



## 2017 Residue Monitoring Report

Skretting Australia

Summary of Results 2012-2017

Issued May 2018

## About Skretting

Skretting is the world leader in the manufacture and supply of aquaculture feeds, making it an essential link in the feed-to-food chain. We apply our knowledge of ingredients and the nutritional needs of fish and shrimp to develop innovations that achieve optimum nutritional value, sustainable production and economic performance as we seek to fulfil our company-wide mission of 'Feeding the Future'.

Read more at [www.skretting.com.au](http://www.skretting.com.au)

Nutreco is a global leader in animal nutrition and fish and shrimp feed.

Experience across 100 years brings Nutreco a rich heritage of knowledge. Nutreco employs approximately 11,000 people in 35 countries, with sales in 80 countries.

Read more at [www.nutreco.com](http://www.nutreco.com)

### Our mission

feeding  
the future

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# Feed to food quality & safety

Nutrace is Skretting's unique, global feed-to-food quality and safety system. It ensures consistency throughout the production process, from raw materials to final feed solutions.

Nutrace is built on five strong pillars:

- Certified Quality & Food Safety
- Ingredient and Supplier Assessment & Management
- Monitoring & Control
- Risk Management
- Tracking & Tracing

Nutrace ensures that our customers and end consumers can have full confidence with regard to feeds in the farmed fish value chain.

Skretting Australia has been a Nutrace compliant company since 2013.

[Click here to read more about Nutrace](#)



Certified Quality & Food Safety



Ingredient and Supplier Assessment & Management



Monitoring & Control



Risk Management



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# About residue testing

Skretting conduct regular testing of our feeds for undesirable substances.

This is part of Skretting's Nutrace, Feed-to-Food Quality and Safety System, which acts to validate the quality controls performed throughout the year. These controls include frequent analysis of raw materials, supplier assessments and systems to control the pellet manufacturing process.

Skretting's Food Safety Team regularly review potential residues based on a risk assessment considering the scale of use, toxicity and persistence of each compound.

A global testing program for these residues is set annually. Testing is conducted by Skretting-approved, accredited laboratories that have demonstrated the highest level of competency and repeatability.

Skretting Australia undertakes residue testing on raw materials and finished feeds to ensure their quality.

Results reported here relate to complete fish feeds produced by Skretting Australia. Samples chosen best represent production since publishing the previous annual Residue Monitoring Report in 2017.

Skretting  
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## About this report

This Residue Monitoring Report summarises the level of undesirable substances in Skretting Australia feeds from 2012 to 2017.

Australian residue limits [maximum residue limit (MRL) and the extraneous residue limit (ERL)] are set by the [Australian Pesticides and Veterinary Medicines Authority \(APVMA\)](#).

If an Australian limit does not exist for a parameter, the relevant EU statutory limit

has been used. EU statutory limits are equivalent to MRL standards.

All results for Skretting Australia feeds were within the Australian and European limits.

We provide this report to keep Skretting customers informed of the status of our monitoring results.

To view previous reports, [please click here](#).

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”

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# Definitions & Terminology

Maximum residue limit (MRL) means the maximum concentration of a residue resulting from the registered use of an agricultural or veterinary chemical which is legally permitted or recognised as acceptable to be present in or on a food, agricultural commodity or animal feed.

Extraneous residue limit (ERL) refers to a pesticide residue arising from environmental sources (including former agricultural uses) other than the use of the chemical directly or indirectly on the food, agricultural commodity or animal feed. ERL means the maximum concentration of the pesticide residue that is recommended to be legally permitted or recognised as acceptable in or on a food, agricultural commodity or animal feed.

EU limit refers to the MRL according to European Union (EU) legislation

Primary feed commodity means a pasture, grain, forage or fodder in, or nearly in, its natural state intended for use by:

(a) Farmers as stockfeed for use without further processing for livestock animals, or after silaging or similar farm processes; or

(b) Stockfeed manufacturers as a raw material for preparing compound feeds.

Compound feed is a nutritionally adequate feed for animals to be fed as the sole ration and is capable of maintaining life and/or promoting production without any additional substance being consumed.

Limit of quantification (LOQ) is the lower limit for a reliable quantitative measurement. Levels that are so low that they cannot be quantified with acceptable reliability will be reported as “below detection limit”.

TEF and TEQ: The [World Health Organisation \(WHO\)](#) has established two lists of toxicity factors for dioxin and PCB congeners. These are called TEF values, (toxic equivalent factors). When a concentration is weighted with its corresponding TEF factor it is no longer called a concentration, but a toxic equivalent, a TEQ. The TEQ values have the same unit of measurement as a concentration, in this case ng/kg wet weight.

Definitions sourced from [FAO](#), [APVMA](#) and [NIFES](#) websites.

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# PCBs & Dioxins

## BACKGROUND

Polychlorinated biphenyls (PCBs) are extremely persistent organic pollutants historically used as coolants, plasticisers, lubricants etc. The term “dioxins” includes polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). These are listed on laboratory reports as PCDD/F and are the main focus in terms of food safety. PCDD/Fs are unwanted by-products of chemical manufacture, bleaching processes and combustion processes.

## LIMITS

Substance	Unit	Australia <sup>1</sup>	EU/ Norway <sup>2</sup>
Dioxins (Dioxins & furans)	TEQ (WHO) ng/kg	No limit	1.75
Sum of Dioxin & Dioxin-like PCBs	TEQ (WHO) ng/kg	No limit	5.5

ng = nanogram

kg = kilogram

TEQ = Toxic Equivalent (the amount of toxin or other poison per kilogram of body weight necessary to kill an animal)

WHO = World Health Organisation (Standard)

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp

2. OJ L 91, 29.3.2012, p.18-20. Commission Regulation (EU) No 277/2012

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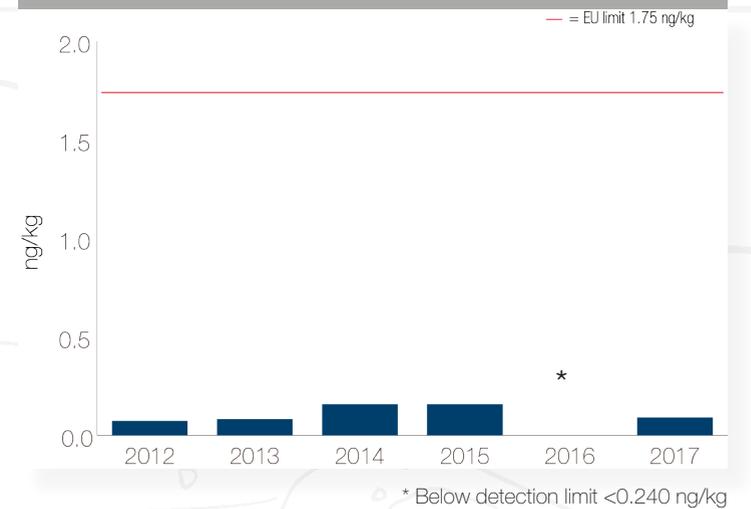
# PCBs & Dioxins

Manufacturing of PCBs has been banned in most countries since the 1980s. Australia banned the importation of PCBs in 1975.

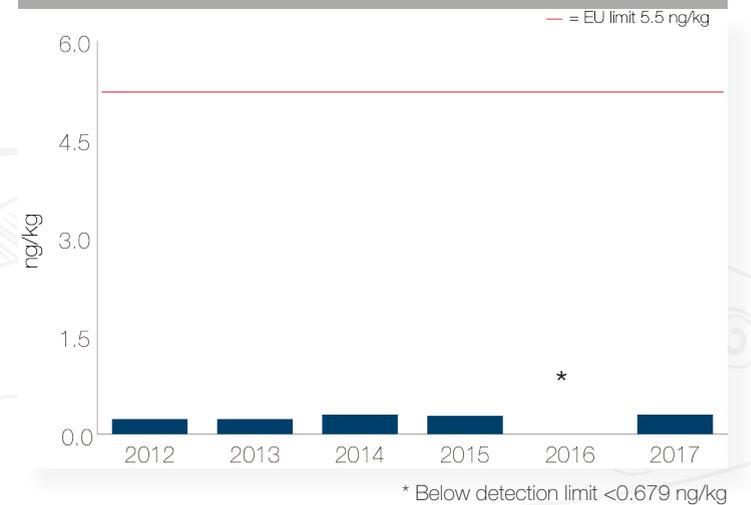
PCBs are usually present in much higher quantities than dioxins, but are less toxic. The most toxic PCBs are classed as 'dioxin-like' by the [World Health Organisation \(WHO\)](#). It is these 12 'dioxin-like' PCBs which the EU has set limits for in combination with dioxin residues.

Skretting Australia feeds have consistently met EU limits for PCBs & Dioxins since testing began in 2012.

## PCDD & PCDF



## SUM DIOXINS & DIOXIN-LIKE PCBs



# Pesticides

## BACKGROUND

Pesticides have been widely and commonly used to protect crops, livestock, buildings and households from pests. Although the widespread use of pesticides posing significant health risks has been banned in many countries, several pesticides are still produced in developing countries. Many pesticides continue to be detected in precipitation, soil, sediment, biota, aquatic ecosystems and food.

## LIMITS

Pesticide	Unit	Australia <sup>1</sup>	EU/Norway <sup>2</sup>
Aldrin & Dieldrin (sum of HHDN & HEOD)	mg/kg	E 0.01	0.02
Chlordane (sum of cis- trans- & oxy-chordane isomers)	mg/kg	E 0.01	0.02
DDT (sum of o,p'-DDT; p,p'-DDE; p,p'-DDT)	mg/kg	E 0.05	0.05
Endosulfan (sum of alpha- & beta-endosulfan & endosulfan sulphate)	mg/kg	No limit	0.005
Endrin (sum of endrin & delta-keto endrin)	mg/kg	E 0.03	0.01
Heptachlor (sum of heptachlor & heptachlor epoxide)	mg/kg	E 0.02	0.01
Hexachlorobenzene (HCB)	mg/kg	E 0.01	0.01
alpha-Hexachlorocyclohexane (alpha-HCH)	mg/kg	No limit	0.02
beta-Hexachlorocyclohexane (beta-HCH)	mg/kg	No limit	0.01

mg = milligram  
kg = kilogram

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp. 'E' denotes an Extraneous Residue Limit (ERL). All Australian ERLs are based on the value for a primary feed commodity as there is no specific MRL/ERL for compound fish feed.

2. OJ L140, 30.5.2002, p.10. Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed.

In previous years, samples were screened for total pesticides, but from 2013 onwards each pesticide is analysed individually. The Residue Report will now show actual level, not just whether the sample was under the threshold.

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# Pesticides

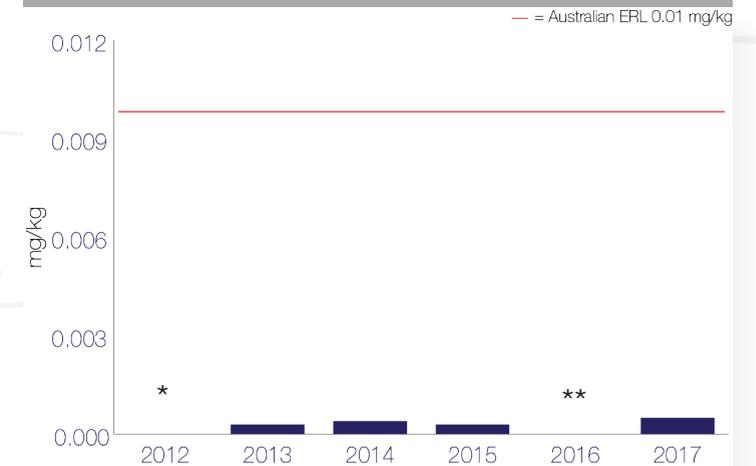
Aldrin and dieldrin (a metabolite of aldrin as well as a marketed pesticide) are both fat soluble, persistent and bio-accumulating organochlorine insecticides. (In the environment, aldrin is rapidly converted to dieldrin).

Widely used as insecticides in agriculture, the registration of the last aldrin and dieldrin products in Australia were cancelled in 1994 and 1988 respectively.

Worldwide, the use of both compounds is severely restricted or banned in many countries.

Skretting Australia feeds have consistently met Australian limits for aldrin and dieldrin since testing began in 2012.

## ALDRIN/DIELDRIN



\*\* Below detection limit <0.005 mg/kg

\* Below detection limit <0.002 mg/kg

# Pesticides

Chlordane is a non-systemic (ie not taken up in the plant) insecticide of agricultural crops.

Chlordane is not used in Australia - the last registered Chlordane product was withdrawn in 1997. Chlordane is banned in Europe (1981) and the USA (1978) and currently in most other countries worldwide.

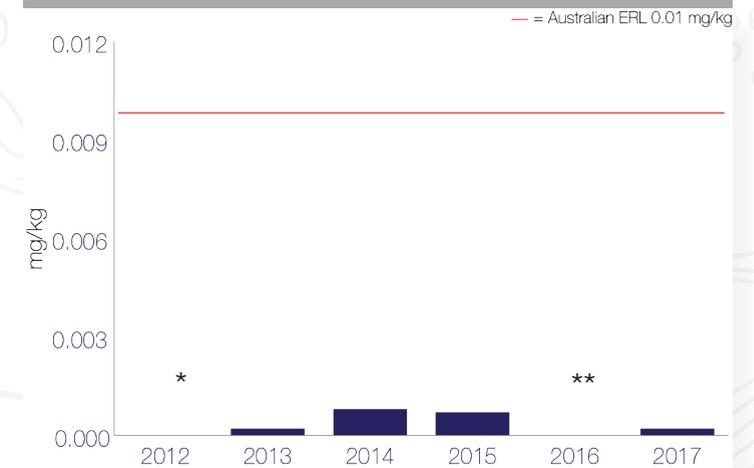
In accordance with the Australian residue limit (ERL) standard, Chlordane is reported as the sum of cis-, trans- and oxy-Chlordane isomers.

DDT is highly insoluble in water, lipophilic and persistent in the environment. Because of the lipophilic properties and persistence in the environment, DDT and related compounds are bio-accumulating and biomagnified along the food chain.

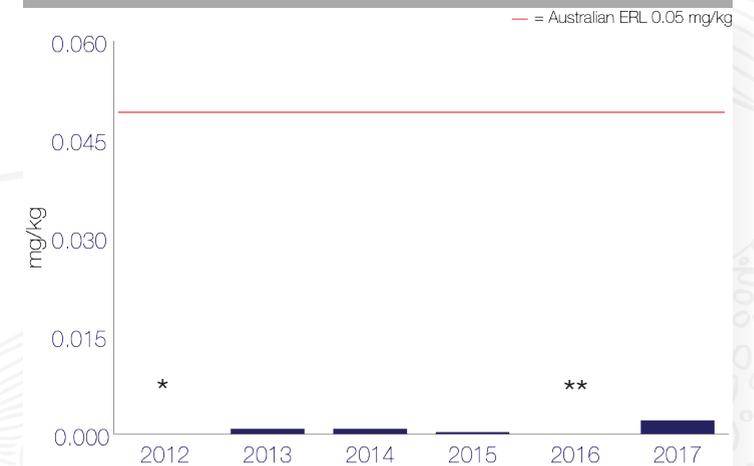
In Australia, registrations of all DDT products had been cancelled by the late 1990's (the majority of products had not been used since the mid-1980's).

Skretting Australia feeds have consistently met Australian limits for chlordane & DDT since testing began in 2012.

## CHLORDANE



## DDT



\*\* Below detection limit <0.005 mg/kg

\* Below detection limit <0.002 mg/kg

# Pesticides

Endosulfan is a non-systemic organochlorine pesticide used in agricultural and horticultural crops for control of insects and mites.

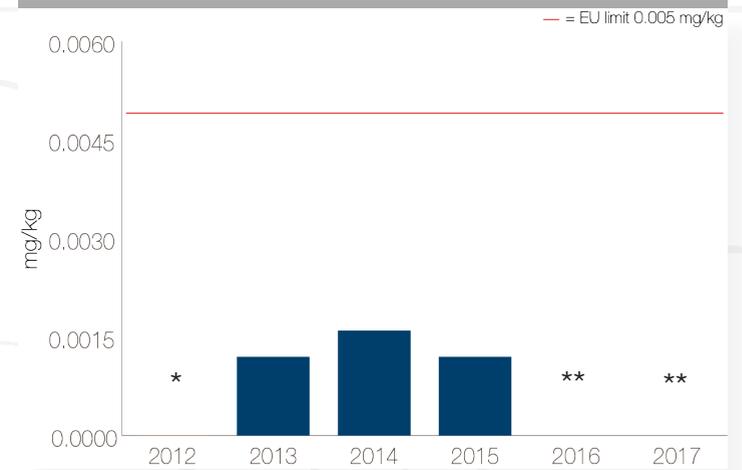
Registration of endosulfan in Australia was cancelled in October 2010. Endosulfan is banned in Europe (2006) and currently restricted or banned in most other countries worldwide.

The last Australian-registered endrin product was cancelled in 1990. Endrin has been banned in most countries worldwide during the last 25 years.

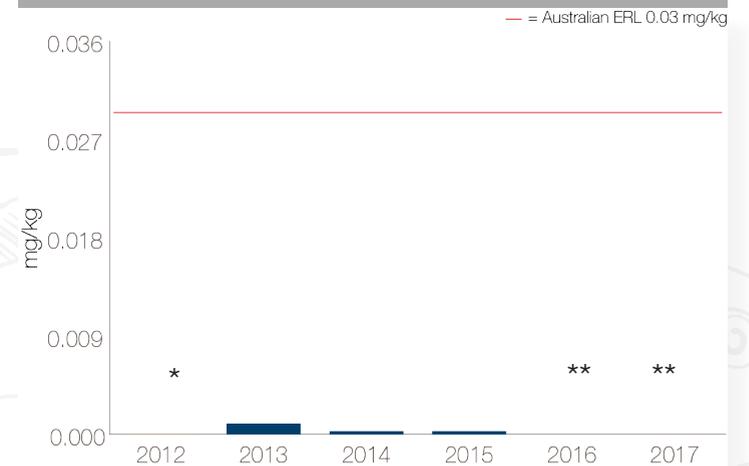
Endrin is partly transformed in the environment into delta-keto endrin.

Skretting Australia feeds have consistently met Australian limits for Endrin since testing began in 2012.

## ENDOSULFAN



## ENDRIN



\*\* Below detection limit <0.005mg/kg

\* Below detection limit <0.002mg/kg

# Pesticides

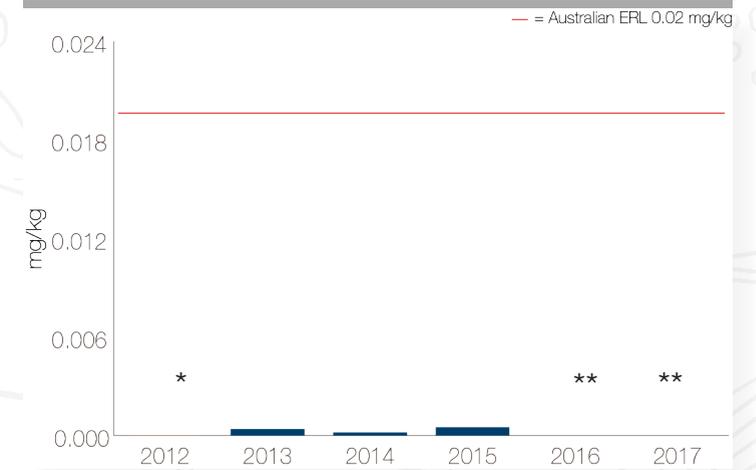
The last Australian-registered heptachlor product was cancelled in 1997 (the majority of heptachlor products were cancelled by the end of 1990). Heptachlor is banned in Europe (1984) and most other countries worldwide.

In the environment, heptachlor breaks down to heptachlor epoxide and photoheptachlor. In accordance with the Australian residue limit (ERL) standard, heptachlor is reported as the the sum of heptachlor and heptachlor epoxide.

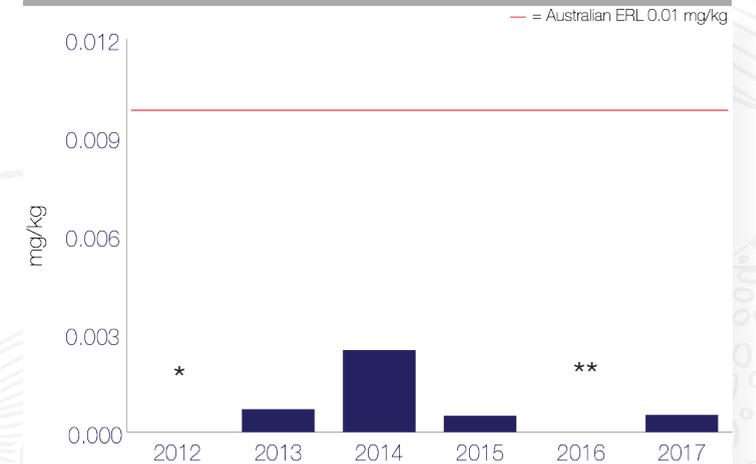
Hexachlorobenzene (HCB) is an agricultural pesticide used as a fungicide (seed disinfectant). The last Australian-registered HCB product was banned in 1987. HCB is banned in Europe (1981) and most other countries worldwide.

Skretting Australia feeds have consistently met Australian limits for Heptachlor and HCB since testing began in 2012.

## HEPTACHLOR



## HEXACHLOROBEZENE (HCB)



\*\* Below detection limit <0.005mg/kg

\* Below detection limit <0.002mg/kg

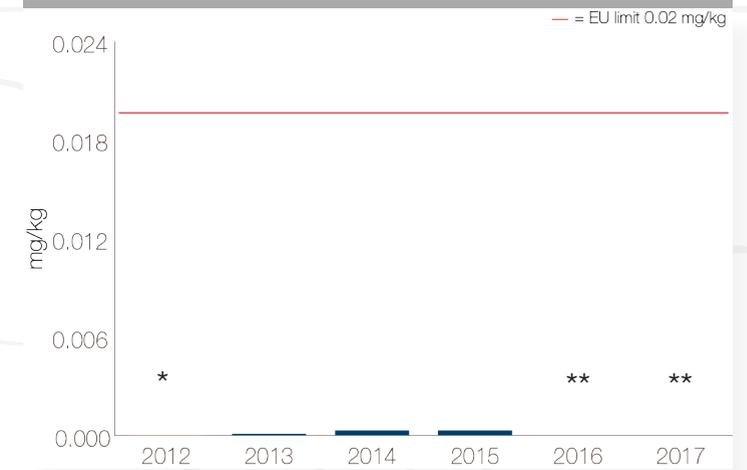
# Pesticides

Technical Hexachlorocyclohexane (HCH) was used as an insecticide worldwide. It is a mixture of isomers – the four predominant are alpha-, beta-, delta- and gamma-HCH (also known as lindane).

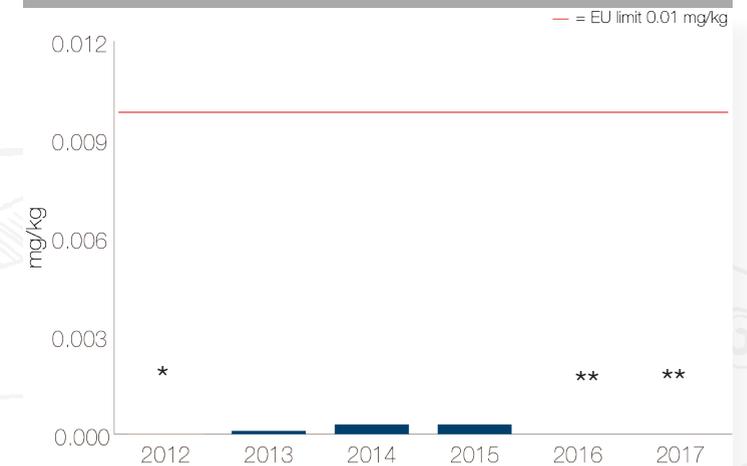
Technical HCH is banned in Europe (1978) and most other countries worldwide.

Skretting Australia feeds have consistently met EU limits for HCH since testing began in 2012.

## ALPHA-HCH



## BETA-HCH



\*\* Below detection limit <0.005mg/kg

\* Below detection limit <0.002mg/kg

# Heavy Metals

## BACKGROUND

Some heavy metals are either essential nutrients (typically iron, cobalt, and zinc), or relatively harmless (such as ruthenium, silver, and indium), but can be toxic in larger amounts or certain forms. Heavy metal pollution commonly arises from the purification of metals, and unlike organic pollutants, heavy metals do not decay. Emissions of heavy metals such as mercury, lead, cadmium and arsenic into the environment occur via a wide range of processes and pathways including the air, surface water, and soil.

## LIMITS

Substance	Unit	Australia <sup>1</sup>	EU/Norway <sup>2</sup>
Arsenic	mg/kg	No limit	10.0
Cadmium	mg/kg	No limit	1.0
Lead	mg/kg	No limit	5.0
Mercury	mg/kg	No limit	0.2

mg = milligram

kg = kilogram

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp

2. OJ L140, 30.5.2002, p. 10. Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed

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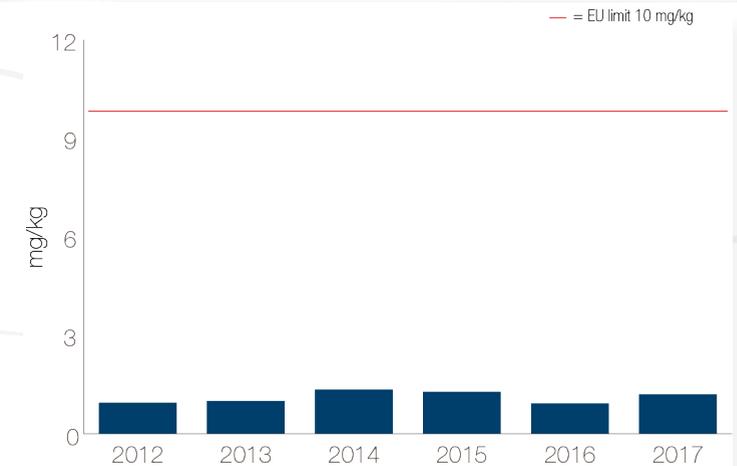
# Heavy Metals

Arsenic and its compounds are used as pesticides and in various alloys. The toxicity of arsenic is strongly dependent on its chemical form. Although inorganic arsenic is highly toxic, organic arsenic is not.

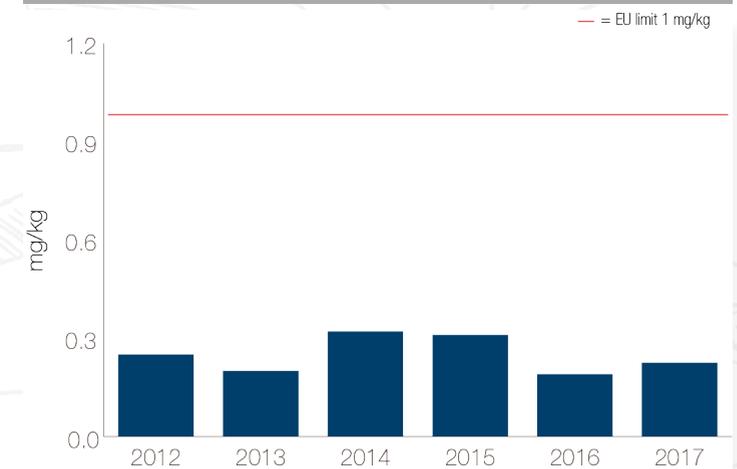
Cadmium is commonly found in its metallic form and as sulfides and sulfates. Globally, about three-quarters of cadmium is used in batteries and most of the remaining quarter is used mainly for pigments, coatings and plating, and as stabilisers for plastics.

Skretting Australia feeds have consistently met EU limits for Arsenic and Cadmium since testing began in 2012.

## ARSENIC (predominately organic)



## CADMIUM

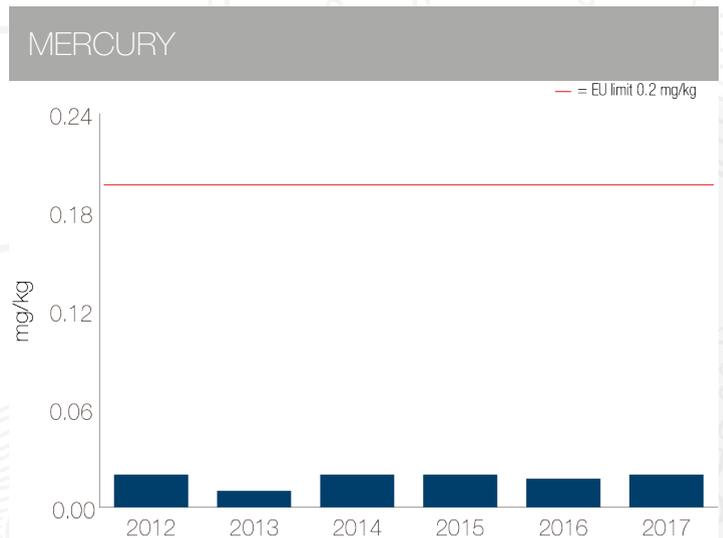
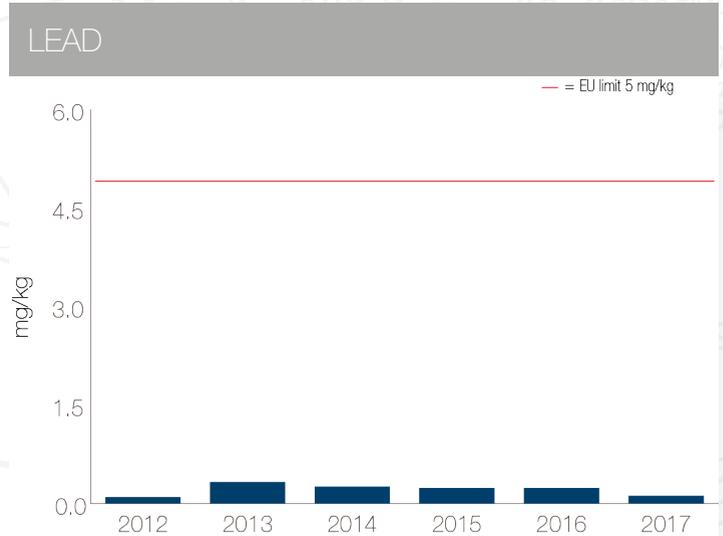


# Heavy Metals

Sources of lead found in the environment are multiple, and the metal is truly ubiquitous, being commonly found in food, water, and air. Evidence exists that lead in the environment has increased during the past 200 years.

Mercury is much more harmful to living organisms as an organic metal compound than as the element. In farmed salmon the levels of mercury are very low, almost not detectable.

Skretting Australia feeds have consistently met EU limits for Lead and Mercury since testing began in 2012.





[www.skretting.com.au](http://www.skretting.com.au)