ANISAKIDAE LARVAL INFECTION IN FISH FILLETS SOLD IN BELGIUM

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SUMMARY

Fish fillets (n= 1760) sold on the Belgium market were examined for Anisakidae larval infection. Seven sea fish species were examined by means of the candling technique over a period of 4 months, from November 1996 to February 1997. Third-stage larvae of *Anisakis simplex* and *Pseudoterranova decipiens* were identified. *A. simplex* was the most abundant species with a prevalence of 84.5%, and was found in 192 of the examined fillets (10.9%). Pollock (*Pollachius pollachius*) was the most heavily infected fish species (82.9%). The prevalence in cod (*Gadus morhua*), saithe (*Pollachius virens*), and whiting (*Merlangius merlangus*) was 34.7%, 26.7%, and 15.4% respectively. The prevalence in the three other fish species examined was low, namely 8.9%, 6.6%, and 3.8% for ling (*Molva molva*), catfish (*Anarchias lupus*), and Northeast red fish (*Sebastes marinus*), respectively. Pollock was the fish species with the largest number of Anisakis larvae (7.8 larvae/kg fish fillet).

Keywords: Fish, *Anisakis simplex*, *Pseudoterranova decipiens*, prevalence, Belgium.

INTRODUCTION

The presence of third-stage larvae of *Anisakis simplex* (Rudolphi, 1809) and *Pseudoterranova decipiens* (Krabbe, 1878) in the fresh meat of marine teleosts from the northeastern Atlantic ocean has been investigated in several studies (14). Furthermore, many cases of human anisakiosis have been documented in the Netherlands and recently a few cases have been diagnosed in the United Kingdom, Germany, France, Spain, and Italy (3,8,9,10,12).

No data on the prevalence of Anisakidae in fish sold on the Belgium market are available, except for a survey of herrings (*Clupea harengus*) from the North Sea, which were found to contain *A. simplex* larvae (5). In addition, a few cases of anisakiosis have been diagnosed in Belgian patients (15). In the present study, fillets of fish species sold frequently in Belgium were examined for the presence of Anisakidae larvae.

MATERIALS AND METHODS

Sampling was carried out from November 1996 to February 1997. A total of 1760 whole fillets were prepared according to Angot and Brasseur (1) and then examined. The fish fillets were from seven fish species caught in the north eastern Atlantic ocean: pollock (*Pollachius pollachius*), cod (*Gadus morhua*), saithe (*Pollachius virens*), whiting (*Merlangius merlangus*), ling (*Molva molva*), catfish (*Anarchias lupus*), and Northeast red fish (*Sebastes marinus*). Fish fillets ranging from 100 to 1500 grams were prepared in a factory in Flanders (Northern Belgium). The larvae were detected by the candling technique, removed, and preserved in 70% alcohol until identified and counted. The larvae were examined morphologically and morphometrically according to standard procedures. The prevalence and the density of larval infections were determined for each fish fillet, where the prevalence is the proportion of infected to uninfected fish, expressed as a percentage, and the density is the mean number of larvae per kilogram of fish fillet (including the uninfected fillets).

The differences among fish species infected with the Anisakidae larvae were tested using a proportionality test which determines the Pearson Chi-square value ($p<0.05$). Fish species with fewer than five infected fillets were not considered in this analysis. Infection with either *A. simplex* or by *P. decipiens* was also analysed by means of the Chi-square test.

RESULTS

In total, 711 third-stage Anisakidae larvae were recovered and identified. *A. simplex* was the most abundant species (84.5%) and was found in 192 of examined fillets (10.9%). *A. simplex* larvae were found mainly in the ventral musculature surrounding the body cavity, tightly coiled in a spiral and encapsulated. *P. decipiens* larvae were recovered less often (15.5%) and were found in 71 fillets (4%), mostly uncoiled and spread throughout the flesh.

The highest prevalence of Anisakidae larvae (82.9%) was seen in pollock. The prevalence in cod (34.7%), saithe (26.7%), and whiting (15.4%) was moderate. The prevalence in the three other examined species was low, 8.9%, 6.6%, and 3.8% for ling, catfish, and Northeast red fish, respectively. Table 1 shows the prevalence according the parasite species present. *A. simplex* larvae were significantly more abundant than *P. decipiens* (Chi-square= 59.3, $P< 0.001$). Pollock was found to have the highest infection rate with *A. simplex* (81.4%), while cod had the highest infection rate for *P. decipiens* (11.9%). Mixed infections were seen regularly in pollock and in cod, but in the other species mixed infections were rare. The prevalence of *A. simplex* infection in pollock was significantly higher than that in the other fish species ($p< 0,001$). Cod and saithe were infected with *A. simplex* more than ling, catfish, and Northeast Atlantic red fish were ($P<0.001$). The prevalence of *P. decipiens* infection in cod was significantly higher than in catfish ($P< 0.05$) and in Northeast red fish ($P< 0.001$). There were fewer than five infected fillets of saithe or ling, and data for these species were not analysed.

The density of *A. simplex* and *P. decipiens* is listed in table 1. Again, pollock was the species with the largest number of *Anisakis* larvae per kilogram of fillet (7.8 larvae/kg fish). The density of *Anisakis* in the other fish species was 1 or lower. The density of *P. decipiens* was always low, with the highest number of larvae observed per kg/fish being 0.3 in cod.

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Table 1. Density and prevalence (%) of infection of fish fillets by *A. simplex* and *P. decipiens* larvae.

Fish species	No. of fillets examined	Density[1] of infection Mean ± st. deviation		Prevalence of infection Fillets infected/examined		
		A. simplex	*P. decipiens*	*A. simplex*	*P. decipiens*	Mixed
Pollock	70	7.8 ± 4.8	0.2 ± 0.5	81.4	8.6	7.1
Cod	303	0.6 ± 1.1	0.3 ± 0.9	25.7	11.9	2.9
Saithe	75	0.8 ± 1.4	0.1 ± 0.3	25.3	1.3	0.0
Whiting	26	1.0 ± 2.7	0.0 ± 0.0	15.4	0.0	0.0
Ling	79	0.3 ± 1.3	0.1 ± 0.1	6.3	3.8	1.3
Catfish	181	0.1 ± 0.5	0.1 ± 0.5	3.3	3.9	0.6
Northeast red fish	1026	0.1 ± 0.6	0.1 ± 0.4	2.2	1.8	0.2

[1] Density = n° of larvae / kg of fillet.

DISCUSSION

Although many studies on the presence of Anisakidae in fish have been performed in Europe, few have distinguished between the presence of Anisakidae in the body cavity and in the musculature or differentiated the larvae present (4,11,13). *A. simplex* larvae, the only larvae implicated in human infections in Europe (14), were the most prevalent in our survey. The highest prevalence and density of larval infection were found in pollock. These data are in agreement with those of Angot and Brasseur (1) and confirm pollock to be the most infected fish species. However, it is well known that the prevalence and density of *A. simplex* depends on a number of ecological and biological factors which affect the distribution of the larvae in the infected specimen (13; 14). Therefore, prevalence data can vary considerably and comparison with other surveys is of limited value. In addition, it is possible that some larvae were not detected. The efficiency of the candling technique with regard to pollock fillets, subject to commercial operating conditions, is only 75-76% (2). *P. decipiens* infections were mainly observed in cod and pollock; however, the prevalence was lower than that observed in other studies (7).

The present survey showed that in Belgium pollock appears to be the species of greatest risk to humans. Because the high prevalence and the high number of larvae, there is a risk that not all larvae are detected and removed (2). The presence of undetected Anisakidae larvae in fish fillets is usually considered as an anisakiosis risk to humans unless the parasite is killed by cooking at a temperature higher than 70°C or by freezing at –18°C for 24 hours (14). However, urticaria and anaphylactic shock have been reported as a result of a hypersensitive reaction to *A. simplex* allergens, which are not necessarily destroyed by freezing or cooking (6).

Further, the presence of Anisakidae larvae in all species sampled confirms both the diffusion of these nematodes in marine waters and the great number of fish species receptive to infection. As a consequence, the risk to humans is quite high and measures to prevent this should be intensified. Anisakidae infection is present in the fish stocks of all fish trading countries within and outside the European Union. Therefore gutting and/or candling should be compulsory for all species recognized as being at major risk of becoming infected, e.g., pollock, cod, whiting, and John dory, and not only those species specified by European Union directives.

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