**Anisakis simplex**

**Classification:**
Phylum Nematoda (roundworms)
Class Secernentea
Order Ascaridida
Family Anisakidae
Genus and species: *Anisakis simplex*

- Many marine fish infected with larval stages
- Adults are parasites of the gastrointestinal tract of a wide variety of animals
  - Those of medical importance are parasites of marine mammals (seals, sea lions, whales, dolphins)

**Life cycle:**
- Eggs passed in the feces of the mammalian host
- Eggs hatch to liberate larvae
- Larvae ingested by marine crustaceans grow and molt
- Crustaceans eaten by fish or squid develop into third-stage larvae and penetrate body cavity or muscles of the host
- Fish or squid are paratenic hosts, in which the larvae grow, but do not molt into adults
- Fish eaten by marine mammals larvae develop into adult worms that hatch and are ingested by crustacean intermediate hosts
- If infected fish are consumed by humans, larvae invade gut tissue, but are unable to complete development to the adult stage
- Most human infections result from the consumption of raw fish as sushi and sashimi

*A. simplex* life cycle

![Diagram of the life cycle of *Anisakis simplex*](attachment:image.png)
Fish muscle of hake (*Merluccius merluccius*) infected with anisakid larvae (Audicana *et al.* 2002)

Of 14,000 cases reported each year, around 95% of anisakid cases are from Japan due to the high consumption of raw fish. Exposure to allergens from *A. simplex* is accompanied by an immune hypersensitivity reaction. *A. simplex* has been established as “an etiological agent of allergic reactions mediated by IgE.” *A. simplex* invades the gut resulting in tissue damage and eosinophilic granuloma. However cases are now being reported where IgE against *A. simplex* appears without clear signs of allergy (sensitized). *A. simplex* allergens are resistant to temperature extremes and so cooking may not diminish their allergic potency. In 2002 there was a report of over 100 cases of anisakiasis in the northern Basque region of Spain. There is evidence that antigens can generate IgE antibody responses without infection. Purified allergens caused anaphylaxis (severe, allergic reaction) upon administration with a skin-prick test. Currently regulations involve visual examination of fish and extraction from the market. Fish intended for marinating or salting below 60°C must be stored at -20°C for 24 hours to reduce infection rates.  

**Citations**

Kingdom: Plantae  
Division: Magnoliophyta  
Class: Magnoliopsida  
Order: Santalales  
Family: Loranthaceae  
Genus: Nuytsia  
Species: N. floribunda

*Nuytsia floribunda* is a parasitic plant found in Australia, commonly known there as the “Christmas tree” since it produces many orange flowers around the holiday season.

It parasitizes by attaching haustoria to the roots of the host plant in order to gather water and mineral nutrients. It has a seed habit. Shown here flowering (http://upload.wikimedia.org/wikipedia/commons/thumb/5/58/Christmas_tree_02_gnangarra.jpg/800px-Christmas_tree_02_gnangarra.jpg).

The article that I found (Calladine, et al., 2000) examined the structure of the haustorial connection between *N. floribunda* and its host plants. The researchers conducted morphological and anatomical studies of the haustoria, using radioactive “heavy” or “Deuterium” water [D$_2$O (hydrogen with an extra neutron)] as well as tracing dyes to examine the structure of the haustoria-host connection. The investigators found that haustoria surround the thin root hairs of host plants with a nodule that has a cutting device. After penetrating the host’s root the parasite taps into the xylem vessels thus utilizing water being transported by the host plant.

Citation

Phylum: Choanozoa      Organism: Rhinosporidium seeberi

Life cycle: Sporoblast→Troph→Sporangium. Rhinosporidium seeberi is a eukaryote that causes rhinosporidiosis in humans and domestic cattle. Rhinosporidiosis is an infection caused by *R. seeberi* which was previously considered to be a fungus, but is now placed within the Choanozoa. The organism infects mucosal surfaces of humans and animals, specifically nasal and oral cavities. Natural and reservoir hosts are still unknown.

Literature: In this article, researchers used a PCR to amplify a portion of the *R. seeberi* RNA sequence. Analysis of the RNA led to the classification of *R. seeberi* as a protozoan and not a fungus. It also showed a phylogenetic relationship between this organism and a novel class of organisms that infect fish and amphibians. This group is Ichthyosporea and is a unique aquatic group of protistan parasites. This organism was most closely related to *Coccidioides immitis*. *R. seeberi* is the first recognized human pathogen of this group.


Picture: Large circular troph stage of *Rhinosporidium seeberi*. Cell walls are stained surrounded by inflammatory cells. 400x magnification