TRICHINELLA IN PORK: CURRENT KNOWLEDGE ON THE SUITABILITY OF FREEZING AS A PUBLIC HEALTH MEASURE

E Pozio[1], CMO Kapel[2], AA Gajadhar[3], P Boireau[4], J Dupouy-Camet[5], HR Gamble[6]

1. Department of Infectious, Parasitic and Immunomediated Diseases, Istituto Superiore di Sanita, Rome, Italy
2. Lab. of Zoology, Department of Ecology, The Royal Veterinary and Agricultural University, Frederiksberg, Denmark
3. Centre for Food-borne and Animal Parasitology, Canadian Food Inspection Agency, Saskatoon, Canada
4. UMR BIPAR INRA AFSSA ENVA UPVM, Maisons-Alfort, France
5. Parasitologie, Hopital Cochin, Universite Descartes, Paris, France
6. National Research Council, Washington, USA

Published online 16 November 2006
Citation: Euro Surveill 2006;11(11):E061116.1.
Available from:
http://www.eurosurveillance.org/ew/2006/061116.asp#1

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 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).

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].*

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

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)

Impact of a genetic variant of *Chlamydia trachomatis* on national detection rates in Sweden

T Söderblom[1], A Blaxhult[1], H Fredlund[2], B Herrmann[3]

1. Swedish Institute for Infectious Disease Control, Solna, Sweden
2. Department of Clinical Microbiology, University Hospital, Örebro, Sweden
3. Department of Clinical Microbiology, Uppsala University Hospital, Uppsala, Sweden

Published online 7 December 2006
Citation: Euro Surveill 2006;11(12):E061207.1.
Available from:
http://www.eurosurveillance.org/ew/2006/061207.asp#1

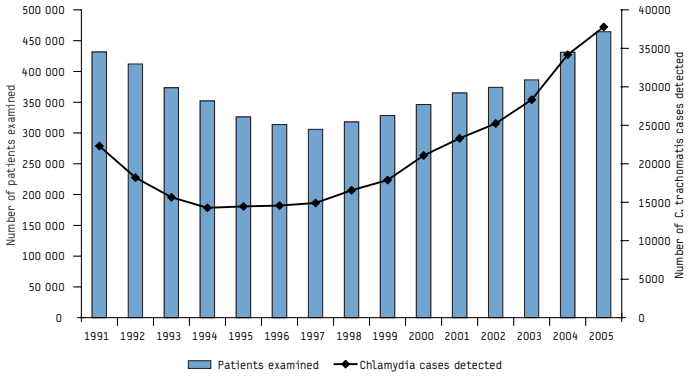
In the Swedish county of Halland, it was recently reported that a proportion of sexually transmitted *Chlamydia trachomatis* infections could not be detected using standard laboratory tests manufactured by Abbott and Roche [1]. Chlamydia bacteria with a variation in a genomic region targeted by PCR primers have been identified. A subsequent investigation to see whether the presence of genetic varients could be inferred from the basic epidemiological data reported from all 21 counties in Sweden has recently been completed.

In Sweden, four commercially available nucleic acid amplification assays are used for chlamydia routine diagnostics, although in most counties, only one assay is used. Three of the detection systems (two from Roche and one from Abbott) use the same PCR primer target region. The chlamydia genetic variant recently identified has a deletion in this region, therefore these tests cannot detect it [1]. The diagnostic test by BectonDickinson uses a different primer target region and can therefore detect this variant.

Chlamydia trachomatis infection is one of the 60 notifiable diseases under surveillance at a national level in Sweden. Chlamydia infections are reported both as individual clinical cases and as the number of people with detected chlamydia infections. The annual number of people in Sweden testing positive for chlamydia has consistently increased since 1994 (Figure 1).

Figure 1

Number of people with detected chlamydia infections, and number of people tested for chlamydia, 1991 - 2005*



* Even though the overall number of patients tested for chlamydia in 2006 is not yet available, on the basis of preliminary data, it is assumed to be the same as in 2005.

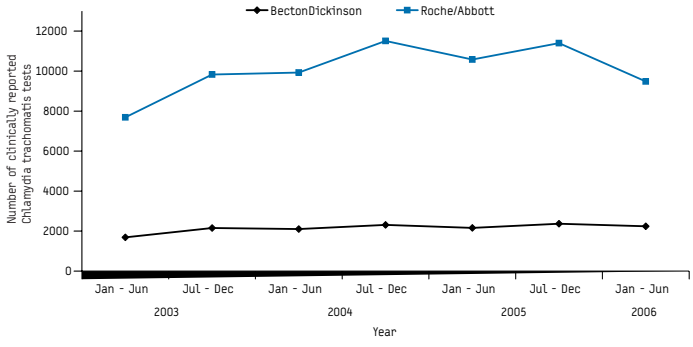
Detection of chlamydia infections by different methods

Data showing clinically reported cases reported between January 2003 and June 2006 according to diagnostic test used is presented in Figure 2. The data was provided by 20 laboratories covering the whole of Sweden, except three counties where laboratories either changed the detection method during the observed period or used both Roche and BectonDickinson systems. The data accounts for approximately 80% of all reported chlamydia cases in Sweden during the period from January 2003 to June 2006. In 2003 and 2004, the number of reported cases increased or stayed at a similar level regardless of the test used.

Due to seasonal variations in chlamydia infections, the incidence is higher in the second half of the year. However, the counties where laboratories used BectonDickinson tests reported a similar number of chlamydia cases in the first and second half of 2005, while the counties using Roche or Abbott tests reported fewer cases in the second half of the year.

Figure 2

Number of clinically reported chlamydia cases in Sweden from January 2003 to June 2006, by diagnostic method



This trend is even more visible when the first half of 2006 is compared with the same period in 2005. A 10% decline in number of chlamydia cases diagnosed with Roche or Abbott tests can be seen, compared with a 1% increase in cases detected with the BectonDickinson test. This could be caused by a nationwide distribution of a genetic variant of *Chlamydia trachomatis* being undiagnosed.

Discussion

At present, it is still unclear when the variant appeared (it still also not determined whether there are several clones), and how far it has spread in Sweden. There are considerable variations in case numbers from month to month between counties which use the same test and there is a lack of information about prevention and control measures (such as chlamydia prevention programmes) for each individual county.