New Zealand Food Safety
Haumaru Kai Aotearoa

National Chemical Contaminants Programme

Dairy Product Result Summary (July 2022 to June 2023)

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1 Summary

This National Chemical Contaminants Programme (NCCP) report provides a summary of results for dairy products sampled without bias, and tested for a range of residues and contaminants, over the 2022/23 dairy season, 1 July 2022 to 30 June 2023.

The objectives of the NCCP dairy products component are to:

- determine whether dairy products manufactured in New Zealand conform to New Zealand 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 unfavourable findings to ensure that controls remain effective and that emerging hazards are identified and appropriate regulatory measures applied.

199 individual dairy products were tested for nearly 33,000 individual test results. There were no non-compliant test results that exceeded regulatory limits for residues and contaminants in dairy products, where concentration factors have been taken into consideration where permitted and appropriate. For compositional and naturally occurring substances, test results were generally within expected ranges.

These dairy product summary results indicate 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, raw milk and colostrum are also sampled, tested and reported separately for a range of chemical residues and contaminants. These two programmes combine to provide a high level of confidence in the safety and suitability of New Zealand dairy products.

Previous reports covering residues and contaminants in milk and dairy products as well as testing of milk powders for radionuclides, and milk and dairy products for dioxins, dioxin-like PCBs and indicator PCBs, are also issued on the New Zealand Food Safety website.

2 Legal framework

Dairy monitoring and surveillance programmes for substances of interest have been in operation in New Zealand for many years and a national programme for the monitoring of raw milk was introduced in the 1996/97 dairy season.

The NCCP is an official programme under the Animal Products Act[1] and supported by various regulations and notices, including the Animal Products Regulations 2021[2] and the Animal Products Notice: Sampling Regimes for Monitoring[3]. The NCCP is administered by New Zealand Food Safety. New Zealand Food Safety is a business unit of the Ministry for Primary Industries.

3 Programme design

Dairy product samples are obtained under the supervision of a recognised person from a Ministry for Primary Industries (MPI) recognised agency, during a performance-based verification (PBV) at the manufacturers' premises. Samples are dairy products deemed eligible for export at the time of sampling. The samples were tested at an MPI recognised laboratory, using ISO/IEC 17025 accredited test methods or validated in-house methods.

The objectives of the NCCP dairy products component are to:

- determine whether dairy products manufactured in New Zealand conform to New Zealand dairy processing requirements;

[1] Animal Products Act 1999 No 93 (as at 06 April 2023), Public Act – New Zealand Legislation
[2] Animal Products Regulations 2021 (SL 2021/400) (as at 06 October 2022) – New Zealand Legislation
[3] Sampling Regimes for Monitoring – Animal Product Notice (mpi.govt.nz)

- 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 unfavourable findings to ensure that controls remain effective and that emerging hazards are identified and appropriate regulatory measures applied.

3.1 Action limits

Action limits are nominated by New Zealand Food Safety. They are the maximum tolerable level of a particular compound detected in a specified matrix, before action is taken. The action includes confirming whether regulatory limits for New Zealand and intended markets have been met and investigating the reason for a test result.

The nominated action limits are based on those established for raw milk[4] 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 test results against action limits, 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 New Zealand Food Safety 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.

4 Sampling and Testing

4.1 What we tested

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 2022 through to 30 June 2023, without bias, from a range of dairy products manufactured in New Zealand, including milk, cream, cheese, butter, 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 2022/2023

Product Type	Proportion of Samples
Powders (Whole milk powder, skim milk powder, buttermilk powder and other powders)	39%

[4] National Programme for the Monitoring of Chemical Residues and Contaminants in Milk (mpi.govt.nz)

Product Type	Proportion of Samples
Nutritional (Infant formula, follow-on formula, growing up milk powder and their bases, nutritional powders)	38%
Protein (Milk protein concentrate, whey powder, whey protein concentrate, casein, sodium caseinate, other caseinates)	13%
Liquids (Pasteurised and ultra-high temperature (UHT) milk, dairy blend, ice-cream and cream)	6%
Fat (Anhydrous Milk Fat (AMF), butter)	3%
Cheese (Firm and soft)	1%

4.2 What we looked for

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

- antibiotics and other veterinary medicines;
- agricultural compounds;
- 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.

4.3 What we tested

NZFS tested 199 product samples and obtained 31,095 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. 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 and 5).

5 Results

5.1 What we found – residues and contaminants

There were no non-compliant results that exceed regulatory limits for residues and contaminants.

This represents a compliance rate of 100%.

For compositional and naturally occurring substances, results were generally within expected ranges.

Of the 31,095 individual test results for the routinely monitored residues and contaminants, there were 165 reported detections (0.53%) above the method reporting limit. The method reporting limit is the lowest level at which residues and contaminants can be reported by the laboratory.

A summary of the detections of residues and contaminants in dairy products are 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.

5.1.1 Detections below action limits

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

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Alkylbenzyldimethylammonium chlorides (C8-C18)	60	57	3	0	●
Arsenic	60	58	2	0	●
Benzyl butyl phthalate (BBP)	48	47	1	0	●
Benzyldimethyldodecylammonium chloride	60	59	1	0	●
Benzyldimethyltetradecylammonium chloride	60	58	2	0	●
Cadmium	60	45	15	0	●
Di(2-ethylhexyl) terephthalate (DEHT)	48	47	1	0	●
Dialkyldimethyl quaternary ammonium chlorides (C8-C12)[4]	60	59	1	0	●
Didecyldimethylammonium chloride	60	59	1	0	●
Diphenylamine	60	59	1	0	●
Hexadecylpyridiniumammonium chloride	60	59	1	0	●
Lead	60	58	2	0	●
Nitrate	60	4	56	0	●
Nitrite	60	0	60	0	●
p,p'-DDE	60	59	1	0	●
SEM (semicarbazide)	49	44	5	0	●
Tin	60	48	12	0	●

Notes

1 Samples are counted as reported if results for the test are reportable. Reportable results are when all the quality control criteria have 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

4 Includes Dimethyldioctylammonium chloride, Dimethyldidecylammonium chloride and Dimethyldidodecylammonium chloride

● The amount reported did not exceed the action limit as set out in section 3.1
Presumptive positives which are found using a qualitative method are not reported as detected, unless the detection is confirmed by a confirmatory method.

5.1.1.1 Semicarbazide (SEM)

49 samples were tested and reported for the metabolites of nitrofurans compounds, including semicarbazide, in butter milk powder, follow-on formula, growing up milk powder, growing up milk powder base, infant formula, nutritional powder, other powders, skim milk powder 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 five samples (follow on formula, infant formula, nutritional powder, other powders and whole milk powder).

These detections were below the action limit (when adjusted on a raw milk basis) 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 nitrofuran 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. A published method in milk and dairy products for the

determination of nitrofurazone is fully validated and available at the testing laboratory[5]. This method was used to confirm nitrofurazone for two samples which results were greater than the action limit prior to concentration factors applied to a raw milk basis. Both samples had no reportable detections of nitrofurazone by this method.

5.1.1.2 Nitrite and nitrate

Nitrate and nitrite occur naturally in raw milk, however, their presence in dried dairy products above action limits 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 both nitrate and nitrite in butter milk powder, casein, follow-on formula, growing up milk powder, infant formula, milk protein concentrate, skim milk powder, sodium caseinate, whey protein concentrate and whole milk powder.

Detections of nitrate were reported in 56 samples. Detections of nitrite were reported in 60 samples. All of the detections were below the action limit for nitrate and nitrite set for dairy products.

5.1.1.3 Metals

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

- **Arsenic** was detected in 2 samples (casein), well below the action limit (adjusted on a raw milk basis) of 0.01 mg/kg.

- **Cadmium** was detected in 15 samples (casein, follow-on formula, growing up milk powder, infant formula, skim milk powder and whey protein concentrate), well below the action limit (adjusted on a raw milk basis) of 0.1 mg/kg.

- **Lead** was detected in 2 samples (casein), below the action limit (on an as consumed basis[6]) of 0.02 mg/kg.

- **Tin** was detected in 12 samples (follow-on formula, growing up milk powder and infant formula), significantly below the joint Australia New Zealand Food Standards Code limit.

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

5.1.1.4 Pesticides

60 samples were tested for a wide range of pesticides in AMF, butter, casein, cheese, cream, dairy blend, follow-on formula, follow-on formula base, growing up milk powder, infant formula, milk protein concentrate, nutritional powder, other powders, skim milk powder, whey protein concentrate and whole milk powder.

- **DDE (p,p')** was detected in one sample (cream). The detection was below the New Zealand Maximum Residue Level (MRL) of 1.25 mg/kg on a fat basis. The detection was 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.

[5] ISO 22186:2020 [IDF 245:2020]. Milk and milk products — Determination of nitrofurazone
[6] GENERAL STANDARD FOR CONTAMINANTS AND TOXINS IN FOOD AND FEED – CODEX STAN 193-1995s

This confirms historic use rather than recent use of this pesticide in New Zealand.

- **Diphenylamine** was detected in one sample (dairy blend). 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. MPI continues to work with industry with the aim of identifying and eliminating or minimising the root cause. The detection was below the action limit (on a raw milk basis) and is of no food safety concern.

5.1.1.5 Phthalates

48 samples were tested for a range of phthalates in butter milk powder, follow-on formula, follow-on formula base, growing up milk powder, infant formula, nutritional powder, other powders, skim milk powder and whole milk powder.

There were 2 detections for phthalates in samples of follow on formula base and whole milk powder. The detections were all below the action limit on a raw milk basis, and do not represent a food safety concern.

One result was for **benzyl butyl phthalate (BBP)**. BBP is mainly used as a plasticiser in PVC and other polymer materials.

One result was for **Di(2-ethylhexyl terephthalate) (DEHT).** DEHT may be used in replacement of DEHP and DINP. It is a plasticiser and a structural isomer to DEHP.

Both findings were investigated and could not conclusively confirm the root source of these phthalate detections.

Contaminant migration standards for milk contact materials are applied through the Code of Practice: Design and Operation of Farm Dairies (NZCP1[7]). 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.

5.1.1.6 Quaternary Ammonium Compounds (QACs)

60 samples were tested for a range of QACs in AMF, butter, butter milk powder, cheese, cream, follow-on formula, follow on formula base, growing up milk powder, infant formula, milk protein concentrate, nutritional powder, other powders, skim milk powder, whey protein concentrate and whole milk powder.

There were nine detections of QACs across three samples of butter, nutritional powder and other powders.

Alkylbenzyldimethylammonium chlorides (C8-C18) was detected in three samples and;
Dialkyldimethyl quaternary ammonium chlorides (C8-C12) was detected in one sample and;
Benzyldimethyldodecylammonium chloride (BDM-C12) was detected in one sample and;
Benzyldimethyltetradecylammonium chloride (BDM-C14) was detected in two samples and;
Didecyldimethylammonium chloride (DM-DC10) was detected in one sample and;
Hexadecylpyridiniumammonium chloride (C16-Py) was detected in one sample. The detections were all well below the action limit.

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. 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.

[7] Operational Code: NZCP1: Design and Operation of Farm Dairies (mpi.govt.nz)

5.1.1.7 Antibiotic screen responses

Presumptive responses for the beta-lactam, tetracycline and aminoglycoside group of compounds were reported in five samples (follow-on formula, infant formula and whole milk powder). This analytical method is a microbial inhibition test. These highly formulated products may have inhibitory components that result in presumptive responses.

A sample with presumptive responses for tetracycline and aminoglycoside group of compounds was retested via the microbial inhibition test with no presumptive responses in the retest.

The samples with presumptive beta-lactam responses were tested using a confirmatory quantitative method. The confirmatory quantitative method did not report any of the beta-lactam compounds above the method reporting limit.

5.1.2 Dairy components

Samples of follow-on formula, follow-on formula base, growing up milk powder, growing up milk powder base, infant formula, infant formula base, milk, milk protein concentrate, nutritional powder, skim milk powder 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[8].

5.1.3 Naturally occurring elements and other compounds

Samples of AMF, butter, casein, cream, follow-on formula, follow-on formula base, growing up milk powder, growing up milk powder base, infant formula, nutritional powder, skim milk powder, whey protein concentrate and whole milk powder were tested for a range of naturally occurring elements and other compounds.

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

6 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.

7 Summary of Dairy Product Results for 2022/23

7.1 Reporting of residues and contaminants in dairy products

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

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
(E)-Metominostrobin	60	60	0	0	
(E)-Pyriminobac-methyl	60	60	0	0	
(Z)-Metominostrobin	60	60	0	0	
(Z)-Pyriminobac-methyl	60	60	0	0	
1,2,3,6-Tetrahydrophthalimide	59	59	0	0	
2-Phenylphenol	60	60	0	0	

[8] 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.

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
5-Hydroxyimidacloprid	58	58	0	0	
Abamectin	59	59	0	0	
Acephate	60	60	0	0	
Acetamiprid	60	60	0	0	
Acetamiprid-N-desmethyl	60	60	0	0	
Acetochlor	60	60	0	0	
Acibenzolar-S-methyl	60	60	0	0	
Acrinathrin	59	59	0	0	
AHD (1-aminohydantoin)	49	49	0	0	
Alachlor	60	60	0	0	
Alanycarb	60	60	0	0	
Aldicarb	48	48	0	0	
Aldicarb sulfoxide	60	60	0	0	
Aldoxycarb	60	60	0	0	
Aldrin	60	60	0	0	
Alkylbenzyldimethylammonium chlorides (C8-C18)	60	57	3	0	●
Allidochlor	60	60	0	0	
alpha-Endosulfan	60	60	0	0	
alpha-HCH	60	60	0	0	
Ametoctradin	60	60	0	0	
Ametryn	60	60	0	0	
Aminomethylphosphonic acid	30	30	0	0	
Amoxicillin	60	60	0	0	
AMOZ (5-methylmorpholino-3-amino-2-oxazolidinone)	49	49	0	0	
Ampicillin	60	60	0	0	
Anilofos	59	59	0	0	
Anthraquinone	60	60	0	0	
AOZ (3-amino-2-oxazolidinone)	49	49	0	0	
Arsenic	60	58	2	0	●
Atrazine	60	60	0	0	
Azaconazole	60	60	0	0	
Azamethiphos	60	60	0	0	
Azinphos-methyl	59	59	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	60	60	0	0	
Bensulide	60	60	0	0	
Benzyl butyl phthalate (BBP)	48	47	1	0	●
Benzyldimethyldecylammonium chloride (BDM-C10)	60	60	0	0	
Benzyldimethyldodecylammonium chloride (BDM-C12)	60	59	1	0	●
Benzyldimethylhexadecylammonium chloride (BDM-C16)	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Benzyldimethyloctadecylammonium chloride (BDM-C18)	60	60	0	0	
Benzyldimethyloctylammonium chloride (BDM-C8)	60	60	0	0	
Benzyldimethyltetradecylammonium chloride (BDM-C14)	60	58	2	0	●
Benzylpenicillin	60	60	0	0	
beta-Endosulfan	60	60	0	0	
beta-HCH	60	60	0	0	
Bifenox	60	60	0	0	
Bifenthrin	60	60	0	0	
Bioresmethrin	57	57	0	0	
Bitertanol	60	60	0	0	
Boron	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	60	60	0	0	
Butamifos	60	60	0	0	
Cadmium	60	45	15	0	●
Cadusafos	60	60	0	0	
Cafenstrole	60	60	0	0	
Carbaryl	34	34	0	0	
Carbendazim	60	60	0	0	
Carbetamide	60	60	0	0	
Carbofuran	60	60	0	0	
Carboxin	52	52	0	0	
Carfentrazone-ethyl	60	60	0	0	
Carpropamid	60	60	0	0	
Cefalexin	60	60	0	0	
Cefalonium	60	60	0	0	
Ceftiofur	60	60	0	0	
Cefuroxime	60	60	0	0	
Chlorantraniliprole	60	60	0	0	
Chlorfenapyr	60	60	0	0	
Chlorfenvinphos	60	60	0	0	
Chloridazon	60	60	0	0	
Chlorimuron-ethyl	60	60	0	0	
Chlorobenzilate	60	60	0	0	
Chlorotoluron	60	60	0	0	
Chloroxuron	60	60	0	0	
Chlorpropham	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Chlorpyrifos	60	60	0	0	
Chlorpyrifos-methyl	60	60	0	0	
Chlorsulfuron	60	60	0	0	
Chlortetracycline	60	60	0	0	
Chlorthal-dimethyl	60	60	0	0	
Chlorthiophos	60	60	0	0	
Chlozolinate	60	60	0	0	
Chromafenozide	60	60	0	0	
Cinidon-ethyl	60	60	0	0	
cis-Chlordane	60	60	0	0	
Clethodim	2	2	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	55	55	0	0	
Cloxacillin	60	60	0	0	
Coumaphos	59	59	0	0	
Coumaphos-oxon	59	59	0	0	
Crufomate	60	60	0	0	
Cyanazine	59	59	0	0	
Cyanophos	60	60	0	0	
Cyantraniliprole	60	60	0	0	
Cyanuric acid	60	60	0	0	
Cyazofamid	60	60	0	0	
Cycloate	4	4	0	0	
Cyclosulfamuron	60	60	0	0	
Cyflufenamid	60	60	0	0	
Cyfluthrin (sum of isomers)	60	60	0	0	
Cyhalofop-butyl	60	60	0	0	
Cyhalothrin (sum of isomers)	60	60	0	0	
Cymoxanil	60	60	0	0	
Cypermethrin (sum of isomers)	60	60	0	0	
Cyproconazole (sum of isomers)	60	60	0	0	
Cyprodinil	60	60	0	0	
Cyromazine	3	3	0	0	
Daimuron	60	60	0	0	
delta-HCH	60	60	0	0	
Deltamethrin	60	60	0	0	
Demeton-S-methyl	46	46	0	0	
Demeton-S-methyl-sulfoxide	60	60	0	0	
Desmedipham	60	60	0	0	
Di(2-ethoxyethyl) phthalate (DEEP)	48	48	0	0	
Di(2-ethylhexyl) adipate (DEHA)	48	48	0	0	
Di(2-ethylhexyl) phthalate (DEHP)	48	48	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Di(2-ethylhexyl) terephthalate (DEHT)	48	47	1	0	●
Di(2-methoxyethyl) phthalate (DMEP)	48	48	0	0	
Di(2-n-butoxyethyl) phthalate (DBEP)	48	48	0	0	
Di(4-methyl-2-pentyl) phthalate (BMPP)	48	48	0	0	
Dialkyldimethyl quaternary ammonium chlorides (C8-C12)[4]	60	59	1	0	●
Diallyl phthalate (DAP)	48	48	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	60	60	0	0	
Dicofol	60	60	0	0	
Dicrotophos	59	59	0	0	
Dicyandiamide	60	60	0	0	
Dicyclanil	60	60	0	0	
Dicyclohexyl phthalate (DCHP)	48	48	0	0	
Didecyl phthalate (DDP)	48	48	0	0	
Didecyldimethylammonium chloride (DMD-C10)	60	59	1	0	●
Didodecyldimethylammonium chloride (DMD-C12)	60	60	0	0	
Dieldrin	60	60	0	0	
Diethofencarb	60	60	0	0	
Diethyl phthalate (DEP)	48	48	0	0	
Difenoconazole	60	60	0	0	
Diflubenzuron	60	60	0	0	
Diflufenican	60	60	0	0	
Diheptyl phthalate (DHP)	48	48	0	0	
Dihexyl phthalate (DHXP)	48	48	0	0	
Dihydrostreptomycin	60	60	0	0	
Diisobutyl phthalate (DIBP)	48	48	0	0	
Diisodecyl phthalate (DIDP)	48	48	0	0	
Diisononyl phthalate (DINP)	48	48	0	0	
Diisooctyl phthalate (DIOP)	48	48	0	0	
Diisopropyl phthalate (DIPP)	48	48	0	0	
Dimepiperate	60	60	0	0	
Dimethenamid	60	60	0	0	
Dimethoate	60	60	0	0	
Dimethomorph	60	60	0	0	
Dimethyl isophthalate (DMIP)	48	48	0	0	
Dimethyl phthalate (DMP)	48	48	0	0	
Dimethyldioctylammonium chloride (DMD-C8)	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Dimethylditetradecylammonium chloride (DMD-C14)	60	60	0	0	
Dimethylvinphos	60	60	0	0	
Di-n-butyl phthalate (DBP)	48	48	0	0	
Di-n-nonyl phthalate (DNP)	48	48	0	0	
Di-n-octyl phthalate (DNOP)	48	48	0	0	
Di-n-pentyl phthalate (DNPP)	48	48	0	0	
Di-n-undecyl phthalate (DUP)	48	48	0	0	
Dioxabenzofos	60	60	0	0	
Dioxathion	60	60	0	0	
Diphenamid	60	60	0	0	
Diphenyl phthalate (DPP)	48	48	0	0	
Diphenylamine	60	59	1	0	●
Disulfoton	46	46	0	0	
Dithiopyr	60	60	0	0	
Diuron	60	60	0	0	
Edifenphos	60	60	0	0	
Emamectin Benzoate	60	60	0	0	
Endosulfan sulfate	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	47	47	0	0	
Erythromycin	60	60	0	0	
Esprocarb	60	60	0	0	
Ethalfluralin	60	60	0	0	
Ethametsulfuron-methyl	60	60	0	0	
Ethiofencarb	45	45	0	0	
Ethion	60	60	0	0	
Ethiprole	60	60	0	0	
Ethofumesate	60	60	0	0	
Ethoprophos	60	60	0	0	
Ethoxyquin	54	54	0	0	
Ethoxysulfuron	60	60	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	59	59	0	0	
Fenamidone	60	60	0	0	
Fenamiphos	48	48	0	0	
Fenarimol	59	59	0	0	
Fenbuconazole	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Fenchlorphos	60	60	0	0	
Fenhexamid	60	60	0	0	
Fenitrothion	60	60	0	0	
Fenobucarb	59	59	0	0	
Fenothiocarb	60	60	0	0	
Fenoxanil	60	60	0	0	
Fenoxaprop	60	60	0	0	
Fenoxaprop-ethyl	60	60	0	0	
Fenoxycarb	60	60	0	0	
Fenpiclonil	60	60	0	0	
Fenpropathrin	60	60	0	0	
Fenpropidin	2	2	0	0	
Fenpropimorph	60	60	0	0	
Fenpyroximate	60	60	0	0	
Fensulfothion	59	59	0	0	
Fenthion	54	54	0	0	
Fenthion oxon	48	48	0	0	
Fenthion oxon sulfone	60	60	0	0	
Fenthion oxon sulfoxide	60	60	0	0	
Fenthion sulfone	59	59	0	0	
Fenthion-ethyl	54	54	0	0	
Fentrazamide	60	60	0	0	
Fenvalerate	60	60	0	0	
Ferimzone	48	48	0	0	
Fipronil	60	60	0	0	
Fipronil sulfide	60	60	0	0	
Fipronil sulfone	60	60	0	0	
Flamprop	2	2	0	0	
Flamprop-methyl	60	60	0	0	
Flazasulfuron	60	60	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	60	60	0	0	
Fludioxonil	60	60	0	0	
Flufenacet	60	60	0	0	
Flumethrin	60	60	0	0	
Flumiclorac-pentyl	60	60	0	0	
Flumioxazin	60	60	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	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Flusilazole	60	60	0	0	
Fluthiacet-methyl	60	60	0	0	
Flutolanil	60	60	0	0	
Flutriafol	60	60	0	0	
Fluvalinate	60	60	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	
Furametpyr	60	60	0	0	
Furathiocarb	60	60	0	0	
Gentamicin	60	60	0	0	
Glyphosate	30	30	0	0	
Halosulfuron-methyl	60	60	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	58	58	0	0	
Hexazinone	60	60	0	0	
Hexyl 2-ethylhexyl phthalate (HEHP)	48	48	0	0	
Hexythiazox	4	4	0	0	
Imazalil	60	60	0	0	
Imazamethabenz-methyl	60	60	0	0	
Imazosulfuron	60	60	0	0	
Imidacloprid	60	60	0	0	
Imidacloprid-olefin	60	60	0	0	
Inabenfide	60	60	0	0	
Indanofan	60	60	0	0	
Indoxacarb	60	60	0	0	
Iodosulfuron-methyl	60	60	0	0	
Iprobenfos	60	60	0	0	
Iprodione	60	60	0	0	
Iprovalicarb	60	60	0	0	
Isazofos	60	60	0	0	
Isofenphos	60	60	0	0	
Isofenphos-methyl	60	60	0	0	
Isoprocarb	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Isoprothiolane	60	60	0	0	
Isoproturon	60	60	0	0	
Isopyrazam	60	60	0	0	
Isoxathion	60	60	0	0	
Jodfenphos	60	60	0	0	
Kanamycin	60	60	0	0	
Karbutilate	60	60	0	0	
Kresoxim-methyl	60	60	0	0	
Lactofen	60	60	0	0	
Lead	60	58	2	0	●
Lenacil	60	60	0	0	
Leptophos	59	59	0	0	
Lindane	60	60	0	0	
Linuron	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	60	60	0	0	
Mesotrione	4	4	0	0	
Mesulfenfos	57	57	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	59	59	0	0	
Methiocarb	48	48	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	
Metosulam	60	60	0	0	
Metrafenone	60	60	0	0	
Metribuzin	60	60	0	0	
Metsulfuron-methyl	60	60	0	0	
Mevinphos	60	60	0	0	
Mirex	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Molinate	60	60	0	0	
Monocrotophos	60	60	0	0	
Monofluoroacetic acid	60	60	0	0	
Monolinuron	60	60	0	0	
Myclobutanil	60	60	0	0	
Napropamide	60	60	0	0	
Nicotine	43	43	0	0	
Nitrate	60	4	56	0	●
Nitrite	60	0	60	0	●
Nitrofen	60	60	0	0	
Nitrothal-isopropyl	60	60	0	0	
Norflurazon	60	60	0	0	
Novaluron	60	60	0	0	
o,p'-DDE	60	60	0	0	
o,p'-DDT	60	60	0	0	
o,p'-TDE	60	60	0	0	
Octhilinone	60	60	0	0	
Oleandomycin	60	60	0	0	
Omethoate	60	60	0	0	
Oryzalin	60	60	0	0	
Oxabetrinil	60	60	0	0	
Oxadiazon	60	60	0	0	
Oxadixyl	60	60	0	0	
Oxamyl	60	60	0	0	
Oxycarboxin	60	60	0	0	
Oxychlordane	60	60	0	0	
Oxyfluorfen	60	60	0	0	
Oxytetracycline	60	60	0	0	
p,p'-DDE	60	59	1	0	●
p,p'-DDT	60	60	0	0	
p,p'-TDE	60	60	0	0	
Paclobutrazol	60	60	0	0	
Parathion	60	60	0	0	
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	
Perthane	60	60	0	0	
Phenmedipham	60	60	0	0	
Phenthoate	60	60	0	0	
Phorate	48	48	0	0	
Phorate sulfone	59	59	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Phorate sulfoxide	60	60	0	0	
Phosalone	59	59	0	0	
Phosmet	59	59	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	60	60	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	48	48	0	0	
Propanil	60	60	0	0	
Propaphos	48	48	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	58	58	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	
Pymetrozine	60	60	0	0	
Pyraclofos	59	59	0	0	
Pyraclostrobin	58	58	0	0	
Pyraflufen-ethyl	60	60	0	0	
Pyrasulfotole	4	4	0	0	
Pyrazophos	59	59	0	0	
Pyrethrins	58	58	0	0	
Pyributicarb	48	48	0	0	
Pyridaben	60	60	0	0	
Pyridaphenthion	59	59	0	0	
Pyrifenox	4	4	0	0	
Pyriftalid	60	60	0	0	
Pyrimethanil	60	60	0	0	
Pyrimidifen	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Pyriproxyfen	60	60	0	0	
Pyroquilon	60	60	0	0	
Pyroxsulam	60	60	0	0	
Quinalphos	60	60	0	0	
Quinoclamine	60	60	0	0	
Quinoxyfen	60	60	0	0	
Quintozene	60	60	0	0	
Quizalofop-ethyl	60	60	0	0	
Rimsulfuron	60	60	0	0	
Saflufenacil	60	60	0	0	
Sebuthylazine	60	60	0	0	
SEM (semicarbazide)	49	44	5	0	●
Sethoxydim	52	52	0	0	
Simazine	60	60	0	0	
Simeconazole	60	60	0	0	
Simetryn	60	60	0	0	
Spinetoram (sum of major and minor components as spinetoram)	60	60	0	0	
Spinosad (sum of spinosyn A and spinosyn D as spinosad)	60	60	0	0	
Spiramycin	60	60	0	0	
Spiromesifen	59	59	0	0	
Spiromesifen-enol	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	60	60	0	0	
Spirotetramat-mono-hydroxy	60	60	0	0	
Spiroxamine	58	58	0	0	
Streptomycin	60	60	0	0	
Sulfentrazone	60	60	0	0	
Sulprofos	48	48	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	48	48	0	0	
Tepraloxydim	60	60	0	0	
Terbacil	59	59	0	0	
Terbufos	54	54	0	0	
Terbumeton	60	60	0	0	
Terbuthylazine	60	60	0	0	
Terbutryn	60	60	0	0	
Tetrachlorvinphos	59	59	0	0	
Tetraconazole	60	60	0	0	

Compound	Samples reported[1]	Samples with no detections	Detections at or below the action limit[2]	Detections above the action limit[3]	Flag
Tetracycline	60	60	0	0	
Tetradifon	60	60	0	0	
Thenylchlor	59	59	0	0	
Thiabendazole	60	60	0	0	
Thiacloprid	60	60	0	0	
Thiamethoxam	60	60	0	0	
Thiazopyr	60	60	0	0	
Thidiazuron	60	60	0	0	
Thiobencarb	58	58	0	0	
Thiometon	46	46	0	0	
Tiadinil	60	60	0	0	
Tin	60	48	12	0	●
Tolclofos-methyl	60	60	0	0	
Tolylfluanid	60	60	0	0	
Tralkoxydim	60	60	0	0	
trans-Chlordane	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	60	60	0	0	
Triazophos	59	59	0	0	
Tribenuron-methyl	52	52	0	0	
Tribufos	60	60	0	0	
Trichlorfon	60	60	0	0	
Tricyclazole	60	60	0	0	
Trifloxystrobin	60	60	0	0	
Trifloxysulfuron-sodium	60	60	0	0	
Triflumizole	60	60	0	0	
Triflumuron	60	60	0	0	
Trifluralin	60	60	0	0	
Triflusulfuron-methyl	60	60	0	0	
Triforine	60	60	0	0	
Triticonazole	60	60	0	0	
Tylosin	60	60	0	0	
Uniconazole-P	60	60	0	0	
Vamidothion	48	48	0	0	
Vinclozolin	60	60	0	0	
XMC	59	59	0	0	
Zoxamide	60	60	0	0	

Notes

1 Samples are counted as reported if results for the test are reportable. Reportable results are when all the quality control criteria have 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

4 Includes Dimethyldioctylammonium chloride, Dimethyldidecylammonium chloride and Dimethyldidodecylammonium chloride

● The amount reported did not exceed the action limit as set out in section 3.1

Presumptive positives which are found using a qualitative method are not reported as detected, unless the detection is confirmed by a confirmatory method.

7.2 Reporting of compositional testing and naturally occurring compounds

Table 4: Dairy components

Product Type	Samples Collected			
	Ash	Fat	Moisture	Protein
Follow-on formula	13	13	6	6
Follow-on formula base	1	1	0	0
Growing up milk powder	17	17	9	9
Growing up milk powder base	1	1	0	0
Infant formula	16	16	8	8
Milk	0	0	0	3
Milk protein concentrate	0	0	4	4
Nutritional powder	12	12	6	6
Skim milk powder	0	0	7	7
Whole milk powder	0	0	17	17

Table 5: Naturally occurring chemical elements and added compounds

Naturally occurring chemical elements and added compounds	Samples collected	Product type collected												
		AMF	Butter	Casein	Cream	Follow-on formula	Follow-on formula base	Growing up milk powder	Growing up milk powder base	Infant formula	Nutritional powder	Skim milk powder	Whey protein concentrate	Whole milk powder
alpha-Linolenic acid (18:3)	60	0	0	0	0	13	1	17	1	16	12	0	0	0
Aluminium	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Arachidonic acid	60	0	0	0	0	13	1	17	1	16	12	0	0	0
Bismuth	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Butanal	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Chromium	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Cobalt	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Copper	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Docosahexaenoic C22:6n-3 (DHA)	60	0	0	0	0	13	1	17	1	16	12	0	0	0
Formaldehyde	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Heptanal	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Hexanal	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Iodine	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Iron	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Linoleic acid (18:2)	60	0	0	0	0	13	1	17	1	16	12	0	0	0
Nonanal	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Octanal	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Pentanal	30	0	0	0	0	0	0	0	0	0	0	9	0	21
Selenium	60	1	2	3	2	6	0	8	0	7	5	7	3	16
Sodium thiocyanate	59	0	0	0	0	8	0	11	0	9	0	10	0	21
Titratable acidity	60	0	0	0	0	7	0	10	0	9	7	8	0	19
Vitamin B6	59	0	0	0	0	13	1	17	1	15	12	0	0	0
Vitamin C	60	0	0	0	0	13	1	17	1	16	12	0	0	0
Zinc	60	1	2	3	2	6	0	8	0	7	5	7	3	16