Responses to questions posed in the mandate on a comprehensive view of fish and other seafood in the Norwegian diet

- **VKM is to assess whether the conclusions in the comprehensive assessment being prepared provide grounds for changes in the current Norwegian recommendations regarding the consumption of fish and other seafood.**

The general Norwegian recommendation is to eat more fish for dinner and on bread (Directorate for Health and Social Affairs). Based on a comprehensive assessment of scientific documentation of the positive health benefits and presence of potentially health damaging substances, as well as on knowledge about fish and other seafood in the Norwegian diet, VKM supports the general Norwegian recommendation to eat more fish both on bread and for dinner. A variety of different types of fish and seafood should be eaten. Over a long period of time, eating more than 2 meals of fatty fish per week at current levels of dioxins and PCB may result in the tolerable intake (TWI) for dioxins and dioxin-like PCB being exceeded. This is especially important in regard to fertile women. Based on knowledge about young women's consumption of fatty fish, however, there is little reason to believe that a general recommendation to increase fish consumption would result in fertile women consuming so much fatty fish that the intake of dioxins and dioxin-like PCB over a long period would exceed the tolerable intake (TWI) and consequently constitute a health risk for the foetus.

The Directorate for Health and Social Affairs recommends that all infants from 4 weeks of age be given a daily supplement of cod liver oil to ensure that they receive a sufficient amount of vitamin D and n-3 fatty acids. After 6 months of age the same amount is recommended for all children. Although today cod liver oil is purified and contains reduced levels of dioxins and dioxin-like PCB, cod liver oil is the source of a relatively high level of exposure to dioxin in the smallest children. The level of organic pollutants in cod liver oil should be monitored closely, and manufacturers should be encouraged to ensure that their products contain the lowest possible level of organic pollutants.

Although children (especially at age 2) may exceed TWI by eating fish and taking cod liver oil, the positive effects of a varied diet, which includes fish and fish products, counterbalances any negative effects. The dietary recommendations issued for the public at large can therefore continue to apply to children.

The Norwegian Food Safety Authority has issued general, nationwide dietary recommendations for certain types of freshwater fish with high mercury content. These recommendations are based on risk assessments and should be maintained and periodically re-assessed. Since the foetus is most sensitive to mercury, it is also important that pregnant women limit their consumption of saltwater fish with high mercury levels (e.g. large wild halibut, fresh tuna and swordfish).

VKM recommends a re-assessment of the general recommendation issued by the Norwegian Food Safety Authority which states that children, fertile women and pregnant women should not eat fish liver or sandwich spread made of fish liver and that the consumption of these in general should be limited. VKM believes a re-assessment is called for since the level of

organic pollutants in fish liver can vary greatly depending on the location where the fish is caught and the time of year when it is caught.

The Norwegian Food Safety Authority has issued special dietary recommendations for the consumption of fish and other seafood from polluted fjords and harbours. VKM recommends that these recommendations be maintained and periodically re-assessed.

The Norwegian Food Safety Authority has also issued special dietary recommendations for certain other foods. These foods should be monitored periodically for levels of organic pollutants, and the recommendations should be re-assessed if these levels change.

The Norwegian Food Safety Authority has also issued a dietary recommendation stating that pregnant women should avoid eating fermented fish, and that cured or smoke fish, such as smoked salmon, should be as fresh as possible when eaten. VKM recommends that this recommendation be maintained.

- **VKM has also been asked to provide a statement on any other circumstances regarding fish and other seafood, such as hygiene, of importance to the public health.**

Listeria monocytogenes present the greatest microbiological risk since these bacteria can contaminate fish products, such as smoked salmon, during production and pose a special danger to pregnant women. Also, homemade *rakefisk*, partially fermented trout, presents a risk of botulism.

Allergy is an issue of great consequence to a small portion of the population. It is particularly important that the presence of fish in various food products be declared and that the authorities ensure that this is done.

Pharmaceuticals are used as an input factor in aquaculture. Their use is well regulated and monitored, and they do not present a problem for food safety. VKM has determined that the use of pharmaceuticals in the Norwegian aquaculture industry is not significant for the public health. Since today it is not likely that documentable amounts of antibiotics will be found in aquaculture facilities, the risk of increased occurrence of resistant bacteria is also limited.

The dosage of radioactivity from fish is not considered to be a problem.

Algae toxins are primarily a problem in shellfish. Continual monitoring should be performed to prevent contamination.

- **VMS has been asked to identify trends in nutritional, toxicological or other conditions that may result in the need for re-assessment of the recommendations in the future.**

Farmed fish in general is expected to comprise an increasingly larger portion of the fish that is consumed. Due to favourable price developments, especially for fatty farmed fish, the share of fatty fish in the diet is also expected to increase. The farming of lean fish will likely increase as well.

The aquaculture industry has the ability to produce fish with low levels of organic pollutants so that the safety margin for the entire consumption of fatty fish can be held at a high enough

level to reap the health benefits. This may be achieved by selecting feed ingredients with low levels of these pollutants and/or by implementing purifying processes. Nutritional composition can only be changed by changing the composition of the feed. It is therefore important that both the nutritional composition and the contamination level be monitored. Due to restrictions on and prohibitions against the use and discharge of PCB and dioxins, a reduction of these substances in fish and other seafood is expected. However, this is a slow process that should be monitored.

As regards the "new" organic pollutants (e.g. PFAS), there is not yet adequate documentation available to be able to determine the degree to which these constitute, or may come to constitute, a problem for food safety.

Increased mobility and internationalisation could lead to a change in dietary habits. The selection of fish and other seafood will be larger, and the use of fish and other seafood in the diet will change.

- **The group has been asked to identify any gaps in knowledge or needs for new monitoring or research that may come to light during the course of the comprehensive assessment.**

Dietary studies should be conducted on a regular basis to uncover changes in the population's diet. Dietary studies should also include foods that are important sources of intake of contaminants. The task of mapping the population's actual diet poses significant methodological challenges. It is important that valid methods be developed and applied. Better knowledge about diet, combined with biomarkers for consumption, is desirable.

The monitoring of foreign substances in fish and other seafood is inadequate in some cases and covers only a few species that are important commercially. Monitoring and mapping studies should have an adequate range and include all of the most important species sold on the market. Analyses of contaminants, which are extremely resource demanding, are conducted by a variety of research communities, and these data should be compiled in a national database.

The current database for nutrients in fish and other seafood, including cod liver oil/dietary supplements, must be continued and enhanced.

There is a need to study the health-related significance of fish and other seafood in the Norwegian diet. These studies, both observational and experimental, could investigate the significance of specific nutrients, marine n-3 fatty acids, the ratio between n-6 fatty acids from plants and n-3 fatty acids from fish and other seafood, contaminants and the interactions between these.

It would be useful to have more knowledge about body concentrations of dioxins and dioxin-like PCB in children of various ages.