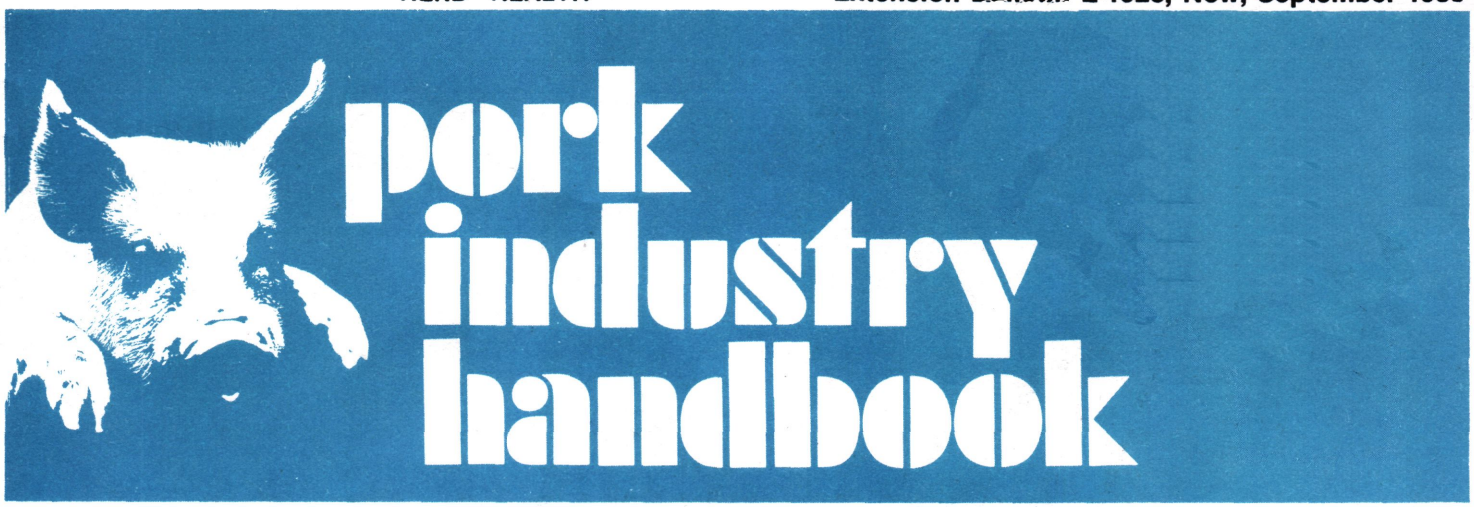

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

Trichinosis

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Trichinosis has been a stigma to the consumption of pork for years. A recent study indicates that a trichina-safe pork supply would increase consumer confidence and pork consumption, and result in additional income to pork producers. The National Pork Producers Council is studying trichinosis and methods of providing trichina-safe pork to consumers. The Council has set a goal of a trichina-safe pork supply by 1987.

Trichinosis is a disease of man and other animals caused by a tiny parasitic worm, *Trichinella spiralis.* Humans may be infected by eating the meat of infected domestic pigs or occasionally the meat of wild bears, wild pigs, or walruses. A number of wild animals are known to be infected. Over the last decade, between 100 and 150 human cases per year are reported in the United States. One study indicated 73.2% of the human cases were attributed to pork products.

The number of human cases of trichinosis has declined dramatically in the United States in the last 40 years, but the infection rate remains the highest of any developed country in the world. Recent surveys indicate the national infection rate in swine is about 0.125% per year. The infection rate in swine in Germany is 0.00003%, 0.0008% in Russia, and 0.0% in Denmark. With approximately 89 million hogs slaughtered each year in the United States, this means there are about 110,000 infected hogs per year. If 360 meals are obtained from one hog carcass, approximately 40,000,000 potential servings of infected pork are produced each year in the United States. Some investigators estimate that there are 100,000 to 300,000 human exposures per year in the United States but 99% of resulting infections are subclinical. In Europe, a major factor in reducing the incidence of swine trichinosis has been the adoption of specific trichina inspection procedures at the slaughter houses.

The major importance of trichinosis in swine is the danger of human exposure resulting in possible clinical disease. According to a study by the Department of Energy, the purely economic benefits to the swine industry of a reduction in trichinosis would be an estimated $449 million dollar increase in revenue per year, an increase in pork exports by one-third, an increase in domestic pork consumption of 2%, and increased confidence of consumers in trichina-safe pork.

Life Cycle

Swine and wild animals are the reservoirs of trichinosis. Swine are usually infected by consuming viable trichinae larvae in pork scraps found in uncooked garbage and by meat from infected carcasses of swine, rats, and other carnivorous wildlife (Figs. 1, 2, and 3).

After the ingestion of infected meat, the larvae are digested free of the muscle cyst, enter the small intestine, and within four to six days develop into sexually mature adults. The adults give birth to larvae that migrate through the intestinal wall into the circulatory system. When they come into contact with skeletal muscle, the larvae invade the muscle and by 17-21 days after infection become mature encysted larvae. Once again, the life cycle is complete, and the trichinae are in the infective stage. Encysted larvae can survive in putrefying meat for long periods. It has been estimated that 25-30% of the total number of muscle larvae present in an infected pig carcass are in the hams and 20% are present in the shoulder cuts. Apparently, swine naturally infected with trichinosis do not show clinical effects. In experimental infections with large numbers of larvae, however, rear paralysis and systemic reactions have been reported.

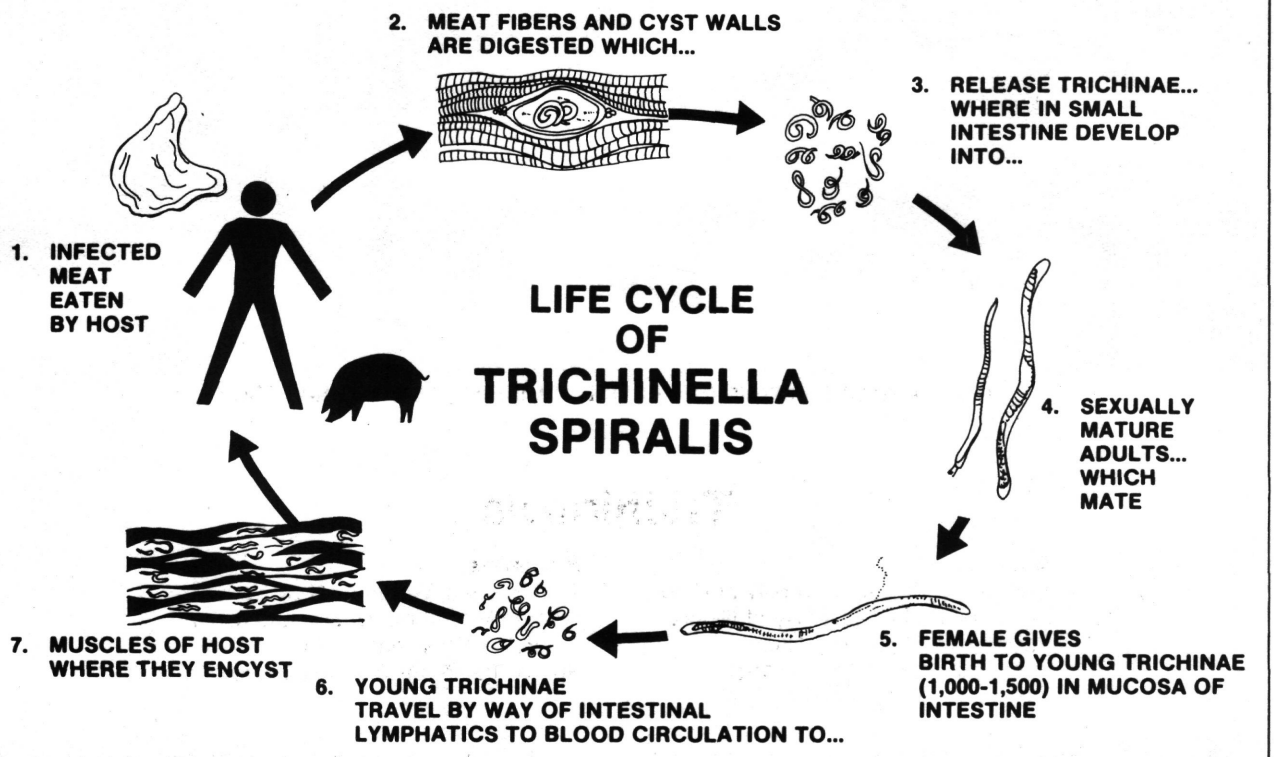

Figure 1. Source: Zimmerman, W., and Zinter, D. *H.S.M.H.A. Health Reports* 86 (Oct. 1971): 937-945. (Adapted from and used with permission)

Treatments

No routine treatment for infected swine before slaughter has been developed that will clean the animals of trichina cysts. In human infections, thiabendazole and other supportive treatments are used. Similar drugs have been used experimentally in swine and have been found effective, primarily against the adult worms in the intestine and less effective against muscle larvae.

Prevention and Control

Experimental vaccines are being studied in pigs but are not available. At this time, management practices are the only tools available to producers to eliminate trichinosis from their market animals. Producers should practice the following trichina-preventive measures:

- Observe all garbage feeding regulations. If garbage is fed, feed only well-cooked garbage, including household scraps (212°F. for 30 min.).
- Practice stringent rodent control. Rats may be important sources in some swine herds.
- Avoid exposing dead pig or wild animal carcasses to live hogs. Do not throw wild game carcasses or parts to hogs or domestic pets.
- Ensure that hog carcasses are properly buried, incinerated, or sent to a rendering plant.
- As often as possible, construct effective barriers between hogs and wild animals.

Pork and meat from all wild mammals should be thoroughly cooked before human consumption. Official federal and state meat inspection programs require that all processed pork products that may be eaten without additional cooking be heated to at least 137°F. to assure destruction of any trichinae larvae that may be present. A recent USDA study indicated an increased chance of survival of trichinae in microwave cooking. Uneven cooking with cold spots in the microwave oven may cause some areas of fresh pork not to reach 137°F. and thus any live trichina would persist. This has brought on a wave of anxiety about trichinosis by the public. However, recent research indicates that pork can be prepared safely in the microwave if an oven cooking bag is used in the cooking procedure. To allow a margin of safety the USDA recommends fresh pork be cooked to 170°F.

Fresh pork less than 6 in. thick can be rendered safe if frozen to 5°F. (-17°C.) for 20 days, -10°F. (-23°C.) for 10 days, or -20°F. (-29°C.) for 6 days. Dry curing, which is the interaction of salt and drying for relatively long periods, will devitalize trichina cysts if proper time and temperature relationships are established.

Hamburger ground in a grinder not properly cleaned following grinding raw pork, or hamburger that has pork added illegally, may transmit the disease to humans if it is insufficiently cooked.

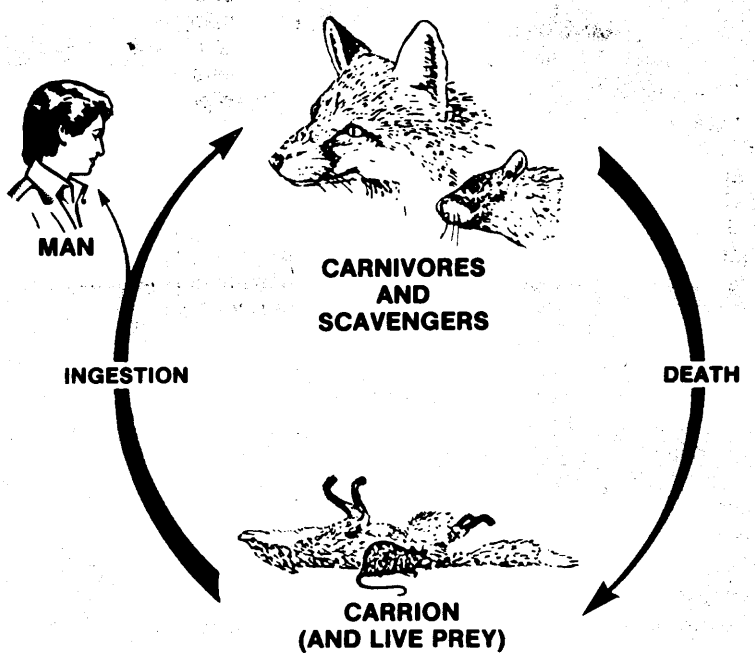

Figure 2. Sylvatic cycle, representing the transmission of trichinosis in nature, independent of man. "Carnivores and scavengers" include fox, bear, rat, walrus, hyena, wildcats, and many others. In the case of human infection, the source would be called game meat, rather than carrion, and the infection would represent an offshoot of the cycle. Original diagram from W. C. Campbell, "Epidemiology I. Modes of transmission." In *Trichinella and Trichinosis*, edited by W. C. Campbell. (New York: Plenum Press, 1983): 425-444. (Adapted from and used with permission)

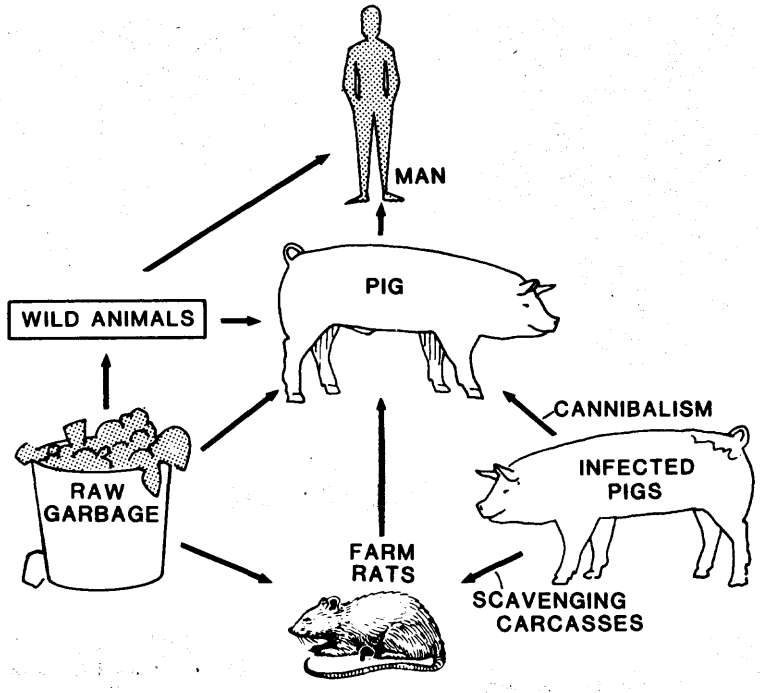

Figure 3. Domestic cycle, the predominant source of human trichinosis. (Illustration courtesy of Dr. K. D. Murrell)

Trichina-Safe Pork

As a part of the National Pork Producers Council's Trichina-Safe Pork in the U.S. by 1987 program, samples would be collected from all swine at slaughter and tested for trichinosis. Infected herds could then be traced back to the farm of origin if a national swine identification program is enacted. The Trichina-Safe Committee of the NPPC has recommended adoption of such a swine identification program.

Since low-dose irradiation (30,000 rads) is sufficient to inactivate encysted trichinae, feasibility of use of this procedure on pork carcasses after slaughter also is being studied.

Eradication and certification of trichina-safe pork will open up new markets for the swine industry at home and abroad. A strong educational campaign of producers and consumers is necessary to remove this currently held stigma from pork.

MICHIGAN STATE UNIVERSITY
COOPERATIVE EXTENSION SERVICE

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