Documenting seafood safety: Contaminant concentrations in Norwegian fish feeds and marine products.

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The dioxin scandal in Belgium in 1999 heightened public concern regarding food safety. In order to protect consumer safety, surveillance programmes on fish feed and seafood exist in Norway. In order to protect fish- and human health, and to minimise the environmental impact of fish farming, regulations exist for the maximum level of contaminants that may be present in fish feed. Fish feed manufacturers are responsible for ensuring that their products comply with these regulations, in addition the Directorate of Fisheries randomly takes fish feed samples which are analysed for various contaminants to ensure that concentrations are below the maximum permitted limits. Table 1 gives results for levels of inorganic and organic compounds in fish feeds sampled in 1999.

Table 1. Concentrations of inorganic and organic compounds in Norwegian fish feed samples analysed in 1999 (n=55).

Compound	mean (mg/kg)	min – max. (mg/kg)
Phosphorous	11"	8 – 16*
Magnesium	1.5"	0.9 – 2.3"
Calcium	13	7,6 – 23
Iron	174	74 – 530
Manganese	51	24-84
Iodine	5.5	0.9 – 12.1
Zinc	188	88-430
Copper	14.2	8-23
Selenium	1.2	0.62-1.7
Lead	0.13	0.02 – 0.29
Arsenic	4.6	2.6-6.6
Cadmium	0.14	0.05 – 0.32
Mercury	0.04	0.02-O. 11
Sum DDT	0.04	0.01-0.07
Sum PCB (9 congeners**)	0.02	0.01-0.05
Dioxin (PCDD/PCDF)	1.9	0.76-2.88

* g/kg

** PCB congeners included: 28, 52, 101, 105, 118, 138, 153, 156, 180.

*** ng WHO TEQ/kg

A range of potential contaminants in Norwegian fish and shellfish of commercial importance, are currently monitored by the Directorate of Fisheries' and Institute of Marine Research's joint environmental programme "Miljødatabasen". The aim of the programme is to:

a) Provide data on marine resources living in Norwegian waters

b) Meet the demand, from distributors and consumers, for information concerning levels of potential contaminants in seafood

c) To provide historical data and monitor contaminant levels in fish and shellfish.

Inorganic compounds measured are: Sc, Ti, V, Cr, Mn, Co, Ni, Cu, Zn, Ga, Ge, As, Rb, Sr, Y, Mo, Pd, Ag, Cd, Sb, Te, Cs, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Tm, Yb, Lu, Ta, W, Re, Pt, Au, Hg, Tl and Pb. Organic compounds monitored include: HCB, HCH, DDT, PCBs (28, 52, 101, 105, 118, 138, 153, 156, 180) and dioxins and dioxin-like PCBs (from 1999). Radioactive cesium-137 is also measured.

In addition to the above mentioned programme which primarily monitors feral species, the Directorate of Fisheries also has a monitoring programme on undesirable substances in farmed fish, and one for monitoring shellfish. The former includes measuring growth hormones, medicine residues and heavy metals in farmed fish, whereas the Shellfish monitoring programme includes algal toxins, microbial and chemical analyses.

The Directorate of Fisheries' Institute of Nutrition participates in all of the above mentioned surveillance programmes (on fish feed, feral fish and shellfish, and farmed fish and shellfish) in addition to conducting research on health and safety aspects of seafood.