

Editorial

Anisakis, anisakidosis, and allergy to *Anisakis*

In this issue of *Allergy*, three papers (1–3) report on various aspects of allergy to *Anisakis*. Since this disorder may be less well known to readers, some comments and clarification are in order.

Anisakis simplex (Rudolphi, 1809) is a nematode belonging to the Anisakidae family, which includes *Anisakis*, *Pseudoterranova*, and *Contracaecum*, found as parasites in fish, cephalopods, crustaceans, and marine mammals. Two types of *Anisakis* larvae (I and II) (4), as well as two *Pseudoterranova* parasites (A and B), have been recognized.

The adult stage of *A. simplex* is found in whales, dolphins, seals, and sea lions. The eggs of the adult are ingested by the tiny crustaceans on which fish and cephalopods feed. In these hosts, the larvae reach the third stage. Ultimately, sea mammals feed on the parasitized fish and cephalopods, and *A. simplex* evolves into its adult form, thus completing its life cycle. Man can become an accidental host of the larvae in stage 3 (L3) by eating the parasitized crustaceans, cephalopods, and fish. Other species of animals can also be affected, as has been observed in cats (5).

A. simplex L3 is widely distributed among fish and cephalopods commonly consumed by man. Studies such as that by Huang (6) on *A. simplex* L3 in commercial marine fish in the Paris area are therefore of great interest. In the cited study, 1173 fish belonging to 13 species were examined in 1986–7. *A. simplex* appeared in high numbers in 10 different species, most frequently in herring (*Clupea harengus*), 82.55% of 682 fish, average 8.8 L3 per fish; red fish (*Sebastes marinus*), 86.11% of 36 fish, average 18.4 L3 per fish; and hake (*Merluccius merluccius*), 88.57% of 35 fish, average 31 L3 per fish. Other studies done in the USA point to the participation of various species of fish in the transmission of *A. simplex* L3 to man, revealing salmon to be one of the most parasitized fish. One of the works (7) examined 50 sockeye salmon (*Oncorhynchus nerka*) caught during spawning migration. All were found to be infected with *A. simplex* L3.

Further studies indicate the great diversity of species and geographic areas where *A. simplex* has been found: in fish and in the Japanese common

squid (*Todarodes pacificus* Steenstrup) (4) from the Sea of Japan; in cod (*Notothenia neglecta*) from the Antarctic Ocean (8); in anchovies (*Engrauris japonica*) caught in the southern and eastern seas of Korea (9), as well as in the sea eel (*Astroconger myriaster*), suspected of being the most important fish reservoir for human anisakidosis in Korea (10); and, in some regions of Russia, in fish caught in the Okhotsk and Bering seas. *Anisakis* type 1 larvae were also found in China, in about 30% of fish and squid caught in the Gulf of Tonkin, and in 60% from the East China and Yellow seas (11). *A. simplex* L3 showed up in fillets of Atlantic cod (*Gadus morhua*) in Canada (12), and fish from Italian waters also showed evidence of *A. simplex* (13), but in lower proportions.

The bibliographic data reveal both the wide geographic dispersion of *A. simplex* and the large number of varieties of parasitized fish consumed by man, the ingestion of which can result in the development of clinical symptoms. One is the parasitic infestation of the gastrointestinal tract caused by eating raw or undercooked parasitized fish. This is known as anisakidosis and is characterized by a series of symptoms that mimic other gastrointestinal disturbances, such as gastric ulcer, tumors, or acute appendicitis. Originally discovered in The Netherlands and later recognized in Japan, France, and the USA, it is diagnosed most often in Japan. Spain has had five cases to date.

However, in recent years, a new type of disorder with symptoms different from those of anisakidosis has been observed. It is characterized by hypersensitivity reactions – urticaria, angioedema, or severe anaphylactic reactions – after the ingestion of parasitized fish, whether raw or cooked (the thermostability of certain *A. simplex* antigens has been demonstrated) (14). These allergic reactions have been shown to be mediated by IgE, leading to the conclusion that *A. simplex* is the cause.

The first data from Spain were obtained during the second half of 1994 in the Allergy Department of the Hospital Santiago Apóstol in Vitoria-Gasteiz, where 28 cases, 52% of the total number of food allergies registered in that hospital, were

diagnosed (15, 16). In the same hospital, 23 new cases appeared in the first half of 1995.

Various studies have detected an elevated frequency of sensitivity to this parasite, but most cases have been asymptomatic. In Japan, IgE antibodies specific for *A. simplex* were detected in 33% of patients with atopic dermatitis, 75% of patients with fish-induced urticaria, and 10% of controls. In more recent studies in Spain, levels of 36% sensitivity among patients with urticaria/acute angioedema (as shown by del Pozo et al. in this issue [3]), 23.3% among blood donors, and 56% among children with high IgE levels have been found. Various explanations may account for these observations, such as high fish consumption; a high infestation level among fish consumed in certain regions of Spain (88% in *Micromessistius poutassou* and 45% in *M. merluccius*); cross-reaction with other nematodes and arthropods (17); and antibodies not clinically related directed against periodate-sensitive allergens that give nonspecific positive test results.

Together, these conditions make it impossible to determine the actual prevalence of allergic reactions due to *A. simplex* sensitization. Therefore, the Spanish Society of Allergy and Clinical Immunology has initiated a multicentric clinical epidemiologic project to study this disorder, involving 50 allergy services distributed throughout Spain. At the same time, immunologic studies are underway to characterize definitively the *A. simplex* antigens responsible for the allergic reactions and immunologic responses observed.

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