



A GREENER WORLD
Our Food. Our Farms. Our Future. Let's Choose!

A Greener World Briefing Paper #3

Trichinella and Pastured Pigs

Certified Animal Welfare Approved by A Greener World (AGW) has the most rigorous standards for farm animal welfare currently in use by any organization in North America. Its standards have been developed in collaboration with scientists, veterinarians, researchers and farmers across the globe to maximize practicable, high-welfare farm management.

A number of reports and articles state that eating the meat from pastured pigs gives you a greater chance of contracting the parasitic disease, trichinellosis. This briefing paper gives details of the disease, including its source and transmission, and examines results from the national trichinellosis surveillance system and various research papers. It concludes that the risk of contracting trichinella is not only very small, but that there is no greater risk from well-managed pastured systems than from indoor pork production.

Background to Trichinella

Trichinella spiralis is a species of roundworm that can cause the parasitic disease trichinellosis. Trichinella infects carnivorous and omnivorous animals, such as domestic pigs, wild boars, bears, cougars and rodents. Humans can be infected with trichinella if they eat undercooked meat from animals that contain larval cysts of the parasite. The symptoms of trichinellosis can range from abdominal pain, vomiting, diarrhea, constipation and low-grade fever to facial edema, headaches, intermittent fever, conjunctivitis, rashes, coughs and muscle pain. Fatal cases might result from nervous system and heart muscle complications, although this is very rare.

Life Cycle of Trichinella

Trichinella can complete all its stages of development in one host. Transmission from one host to another host can only occur by ingestion of muscle tissue (meat) which is infected with the encysted larval stage of the parasite. When ingested, muscle larvae come out of the cyst stage and enter the small intestine, where they undergo development to the adult stage. Adult parasites mate and produce larvae which leave the intestine and migrate through the circulatory system to muscle tissue. There, they penetrate a muscle cell, modify it to become a cyst, and mature to become infective for another host. The total time required for this development is from 17–21 days. Adult worms will continue to produce larvae in pigs for several weeks before they are expelled.

How Do We Know About Trichinella?

The National Center for Infectious Diseases manages a national trichinellosis surveillance system. Trichinellosis became a nationally reportable disease in 1966, but statistics have been kept on the disease since 1947. The national trichinellosis surveillance system relies on existing resources at the local, state, and federal levels. Cases are diagnosed based on clinical history with laboratory confirmation and reported weekly to Centers for Disease Control and Prevention. The purpose of the surveillance system is to determine the incidence of trichinellosis, to maintain awareness of the disease, to monitor epidemiologic changes, to identify outbreaks, and to guide prevention efforts.

What Are the Main Risks for Humans?

Historically, trichinellosis was associated with eating trichinella-infected pork. In some developing countries of the world where pigs are scavengers, and mainly subsist on garbage, this is still the most common source of infection. However, in the U.S. the most likely cause of trichinellosis is now from eating raw or inadequately cooked wild game meat. During 1997–2001, for the first time the consumption of meats other than pork, particularly wild game meat, was the most common cause of infection. Out of the 72 cases of trichinellosis that were reported between during this period where the source of the infection could be established, 31 cases were associated with eating wild game meat (and 29 of those from eating bear), 12 cases were associated with eating commercial pork products and nine cases were associated with eating pork from non-commercial home-raised pigs. Similarly, between 2002–2007, 66 cases of trichinellosis were reported; of those that were traced back to a source of meat, 21 were associated with eating bear meat, one with cougar meat, one with deer meat, one with walrus meat and two with commercial beef. Pork was associated with 10 cases – two of which related to wild boar meat from a farmers’ market, while another two cases were attributed to pork eaten while the consumers were traveling in Asia.

These results demonstrate two things. First, we are seeing a continued decline in total number of cases of trichinella that are reported annually. During 1947–1951, the average number of annual cases was 393. Today, it is now around 12. Second, these results show that in recent years the main risk is not pork – whether from pastured or intensive systems – but meat from wild game.

As a side issue, the fact that two cases of trichinella were linked to eating beef is quite worrying. As noted above, the only way the trichinella parasite can be transmitted from host to host is from eating infected meat. This would indicate that the infected cattle were obviously not 100% grass-fed animals! Or cattle had obviously eaten infected raw meat of some form or other.

Why Are Pastured Pigs Being Flagged as a Risk Factor?

Pigs can pick up trichinella parasites in a limited number of ways. The principal risk factors include feeding raw waste products or animal remains, and exposure to infected rodents or wildlife. In 1980, Congress passed the Federal Swine Health Protection Act (Public Law 96-468) that prohibits feeding potentially contaminated garbage to swine. Trichinella cases had already declined up to this point due to

garbage cooking laws that were introduced in the 1950s and 1960s. This law effectively rules out transmission from raw waste or other garbage on any well-managed farm.

The next potential transmission risk is rodents – particularly rats. Rodents can pick up infection from landfills, carrion or even dead pigs. When rat populations are in close contact with pigs it is possible that either live or dead rats will be caught and eaten. If the rat happens to be infected, then trichinae infection will occur. Rodents can present a risk in both indoor and pasture-based systems. It might even be possible that a poorly-run indoor unit has a greater rodent problem than a well-run pastured system simply because of the possibility of a greater number of havens for rodents in an indoor system.

The third potential risk is exposure to infected wildlife. Pigs which have free access to foraging areas outdoors could potentially encounter wild animal carcasses, such as raccoons, skunks and opossums, which have been shown to have high prevalence rates for trichinae. This is not a risk factor for well-managed indoor units and is the only possible extra risk for pastured hogs. This does assume that the pastured operation includes areas of land where small dead mammals might be found by hogs.

However, it is important to note that there is no detailed research or data on the prevalence of trichinella in commercially managed indoor hogs versus that of pastured hogs. In fact, the trichinellosis surveillance report from 2002–2007 notes that the number of swine reared in USDA-certified organic livestock operations increased from 482 in 1997 to 10,018 in 2005; yet the total number of cases of trichinellosis traced to any kind of pork actually decreased – and was only linked to 10 cases between 2002 and 2007. The rise in organic production can be measured by reference to organic certification records. We also know that pastured non-organic production – which is more difficult to quantify - increased during this same period – and still the overall level of trichinellosis from pork dropped.

Research and Testing

A research paper published in the *Foodborne Pathogens and Disease* journal in 2008 looked at the incidence of trichinella in free-range and intensively farmed pigs, sampling 600 pigs in North Carolina, Ohio and Wisconsin. Financed by the National Pork Board, the study identified two free-range pigs that were carrying antibodies for trichinella, while none of the indoor pigs tested were carrying the same antibodies. As the authors of the study explained, the results didn't mean that the free-range pigs definitely had trichinella, but it did mean that they had been exposed to the parasite in the past. The researchers made it clear that this was a “preliminary study” which warranted the need for a “robust epidemiological study” to determine risk factors and “potential reemergence of parasitic pathogens.” In 2009, however, the study received significant publicity – notably in a *New York Times* Op-Ed piece – which attempted to suggest that eating pasture-raised pork would dramatically increase the consumer's risk of trichinella.

Set against the national surveillance survey results, it is clear that the research does *not* provide any evidence that pasture-based hog production presents any greater risk of trichinella than indoor

production, and that the *New York Times* Op-Ed at best blew the issues out of all proportion – and, at worst, misrepresented the actual findings. This is further supported by the fact that the National Animal Health Monitoring Survey (NAHMS) tested 14,121 hogs across 17 states in 2000 and found no positive results for trichinella. The NAHMS survey in 2006 also found no trichinella-positive pigs.

Risks and Interventions

The key recommendations for trichinella-free pork production can be met by both indoor and pasture based pig producers:

- Don't feed uncooked waste products, table scraps or animal carcasses to pigs. This is particularly important in the case of carcasses from hunted or trapped wildlife.
- Eliminate or minimize exposure of pigs to live wildlife. In particular, create barriers which are effective in separating pigs from skunks, raccoons and other small mammals.
- Implement and maintain an effective rodent control program. Biosecurity, maintaining perimeters, baiting and trapping are all part of rodent control.
- Maintain good hygiene. Remove dead pigs as soon as they are found. Keep barns free from clutter to reduce havens for rodents and store feed securely to prevent rodent access.

In summary, good production and management practices for pig husbandry will preclude most risks for exposure to trichinae from the wider environment – whether the pigs are indoors or on pasture.

Cooking pork

Although the above evidence should dispel any concerns that consumers might still have about the risk of consuming trichinella-infected pork, proper cooking of pork will of course eliminate the risk of infection altogether. The trichinella parasite cannot withstand even a minute at 140°F (60°C). The U.S. Department of Agriculture recommends that consumers of fresh pork cook the product to an internal temperature of 160° F (71°C) to ensure that any risk from trichinella is removed.

Summary

There is no evidence that the potential additional risk of exposure of pasture-based pigs to the carcasses of trichinella-infected wildlife is translated into any additional risk of trichinellosis by consuming pasture-based pork when compared to the consumption of intensively-raised pork. In addition, the overall level of trichinellosis traced to the consumption of pork of any kind is actually declining against a backdrop of increased outdoor pig production. Furthermore, proper handling and cooking of pork of any kind will eliminate any potential risks of trichinellosis entirely.

References

Gamble, H.R. *The US Trichinella certification program*

http://www.iss.it/binary/crlp/cont/Gamble_Trichinella.1214402888.pdf [accessed 5/23/12]

Sharon L. Roy, S.L., Lopez, A.S., and Schantz, P.M. (2003). *Trichinellosis Surveillance --United States, 1997–2001*, National Center for Infectious Diseases

<http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5206a1.htm> [accessed 5/23/12]

Kennedy, E.D., Hall, R.L., Montgomery, S.P., Pyburn, D.G., and Jones, J.L. (2009). *Trichinellosis Surveillance - United States, 2002- 2007* National Center for Infectious Diseases

<http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5809a1.htm> [accessed 5/23/12]

Gebreyes, W.A., Bahnson, P.B., Fun, J.A., McKean, J., and Patchanee, P. (2008). Seroprevalence of *Trichinella*, *Toxoplasma*, and *Salmonella* in Antimicrobial-Free and Conventional Swine Production Systems, *Foodborne Pathogens and Disease* 5(2):199–203.

Trichinella and Pastured Pigs is one of A Greener World's Briefing Paper range, designed to provide analysis and comment on current issues. For more information visit agreenerworld.org.