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Trichinella in pork: current knowledge on the suitability of freezing as a public health measure

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Nematodes of the genus *Trichinella* are the causative agents of trichinellosis, a potentially severe disease in humans. Raw or undercooked pork, horse and game meat (predominantly wild boar and bear) poses a health risk to consumers. Various European and international regulations and guidelines have been developed to protect consumers from exposure to this parasite [1-3]; these regulations and guidelines cover both slaughter inspection and post-slaughter processing (e.g., freezing, cooking). Scientific studies have been conducted to validate these methods in pork, including an international study, which described the time and temperature requirements for the freezing process to inactivate *Trichinella spiralis*, the species of *Trichinella* most commonly associated with pork [4]. Results of this study have been widely used to develop regulations governing the commercial freezing of pork and pork products [1, 3]. However, recent scientific information on the geographical distribution of species of *Trichinella*, other than *T. spiralis*, which can infect pigs, and the ability of some of these species to tolerate freezing, have raised doubts about the effectiveness of commercial freezing methods to kill trichinella larvae in pork intended for human consumption [5].

Freeze resistant species of Trichinella

More than 50 years ago, it was discovered that trichinella larvae (at that time all trichinella larvae were considered to be *T. spiralis*), present in the muscles of animals living in arctic and subarctic regions of the world (e.g., Greenland, Canada, Russia, Siberia), were able to survive freezing for

regions of the world (e.g., Greenland, Canada, Russia, Siberia), were able to survive freezing for months or even years. We now recognize eight species and three genotypes of the genus *Trichinella* [5]. Of these, only muscle larvae of *Trichinella nativa*, its related genotype *Trichinella* T6, and *Trichinella britovi* are known to survive extended periods of freezing in the muscles of some of their natural hosts, including pigs [5].

From the perspective of food safety, freeze tolerant species of *Trichinella* are a potential concern as they might remain infective in pork following commercial freezing treatments. However, a number of experimental studies have demonstrated that *T. nativa* and *Trichinella* T6 larvae are only able to establish in very low numbers in the domestic pig [6, 7]. In general, the infectivity of *T. nativa* and *Trichinella* T6 for pigs is 10^4 lower than the infectivity of *T. spiralis*, and neither *T. nativa* nor *Trichinella* T6 has ever been found in a domestic pig in nature. These trichinella species pose a very low or negligible risk to consumers of pork from domestically reared pigs and therefore may not need to be considered in regulations governing freezing of pork and pork products.

Potential risks associated with freezing pork in areas where *T. britovi* is endemic

T. britovi is found across Europe, Asia, Northern and Western Africa and has been shown in experimental studies to have moderate infectivity for the domestic pig [5,6]. According to the database of the International Trichinella Reference Centre (http://www.iss.it/site/Trichinella/index.asp), 36 of 200 (18%) of trichinella species isolated from domestic pigs in Europe were identified as *T. britovi*.

Freeze tolerance of *T. britovi* in pork is influenced by the age of the infection as well as the conditions of freezing and thawing (i.e. temperature and time) [8]. Data shown in Table 1 [9-11], demonstrate the high variability of survival of *T. britovi* larvae in frozen meat of domestic pigs and wild boar (Sus scrofa).

Table 1. Infectivity of *T. britovi* larvae after freezing of pork of naturally or experimentally infected swine.

Origin of infected pork	Age of larvae	Temperature °C	Week/s of freezing	Infectivity of larvae after thawing	Reference
Naturally infected wild boar	unknown	-20	3	yes	9
Naturally infected wild boar	unknown	-20	4	no	9
Experimentally infected pigs	5-10 weeks	-18	1 - 4	no	10
Experimentally infected pigs	5-10 weeks	-5	1 - 4	yes	10
Experimentally infected wild boar	5 - 10 weeks	-18	1 - 4	no	10
Experimentally infected wild boar	5 - 10 weeks	-5	1 - 4	yes	10

Naturally infected pigs	unknown	-18	1	no	a
Naturally infected wild boar	unknown	-35	1	yes	11

Recommendations

Considering the moderate infectivity of *T. britovi* for pigs, the regular isolation of this species from the domestic pig in Europe, and the uncertainty of freezing as a method to inactivate this species, pork from areas where *T. britovi* is endemic should not be treated by freezing alone as a method to protect human health until further research has been conducted. In the interim, pork from areas where *T. britovi* is endemic should be inspected using reliable detection methods [2].

Research on freezing pork as a method to inactivate *T. britovi* should account for all the factors which may influence the susceptibility of this parasite, such as intra-specific variation of isolates from and within different geographic regions. Furthermore, studies investigating the susceptibility of *T. britovi*, or other trichinella species in different hosts to various freezing conditions should be conducted with the same rigour as applied in earlier studies [4], as these results will influence future regulations on meat safety.

Note: The authors are members of the International Commission on Trichinellosis (http://monsite.wanadoo.fr/intcomtrichinellosis) and provide information and recommendations based on recent recognition of gaps in knowledge on this parasite which may impact regulatory decisions. Additional information on the subject of freeze tolerant Trichinella can be found in an opinion paper from the European Food Safety Authority [12].

References:

1. Commission Regulation (2075/2005) laying down specific rules on official controls for Trichinella in meat. Official Journal of the European Union, 2005, 338:60-82.
2. Gamble HR, Bessonov AS, Cuperlovic K, Gajadhar AA, Knapen F van, Noeckler K, Schenone H, Zhu X. International Commission on Trichinellosis: Recommendations on methods for the control of Trichinella in domestic and wild animals intended for human consumption. Vet. Parasitol. 2000, 93:393-408.
3. U.S. Code of Federal Regulations, § 318.10. Prescribed treatment of pork and products containing pork to destroy trichinae. (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=f9361ee66063187dffee4c083c24b6a7&rgn=div5&view=text&node=9:2.0.2.1.19&idno=9#9:2.0.2.1.19.1.21.9)
4. Kotula AW, Sharar A, Paroczay E, Gamble HR, Murrell KD, Douglas L. Infectivity of Trichinella from frozen pork. J. Food Prot. 1990, 53:571 573.
5. Pozio E, Murrell KD. Systematics and epidemiology of Trichinella. Advances in Parasitology, 2006, 63:367-439.
6. Kapel CMO, Gamble HR. Infectivity, persistence, and antibody response to domestic and sylvatic Trichinella spp. in experimentally infected pigs. Int. J. Parasitol. 2000, 30:215-221.
7. Nockler K, Serrano FJ, Boireau P, Kapel CMO, Pozio E. Experimental studies in pigs on Trichinella detection in different diagnostic matrices. Vet. Parasitol. 2005, 132:85-90.
8. Pozio E, La Rosa G, Amati M. Factors influencing the resistance of Trichinella muscle larvae to freezing. In, Trichinellosis (Eds C.W. Campbell, E. Pozio, F. Bruschi), ISS Press, Rome, Italy, 1994, pp. 173-178.
9. Pozio E, La Rosa G, Mignone W, Amati M, Ercolini C. Sopravvivenza delle larve muscolari di Trichinella britovi nei muscoli congelati di cinghiale. Arch.Veterin. Italiano 1992, 43:28-31.
10. Kapel CMO, Webster P, Malakauskas A, Hurnikova Z, Gamble HR. Freeze tolerance of nine Trichinella genotypes in muscle tissue of experimentally infected pigs, horses, wild boars, mice, cats, and foxes. Abstracts, XIth International Conference on Trichinellosis, August 8-12, San Diego, California, 2004, p. 28.
11. Gari-Toussaint M, Tieulie N, Baldin J, Dupouy-Camet J, Delaunay P, Fuzibet J et al. Human trichinellosis due to Trichinella britovi in southern France after consumption of frozen wild boar meat. Euro Surveill 2005;10 (6):117-8 (http://www.eurosurveillance.org/em/v10n06/1006-226.asp)
12. European Food Safety Authority. Opinion of the BIOHAZ Panel on the suitability and details of freezing methods to allow human consumption of meat infected with Trichinella or Cysticercus. Adopted on 1

December 2004 in Parma. (http://www.efsa.europa.eu/en/science/biohaz/biohaz_opinions/777.html)

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