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Mattilsynet

RISK ASSESSMENT REGARDING PROCESSING REQUIREMENTS OF BY-PRODUCTS FROM AQUACULTURE FOR USE IN FISH FEED

The Norwegian Food Safety Authority (NFSA) requests a risk assessment regarding the requirements for processing by-products from farmed fish for the use in feed for other farmed fish. The risk assessment should ensure that the use of fish meal and oil originating from farmed fish should be microbiologically safe with respect to fish pathogens.

1. Background.

In Norway traditionally fish meal has been produced from wild caught fish. The large salmon production in Norway generates about 195 000 tons residual raw materials per year (Rubin 2009). This raw material can either be handled according to hygiene legislation for human consumption, or defined as a by-product, according to the by-product legislation, and used as feed. This is valuable marine raw materials that could represent about 65-70,000 tons of fish meal / fish oil (statement from the industry).

Processing of by-products is regulated by the provisions of the by-products Regulation (EC) 1774/2002. This Regulation specifies different methods for handling by-products, but none of these secure the fish health.

From March (2011), the new by-product Regulations (1069/2002 and 142/2011), were implemented in the EU. These new regulations will also be implemented in Norway, but it is not clear when the regulations will come into force in Norway.

Animal by-products from fish farms are allowed to be used in feed for farmed fish, however the use of the products are restricted by the species barrier. Species restrictions are related to the fish meal (protein fraction), and as an example, it is not allowed to feed salmon meal to salmon. Fish meal from salmon can be fed to cod, trout, sea bass and other fish species. Pure fish oil (protein free) has no species restrictions related to the application.

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The new by-product regulation has emphasized the requirements for microbiological safety of fishmeal from aquaculture animals, and also the restrictions related to species barrier, are maintained.

Raw material

Raw materials that are allowed to be used in the production of fishmeal is defined as category 3 in the by-product regulation.

By-products from fish for human consumption are category 3 materials, and can be processed to feed for food producing animals (non-ruminants). Fish that died for other reason than being used for human consumption are category 2 material, and can not be used as feed.

By-products from plants with disease restrictions (listed diseases) where the fish are not clinically ill, is also considered to be category 3 material. As far as the fish can be used for human consumption, the by-products are considered category 3. This means that the fish meal produced from category 3 materials from plants with disease restrictions may also be used in feed.

The amount of infectious substances of category 3 material from farmed fish is difficult to predict, because clinically healthy fish may also carry high levels of infectious substances. It is therefore of great importance that the processing method used in fish meal and fish oil production, must be sufficient for inactivating all types of infectious agents that can occur in the aquaculture industry.

If the processing method can provide documentation that all known fish pathogens are inactivated,this feed can also be allowed for fish feed, and it is not necessary with restrictions on the use of products from category 3 material (except the species barrier).

In Norway, it is used either silage (pH ≤ 4) or fresh (frozen) raw materials in the production of fish meal/oil from aquaculture raw materials. Silage as conservation method will reduce the amount of contamination in raw materials. Fish meal from wild caught fish has always been produced from fresh raw materials with no use of silage.

The NFSA requests an assessment of how the pH, especially pH ≤ 4 and pH 7, will affect the temperature required for sufficient inactivation of fish disease agents.

2. Data

We refer to the previous VKM report, "Assessment of a method for treatment of category 2 and 3 materials of fish orign". Based on this report, the NFSA recommended a method (FSPM), silage, particle size ≤ 10 mm, with heating (≥ 85 ˚C for ≥ 25 min at pH ≤ 4), as hygienically safe to produce fish meal and oil by-products from farmed fish, also from plants with disease restrictions (category 3).

In addition, the NFSA recommended that the processing of fresh raw materials, (no silage) can also be processed at 85 ˚C in 25min. This assessment is based on the fact that IPN virus, which is considered to be the most resistant pathogen, is not inactivated at low pH but is inactivated at sufficiently high temperature and time.

This recommendation from the NFSA is applicable until satisfactory documentation of new relevant knowledge becomes available.

New documentation
On behalf of the industry, Rubin has recently published a report (Rubin nr 199), on the inactivation of IPNV at various temperature / time regimes in an appropriate matrix, and documented D and Z values for IPN virus. The report is a collaboration between Nofima and the National Veterinary Institute and is available in the following link:
http://www.rubin.no/index.php?current_page=nyheter&id=195

The NFSA consider this report as important basic knowledge for a scientific approach to establish a safe processing method for fish meal and oil from both wild caught fish and aquaculture raw material.

Based on the documentation of inactivation of IPN virus in this Rubin report, the industry has asked the NFSA for approval of an updated method, "Standard Norwegian fish meal and oil processing method", The method includes the use of raw material from wild-caught fish and from farmed fish. Due to the different risks of disease associated by the two types of raw materials, the industry will differentiate the temperature requirement for processing of the two raw materials.

Based on the conclusions in the report, the industry has requested to use 70 °C for 20 minutes for processing of wild fish. It is concluded in the Rubin report that the use of 70 °C for 20 minutes for processing of wild fish, will give a 100-$\log_{10}$ inactivation of *Enterobacteriaceae* and *Salmonella*.

For the processing of farmed fish, the industry has requested to use 76 °C for 20 minutes or equivalent time / temperature combinations that results in a 3$\log_{10}$ inactivation of the IPN virus.

To assess the request from the industry, the Food Safety Authorities has asked the National Veterinary Institute to answer the following questions regarding the new knowledge in the Rubin report regarding inactivation of the IPN virus.

1. How can the report "Inactivation of pathogenic microorganisms in fish products" (Rubin Report No. 199) be used in a practical context with respect to process parameters that ensure adequate inactivation of pathogens for the fish meal industry?

2. Is it possible to give a statement regarding the uncertainty related to measurements and estimates in the report? Is it necessary to add safety margins compared to the results in Table 11?

The NFSA will in the near future receive a response from the National Veterinary Institute. This report should also be part of the background documentation for the further work of VKM in this risk assessment.

Today there are discrepancies between the processing requirement recommended as safe by the NFSA for both silage and fresh by-products from farmed fish, particle size ≤ 10 mm, heating ≥ 85 ° C for ≥ 25 min, and particle size ≤ 10 mm, heating ≥ 76 ° C for ≥ 20 minutes, as the industry has requested to use for fresh (not silage) raw materials from aquaculture.

The processing requirements should be proportionate to the risks associated with the possibility that raw materials can spread unwanted known and unknown fish pathogens.

It could be mentioned that a country such as China requires that all fish meal to be imported will be processed at 85 ° C for 15 minutes, or equivalent method approved by

Chinese authorities.

Other relevant reports for this assessment are included:
Inaktivering av *Salmonella* rapport nr 180
Inactivation of *Clostridium sporogenes* spores Nofima report 10/2011
Standard norsk fiskemel- og fiskeoljeprosess. Nofima rapport 35/2010 (norsk (33/2010
Engelsk versjon (33/2010)

Fish oil
The oil produced by a fish meal-oil process may in practice be separated from the protein fraction before the mixture has reached a sufficient heat treatment. It may be desirable to have a more gentle treatment of fish oil to protect quality. Adequate heating to obtain sufficient inactivation of fish pathogens in the oil fraction is important, also because there is no species restriction in the use of pure (protein free) fish oil.

The NFSA request to know if the variation in matrix (meal / oil fraction) will affect the temperature required for sufficient inactivation of fish pathogens. Will the processing at a certain temperature give the same inactivation in a pure oil matrix as in a fish meal mixture?

Microbiological regulatory requirements
Microbiological regulatory requirements for documentation of fish meal does not include fish pathogens. There are only requirement related to *Salmonella* and *Enterobacteriaceae*, and for approval by method 7, also documentation of *Clostridium perfringens* is required.

Previously, we had the national regulatory requirements (For 2007-03-29 No. 511) by 3 log 10 (99.9%) inactivation of *Aeromonas salmonicida*, *subsp*. *Salmonicida* and IPNV, in addition to the microbiological criteria applicable to fishmeal. This regulation is now repealed.

Available literature indicates IPN-virus to be the most heat-and chemical- resistant fish pathogen, but is the inactivation of the IPN-virus a suitable indicator for adequate inactivation of fish pathogens in general?

The NFSA would like an assessment of microbiological criteria suitable for validation of methods to secure a hygienic standard for the production of fish meal and oil from the fish farming industry.

3. Terms of reference
The NFSA has requested that the Norwegian Scientific Committee for Food Safety (VKM) conduct a risk assessment regarding the use of by-products from farmed fish in the feed for other farmed fish. NFSA has asked VKM to address the following questions. The final report should be written in English.

1. To which risks, in terms of listed diseases and infectious pancreatic necrosis (IPN) virus, will fish be exposed by use of untreated animal by-products (ABP), category 3?

2. Which risks to fish health will be presented by ABP category 3 materials following heat treatment at 76°C for 20 minutes or 85°C for 25 minutes?

3. What are the risks to fish health presented by fish oil or fish meal originating from ABP category 3 materials after heat treatment at 76°C for 20 minutes or 85°C for 25 minutes?

4. What are the risks of infection presented by using processed salmon oil in salmon feed?

5. Is documentation of evidence of inactivation of the IPN virus a suitable indicator for sufficient inactivation of fish pathogens?

6. To what extent will silaging (pH equal to 4 or below) of by-products affect the answers given to the questions above?

4. Time frame

The Norwegian NFSA request to have this risk assessment answered within 6 months after the formal transmission of the request.

5. Case Manager in the NFSA

Contact person for NFSA for this request is senior adviser Gerd Eikeland Berge (gerbe@mattilsynet.no) and Head of section Friede Andersen (frand@mattilsynet.no)

Best regards

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Kopi til: