



Bord Iascaigh Mhara
Irish Sea Fisheries Board

Information Note

Parasitic Worms in Fish

Introduction

All living organisms, including fish, can have parasites. Parasites are a natural occurrence. They are common in fish but do not present a health concern in thoroughly cooked fish. Parasites become a concern when consumers eat raw or lightly preserved fish such as sashimi, sushi and gravalax.

Roundworms called **Nematodes** are the most common parasite found in marine fish. Some people call these nematodes herring worms or cod worms but several different species exist and it is difficult to distinguish between them. All are in the family Anisakidae and are known as anisakid nematodes. The life cycle of an anisakid nematode begins when seals or sea lions eat infected fish. The larval nematodes grow to maturity, and the marine mammal excretes the nematode eggs into the sea where they hatch. Shrimp-like animals eat the larvae, and fish eat the shrimp-like animals. The larvae then develop into the form we see in fish.

The life cycle for a tapeworm is similar. Mammals or birds eat infected fish. The eggs hatch in freshwater. Crustaceans eat the eggs, freshwater and anadromous fish eat the crustaceans, and we eat the fish.

Nematodes rarely cause health problems because they are uncommon in fish fillets and normal cooking easily destroys them. In most cases, swallowing a live nematode is harmless. The nematode passes through the intestine without causing problems. In rare cases, swallowing a live nematode larva can cause severe gastric upset called anisakiasis. This happens when the nematode attaches to or penetrates the intestinal lining. Nematodes do not find humans to be suitable hosts and will not live longer than 7-10 days in human digestive tracts.

Freshwater fish like trout and fish that spend part of their life in freshwater such as salmon may carry *Diphyllobothrium* tapeworm larvae. Tapeworms are found in the internal organs (especially the intestines) and body cavities of the fish. You can avoid ingesting them by only eating the flesh of the fish, staying away from all organs. Swallowing live tapeworm larvae can cause a tapeworm infection. Symptoms can include abdominal pain, weakness, weight loss and anaemia but these can be treated successfully.

Control Measures in relation to Parasites

In relation to legislative requirements Regulation 853 of 2004 states:

1. The following fishery products must be frozen at a temperature of not more than – 20 °C in all parts of the product for not less than 24 hours; this treatment must be applied to the raw product or the finished product:
 - (a) fishery products to be consumed raw or almost raw;
 - (b) fishery products from the following species, if they are to undergo a cold smoking process in which the internal temperature of the fishery product is not more than 60 °C:
 - (i) herring;
 - (ii) mackerel;

- (iii) sprat;
- (iv) (wild) Atlantic and Pacific salmon;
- (c) marinated and/or salted fishery products, if the processing is insufficient to destroy nematode larvae.

2. Food business operators need not carry out the treatment required under point 1 if:

- (a) epidemiological data are available indicating that the fishing grounds of origin do not present a health hazard with regard to the presence of parasites;
- (b) the competent authority so authorises.

3. A document from the manufacturer, stating the type of process they have undergone, must accompany fishery products referred to in point 1 when placed on the market, except when supplied to the final consumer.

Food business operators must also ensure that fishery products have been subjected to a visual examination for the purpose of detecting visible parasites before being placed on the market. They must not place fishery products that are obviously contaminated with parasites on the market for human consumption

Cooking fish to an internal temperature of 60°C will kill all fish nematodes and tapeworms. Heating hot-smoked fish to an internal temperature of at least 60°C will kill all fish nematodes and tapeworms. Normal hot-smoking procedures generally exceed this temperature. Dry-salting fish, or curing them in a saturated salt brine, for 5-7 days before pickling will kill nematodes and tapeworms. Pickling without salt curing may not destroy some nematodes.

Good Practice for the Control of Nematodes

Good handling practices on-board fishing vessels and in processing plants minimise nematode infestation. Many seafood processors inspect seafood fillets of species likely to contain parasites. This process called candling involves examining fish fillets over lights. The simplest kind of candling table is a box about 50 cm square with a ground glass or perspex top about 6 mm thick. The inside of the box is white, and is lit by two fluorescent tubes giving a white light. To use the box, the fillet is laid down on the illuminated top; worms show up as dark shadows in the flesh, and can be removed with forceps or a knife. Light from above the box should be restricted; the box is useless in bright sunlight for example. An experienced operator can handle up to 300 fillets an hour, but the eyes rapidly become fatigued and efficiency falls during long spells, with the consequent risk of greater numbers of worms passing undetected. Visual inspection of fillets will reveal worms embedded near the surface; these can be removed easily with a knife. Worms embedded deep in the flesh are not immediately obvious, but some can be detected by this method.

In commercial practice candling is effective in detecting *Phocanema* in thin skinless fillets of white fish, particularly cod however the method does not work well on thick fillets with the skin on. Candling is less effective in detecting *Anisakis*. Time can be saved by candling a sample of fillets from a batch of suspect fish to determine the level of infestation; it can then be decided whether the whole batch needs to be candled, and whether the batch is more suitable for one purpose than another.

If a parasite is present in a fish, you have several options:

- Remove the parasite, examine the fish for others and cook the fish. Thorough cooking kills all parasites.
- Notify the store where you bought the fish so that the store can carefully inspect remaining fish.
- Depending on the return policy of the particular store, you may wish to return or exchange the unused portion.

No matter how carefully fish is inspected by processors, caterers and retailers, some worms will occasionally be discovered in fish by the consumer. In reply to complaints it should be pointed out that every reasonable precaution is taken to prevent worms being present in the edible part of a fish. An international standard, Codex Alimentarius, allows a maximum of 5 worms in 1 kg of fish of certain species; only worms of encapsulated diameter of 3 mm, or 1 cm in length, are considered to be of significance. It should therefore be emphasized that the presence of worms in fish offered for sale does not imply carelessness or bad practice on the part of the processor or retailer. It can also be explained that the presence of worms does not reduce the nutritional value of the fish, and that correct cooking or freezing will kill all parasites.

Summary

For the processor, parasites become a concern if they are supplying the market with raw or lightly preserved fish such as sashimi, sushi and gravalax. There is no doubt that the presence of nematode parasites in these fishery products is a hazard to human health. The only way to reduce the numbers of parasites reaching the consumer is to inspect the fish and process them in such a way that the hazard is controlled and most of the parasites are removed. If the processor uses raw material that has not been frozen, a freezing step must be introduced in the process as a control measure in the HACCP Control Plan.

In many fish processing operations, the product will be manufactured from raw material that has been frozen as a means of preservation. For example, pelagic fish are often frozen in bulk to provide year-round supplies. In these cases the freezing step is the control measure to eliminate the hazard, and forms a part of the company's HACCP plan. There are various combinations of freezing conditions and storage times that can achieve the necessary control and the processor must select the most suitable combination. When processing fresh fish, the guts and gut cavity of many fish are often heavily infested with nematodes. For this reason it is always advisable to gut fish and clean out the gut cavity before offering them for sale. Most *Phocanema* and almost all *Anisakis* in fish flesh are found in the belly flaps; therefore, trimming off and discarding flaps from fillets will remove most of the worms. The greater the area of flap discarded, the greater will be the proportion of worms removed control.

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