



Food & Feed Testing

Eurofins introduces a more sensitive analysis of dioxins and dibenzofurans

 Some of the methods for analyzing dioxins and dibenzofurans(PCDD/F) are optimized to meet the WHO 2005 criteria regarding Level Of Quantification(LOQ) but not necessary measure the exact level of dioxins. Because of this, Eurofins has optimized and validated a method for analysis of dioxins and dibenzofurans in salmon by decreasing Upperbound TEQ for PCDD/F. This method will give an better indication of "true level" of PCDD/F in salmon muscle.

 De fleste analyser av dioksiner og dibenzofuraner(PCDD/F) utføres for å møte kravene til WHO 2005 for gjeldende næringsmiddel. Metodene er stort sett bygget opp slik at de skisserer «verst mulig» scenario og ikke nødvendigvis «sann verdi». På grunn av dette har Eurofins optimalisert og validert en metode der vi har senket «Upperbound TEQ for PCDD/F», noe som gir et resultat som viser «sann verdi» av disse stoffene. Metoden er spesielt utviklet for oppdrettslaks og ørret.



Analysis of dioxins and dibenzofurans

Human exposure to dioxins and dioxin-like substances has been associated with a range of toxic effects, including chloracne; reproductive, developmental and neurodevelopmental effects; immunotoxicity; and effects on thyroid hormones, liver and tooth development. Dioxins are also carcinogenic. Developmental effects in males are the most sensitive reproductive health end-point, making children – particularly breastfed infants – a population at elevated risk. Dioxins and dioxin-like substances are persistent organic pollutants (POPs) covered by the Stockholm Convention on Persistent Organic Pollutants; they can travel long distances from the emission source and can bioaccumulate in food chains. Human exposure occurs mainly through consumption of contaminated food, but higher levels of exposure can occur in occupational settings. Public health and regulatory actions are needed to reduce emissions of these substances, as required by the Stockholm Convention, and to reduce human exposure, particularly for children (WHO).

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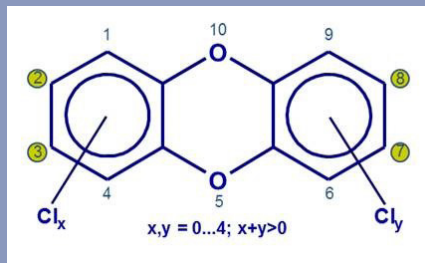
Eurofins Scientific is an international life sciences company which provides a unique range of analytical testing services to clients across multiple industries. The project in creating more sensitive analysis of dioxins and dibenzofurans is a collaboration between Eurofins Food & Feed Testing Norway and Eurofins Lab Zeeuws Vlaanderen.

Eurofins Food & Feed Testing Norway

Eurofins Food & Feed Testing is the market leader in Norway within microbiological, chemical and sensory analyzes of food, feed and dietary supplements. To understand the customer and bring their needs to our competence center and expert labs is a keystone in our business.

Eurofins Lab Zeeuws Vlaanderen

Eurofins Lab Zeeuws Vlaanderen is an expert lab in analyzing dioxins and pcb's in all kind of food and feed matrices. The lab has been engaged in project for lowering the upperbound TEQ, and has developed and validated the method for analyzing the "true" value of dioxins in salmon. Besides the analysis of dioxins and pcb's the lab is also able to help customers in a wide range of other contaminants analysis like pesticides, metals, MCPDs, MOSH, MOAH, etc.



In June 2005 World Health Organization reevaluated human and Mammalian toxic equivalency factors and limits for dioxins and dioxin-like compounds in food. It is possible that the WHO TEQ values may be lowered in the future. Because of this, Eurofins wanted to optimize analysis methods for dioxins and PCBs to be prepared for possible new regulation from EU and WHO.

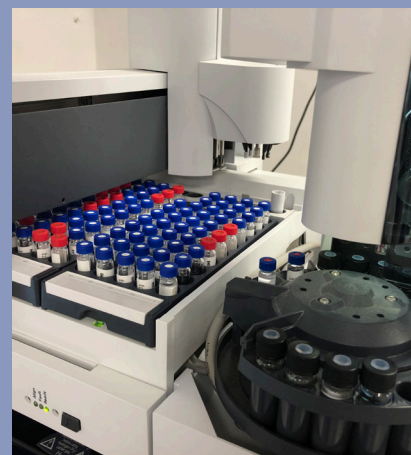
The aim of the project was to modify and validate an analytical method with regards to dioxins and dioxin-like PCBs in salmon for finding the optimum sample size which gave lowest LOQs and thus being able to analyze and report as close as possible to true levels of POPs.

The work undertaken in the project where the sample intake (weight) and solvent extract was varied.

The conclusion from the trial indicates that 15g of freeze dried salmon muscle is the optimum sample size in order to analyze and report as close as possible to true levels. A sample size of 3g showed that the LOQ was affected and thus reporting according to regulatory requirements at upper bound results over-estimated the level of dioxins and dioxin-like PCBs. Sample size above 15g (evaluated at 25g, 30g and 40g) did not improve the sensitivity in our analysis further.

Dioxins and PCB analysis of fish

The dioxins and PCBs are accumulated in the lipid phase of the fish and especially the triglyceride fraction. Because of this all analysis of dioxins and PCB in fish starts with a lipid extraction with unpolar solvents. Normally the extraction is being performed directly on native homogenized tissue. In this method we focused on using fat extraction of freeze dried tissue. When using freeze drying, all water from the sample are evaporated under mild conditions and give a better extraction yield due to no interferences with water and possibilities for formation of emulsions. Since the analysis is performed on dioxins in very low concentrations, it is necessary to work with large sample amounts (sample intake). Salmon fillet consist of approx. 60% water, and when freeze drying the evaporation of water concentrates the analytes in the sample intake. Because of this, it is better to use freeze dried material from an analytical point for view.



After sample preparation, extraction and purification, the samples are analyzed by Gas Chromatography and detected by Mass Spectrometry (GC-MSMS)

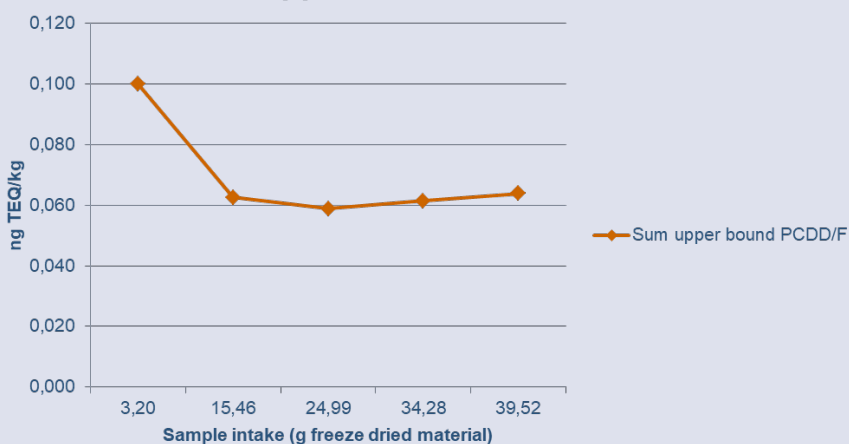


The detector in the mass spectrometer used is extremely sensitive, making it possible to detect and measure very small amounts of dioxins.

Results

The figure below shows variations of results, sum Upper bound TEQ regarding analysis of PCDD/F for different sample intakes.

Sum upper bound PCDD/F TEQ



Discussion and conclusion for analysis of Dioxins and PCB

There was observed a decrease in LOQ of analysis of PCDD/F with increasing sample intake. Sum upper bound PCDD/F TEQ decreases when sample intake is increased from 3 g to 15 g, but no difference was observed between 15 g and 25 g, 30 g or 40 g sample intake.

A decrease in sum upper bound with the increasing sample intake was not observed for dl-PCB and ndl-PCBs, because in the tested samples all the individual PCB-congeners were present in a concentration level above the LOQ, and therefore the method for PCBs has not been discussed.

According to our experience the sample intake of 15 grams shows the optimum performance and Eurofins Norway therefore recommend to perform the analysis with a sample intake of 15 grams freeze dried sample for measurement of dioxins and dibenzofurans in salmon muscle.

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