

Parasites

The parasites of concern in the production of meat and poultry products include worms and protozoa. Some of them are large enough to be seen with the naked eye, whereas others are microscopic. Parasites cannot multiply in food, only in a host cell, and they are not heat resistant.

Parasitic worms of public health importance are the beef and pork tapeworms (*Taenia saginata* and *Taenia solium*, respectively) and the roundworm that causes trichinosis (*Trichinella spiralis*, also referred to as trichinae) found in pork.

These small cysticerci (referred to as *Cysticercus cellulosae*) are approximately 6-18mm wide by 4 - 6mm in length when found in the muscles or subcutaneous tissues (the normal sites for the larvae of this parasite). The cysticerci may however be found in other tissues, such as those of the central nervous system, where they may grow much larger up to several cm in diameter.

Muscle and organs of animals with severe tapeworm infection are usually visually detected by government inspection personnel or by plant employees through evidence of the immature stages (larval stage in a cyst known as a cysticercus) of tapeworms, which are 6- 18 mm wide by 4 – 6 mm in length when found in the muscles. Such product cannot be further processed for human consumption.

When the cysts are less severe or evident, infected meat may enter the human food chain, however illness will not occur if meat is properly cooked. Humans consuming undercooked meat infected with these tapeworms become ill with taeniasis generally after the mature stages of the tapeworms, which develop from the cysticercus, invade the intestinal tract. Most cases of infection with adult worms are without symptoms. Some persons may experience abdominal pain, weight loss, digestive disturbances, and possible intestinal obstruction.

Taeniasis may last many years without medical treatment. However, people can get a more serious illness called cysticercosis by consuming food or water contaminated with the eggs of *T. solium* (pork tapeworm). Worm eggs hatch and the larvae then migrate to various parts of the body and form cysts (cysticerci).

This can be a serious or fatal disease if it involves organs such as the central nervous system, heart, or eyes. Symptoms may vary depending on the organ or organ system involved. For example, an individual with cysticercosis involving the central nervous system (neurocysticercosis) may exhibit neurological symptoms such as psychiatric problems or epileptic seizures. Death is common.

Trichinella spiralis is an intestinal worm that produces larvae that migrate to and encyst in muscles of a number of animals, particularly swine. Humans consuming infected pork that is undercooked get ill from the cysts, which then live in the muscles of the human hosts. The first symptoms are nausea, diarrhea, vomiting, fever, and abdominal pain, followed by headaches, eye swelling, aching joints and muscles, weakness, and itchy skin. In severe infections, persons may experience difficulty with coordination and have heart and breathing problems. Death may occur in severe cases.

Parasitic protozoa of concern in meat processing include *Cryptosporidium parvum* and *Toxoplasma gondii*. *Cryptosporidium* is typically transmitted to humans from fecal material of animals, primarily cattle, via contaminated water or occasionally, food. The organism is destroyed by boiling water. *Toxoplasma gondii* is carried by cats but can infect many warm-blooded animals. A form known as the oocyst is shed and can sporulate and survive in soil and other environments for extended times; the sporulated oocyst is infectious to all warm-blooded hosts. When ingested, the sporulated oocysts go through several forms, eventually forming cysts in tissue such as muscle. These cysts are infective if ingested. *Toxoplasma* can cross the placenta and affect the fetus, resulting in blindness and more serious effects in the brain.

Parasites are readily destroyed at cooking temperature and are not a major concern in thermally processed commercially sterile meat and poultry products since they are subjected to temperatures well in excess of what is needed to destroy parasites. Parasites are a concern with respect to shelf-stable products that are not cooked. For example, trichinae are a concern with respect to shelf-stable products, such as dried sausages, containing pork.