	60	60	0	0	
Triflumuron	60	60	0	0	
Trifluralin	60	60	0	0	
Triflusulfuron-methyl	60	60	0	0	
Triforine	59	59	0	0	
Triticonazole	59	59	0	0	
Tylosin	60	60	0	0	
Uniconazole-P	60	60	0	0	
Vamidothion	60	60	0	0	
Vinclozolin	60	60	0	0	
XMC	59	59	0	0	
Zoxamide	60	60	0	0	

#### Notes

- 1 Samples are counted as collected if results for the test are reportable. Reportable results are when all quality control criteria has been met to give results at the method reporting limit.
- 2 The number of detections reported at or below the maximum allowable level. In some cases no limit applies
- 3 Non-complying results: detection of a compound above the New Zealand or export market maximum limit for the residue or contaminant, or detection at or above the limit of quantitation for a compound not permitted for food producing animals

## 5.2 REPORTING OF COMPOSITIONAL TESTING AND NATURALLY OCCURRING COMPOUNDS

Table 4: Dairy components

Product type	Samples collected			
	Ash	Fat	Moisture	Protein
Follow on formula	12	8	6	6
Growing up milk powder	17	9	9	8
Infant formula	12	8	6	6
Milk	0	4	0	4
Milk protein concentrate	0	1	2	2
Nutritional	4	5	2	2
Skim milk powder	0	6	7	6
Whole milk powder	0	19	28	25
Whey protein concentrate	9	0	0	0
Whey	3	0	0	0



Table 5: Steroids and resorcylic acid lactones

Substance	Samples collected	AMF	Butter	Growing up milk powder	Infant formula	Skim milk powder	Whey protein concentrate	Whole milk powder	Whey
$\alpha$ - + $\beta$ -boldenone	60	1	3	8	6	7	5	28	2
$\alpha$ -trenbolone	60	1	3	8	6	7	5	28	2
$\beta$ -trenbolone	60	1	3	8	6	7	5	28	2
Dexamethasone	60	1	3	8	6	7	5	28	2
Dienestrol	60	1	3	8	6	7	5	28	2
Diethylstilbestrol	60	1	3	8	6	7	5	28	2
Hexestrol	60	1	3	8	6	7	5	28	2
Megesterol	60	1	3	8	6	7	5	28	2
Melengestrol	60	1	3	8	6	7	5	28	2
$\alpha$ -nortestosterone	60	1	3	8	6	7	5	28	2
$\beta$ -nortestosterone	60	1	3	8	6	7	5	28	2
$\alpha$ -testosterone	60	1	3	8	6	7	5	28	2
$\beta$ -testosterone	60	1	3	8	6	7	5	28	2
Estriol	59	1	3	7	6	7	5	28	2
Estrone	60	1	3	8	6	7	5	28	2
Ethinylestradiol	60	1	3	8	6	7	5	28	2
Hydroxyprogesterone	60	1	3	8	6	7	5	28	2
Medroxyprogesterone	60	1	3	8	6	7	5	28	2
Estradiol	60	1	3	8	6	7	5	28	2
$\alpha$ -methylprednisolone	60	1	3	8	6	7	5	28	2
Prednisolone	60	1	3	8	6	7	5	28	2
Progesterone	60	1	3	8	6	7	5	28	2
$\alpha$ -zearalanol	60	1	3	8	6	7	5	28	2
$\beta$ -zearalanol	60	1	3	8	6	7	5	28	2
$\alpha$ -zearalenol	60	1	3	8	6	7	5	28	2
$\beta$ -zearalenol	60	1	3	8	6	7	5	28	2
Zearalanone	60	1	3	8	6	7	5	28	2
Zearalenone	60	1	3	8	6	7	5	28	2

Table 6: Naturally occurring chemical elements and added compounds

Chemical Elements	Samples Collected	Product type collected												
		AMF	Butter	Casein	Cream	Follow-on formula	Growing up milk powder	Infant formula	Milk Protein Concentrate	Nutritionals	Skim Milk Powder	Whey Protein Concentrate	Whole Milk Powder	Whey
Aluminium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Barium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Bismuth	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Chromium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Cobalt	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Copper	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Iron	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Magnesium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Manganese	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Nickel	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Potassium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Selenium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Sodium	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Sodium thiocyanate	58	0	0	0	0	6	8	6	2	0	6	3	26	1
Zinc	59	1	2	2	1	5	7	5	0	2	6	5	22	1
Butanal	30	0	0	0	0	0	0	0	1	0	5	2	20	2
Formaldehyde	30	0	0	0	0	0	0	0	1	0	5	2	20	2
Heptanal	30	0	0	0	0	0	0	0	1	0	5	2	20	2
Hexanal	30	0	0	0	0	0	0	0	1	0	5	2	20	2
Pentanal	30	0	0	0	0	0	0	0	1	0	5	2	20	2
Arachidonic C20:4n-6	25	0	0	0	0	7	12	6	0	0	0	0	0	0
Docosahexaenoic C22:6n-3 (DHA)	25	0	0	0	0	7	12	6	0	0	0	0	0	0