

INSPECTION FOR *TRICHINELLA* IN THE EU - FOOD SAFETY OR EXPORT CONCERNS

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Abstract The former 15 EU countries have been spending an estimated 570 million Euro yearly to inspect for *Trichinella* in pigs primarily raised on industrialized farms with negligible little risk of acquiring the parasite; human trichinellosis in the EU is generally caused by game meat, imported horse meat, or meat from local pigs raised outdoors. Occurrence of both pig and human trichinellosis has significantly higher prevalence in the newly associated eastern countries. Attempts are made to define *Trichinella*-free areas, but only certification of *Trichinella*-free pig production units/farms appears feasible. Because current serological detection methods are not suited for meat inspection, the classical direct detection methods and inactivation by freezing remain the methods of choice for inspection of pork in the new EU legislation, which is planned to go into force in early 2006. Automation of direct inspection methods may represent a cost effective alternative to certify pig farms free of *Trichinella*.

Introduction Human trichinellosis is estimated to affect at least 11 million people globally, and based on the cost of previous outbreaks (Dupouy-Camet, 2000), the annual cost of the 3,000-5,000 yearly human cases in EU (1990-2004) is many million Euro. Human trichinellosis have been increasing during the 1990s in the original EU member states, but especially so in the newly associated EU countries (Murrell and Pozio, 2000; Djordjevic *et al.*, 2003). Almost exclusively the meat sources of infection in Europe have been horses, wild boar, and pigs bred on small farms or allowed to graze on open pasture (Pozio, 1998; Murrell and Pozio, 2000; Oivanen *et al.*, 2002; Malakauskas *et al.*, 2005). Most of such pigs (organic, ecological, free-ranging, etc.) are used for local or regional consumption only. Although animals for local and regional consumption has not required to be tested in the present EU legislation, but this will be changed in the future legislation. In addition, the illegal importation of infected pork and pork products has led to outbreaks of trichinellosis in Germany, Denmark, Italy and the UK (Pozio and Marucci, 2003; Hansen and Kristensen, 2004).

As management scenarios differ widely in Europe, the typical management systems at risk in Western Europe are the free-range production and the small farm where pigs are raised for private consumption; in Eastern Europe it is the newly established private farms and the small backyard rearing which have gradually replaced the larger collective farms.

The high number of infections in domestic pigs in east and central European countries represents a serious problem for the meat trade between EU countries, and most likely also for the general perception of the quality pig meat exported from the EU.

Methods of Meat Inspection Although trichinoscopy, which is laborious, costly and not very sensitive, has gradually been replaced by artificial digestion methods in most industrialized slaughterhouses of Western Europe, it is still common many places in Central and East Europe, and in small slaughterhouses in Western Europe. The method does not detect the non-encapsulating *T. pseudospiralis*, which is widespread in European wildlife, representing a risk of infection of livestock in extensive production units as has occurred in farmed wild boars in Finland (Oivanen *et al.*, 2002) and in a domestic pig herd in the Slovak Republic (Hurníková *et al.*, 2005). Thus, the use of trichinoscopy as a method for *Trichinella* control in the EU will only be allowed as a transitional measure.

Six artificial digestion methods have up to now been accepted by the EU, but in future legislation this number will be reduced to four:

- The magnetic stirrer method (gold standard);
- the "Stomacher" sedimentation method;
- the "Stomacher" filtration technique; and
- the "Trichomatic 35" automated digestion.

These digestion methods are all very suitable for demonstrating *Trichinella* larvae in pork, but only the magnetic stirrer digestion has been subjected to validation studies (Forbes and Gajadhar,

1999). All animals slaughtered in EU export accredited abattoirs should be examined according to one of these artificial digestion methods. The amount of meat that must be tested per animal in future is 1 g for pigs, 5 g for horses and wild boars, and 10 g for other game.

Indirect (serological) test methods are at present not recommended as a substitute for direct (pooled sample digestion) methods of individual carcasses at slaughter (Gamble *et al.*, 2000; 2004). Among others, serology cannot detect early infections in pigs (Kapel and Gamble, 2000). The sensitivity and specificity of such tests are obviously important for the validity of the test results, but the statistical predictive value of the test rely on the true prevalence in the population subjected to surveillance. In non-endemic areas, the positive-predictive value is extremely low and useless as a substitute for meat inspection. However, the negative predictive values in the same areas may be used for surveillance of farms under a pre-harvest control program (see below).

Certification by Freezing (Only for Pork) Pork can be certified after freezing by either of three different methods, and in consideration of the size of the meat portions frozen. As larger pieces of meat have to be frozen for longer time periods (e.g. 20 days at -25°C), the procedure is a rather expensive substitute for inspection by digestion, but it may be suitable for meat that would anyway be sold frozen. In the future EU legislation, meat from wild boars, horses or game cannot be certified by freezing since they may hold cold tolerant species of *Trichinella*.

Potentials for Pre-Harvest Control (Trichinella-Free Farming) The EU and USA have investigated strategies to limit meat inspection to pigs at risk (pigs on farms without rodent control and barriers to the surrounding fauna, pigs on pasture, etc). Before this can be realized, however, a system must be put in place which allows certification of pig farms as *Trichinella*-free, on the condition that they fulfill certain criteria. In the US, a pilot program for certifying pig herds is being conducted.

In the future EU legislation, the following criteria (simplified) have been proposed for designating *Trichinella*-free pig farming:

- 1) All pigs, originating from certified breeders, are registered, identifiable at arrival and when leaving the farm;
- 2) production pigs never have access to pasture;
- 3) pig buildings are constructed to prevent rodents from entering and a rodent control program is enforced;
- 4) only feed from certified producers maintained in closed silos to prevent access by rodents is used;
- 5) waste food, containing meat products, is heated to inactivate *Trichinella*;
- 6) dead animals are disposed by sanitary means within 24 hours; and
- 7) introduced new animals originate from *Trichinella*-free farms or, alternatively, animals are held in quarantine and are examined serologically prior to introduction.

In addition to the above "on-farm" requirements that have to be fulfilled by the operator of the farm, it will be a requirement that a competent authority shall periodically conduct audits ensuring that the farm meets the prescribed criteria. The same authority shall ensure that the individual *Trichinella*-free farm is monitored in a surveillance program, which verifies that pigs are indeed free of *Trichinella*. In addition, a risk based wildlife monitoring program on indicator animal species shall be conducted by an independent authority.

Although the "on-farm" measures for certification and periodic audits are very similar between the US and EU initiatives, the surveillance of all individual *Trichinella*-free farms is not included in the US initiative. Instead, surveillance is conducted on a part of the national pig herd, which is less costly, but does not allow for any direct risk assessment in the *Trichinella*-free farming units. Also, the US initiative does not include regional monitoring programs of wildlife, which in the EU initiative provide data for the risk assessment on transmission from the surrounding fauna.

Although risk of *Trichinella* transmission is eliminated in confined industrialized production, one single finding of *Trichinella* in animals raised in other management systems will presumably have a major impact on the export of animals from the same region, independently of its relative risk. For *Trichinella*-free farming such individual findings may exaggerate consumer perception of the risk much more than if pigs are individually inspected by meat inspection.

Cost of Meat Inspection and Herd Certification The major intention for instituting herd certification or *Trichinella*-free farming is to allow the meat industry to save money without compromising food safety. Cost estimates for classical *Trichinella* inspection by digestion ranges from 0.12 to 2.5 Euro per pig. In large industrialized slaughterhouses (roughly 10,000 pigs/day) in Denmark, the cost estimate for inspection by pooled sample digestion is 0.15 Euro per pig. Although, the EU has not done any cost estimates of certifying *Trichinella* free farming, the comparable US herd certification program estimates that the cost is 0.2-0.6 US\$ (0.16-0.48 Euro) per pig (excluding surveillance in individual certified farms and monitoring of wildlife). Thus, the costs are at least the same for the certification procedure as for the classical digestion procedures.

Other alternatives to make *Trichinella* inspection more cost effective include serological inspection or automation of the classical inspection techniques. Although the present technical problems for the use of serology (sensitivity, specificity and low predictive value) may be overcome, another cost efficiency obstacle, is that serological samples cannot be pooled (as for the direct detection techniques).

Stake Holders: Export Concerns or Real Consumer Protection The demand for changes in the present EU legislation has been primarily put forward by the meat industry to reduce the cost for inspection, but the same industry is very much aware of the consumer perception of risk associated to their product. This is especially the case for pigs that are exported. For pigs raised in confined farms under industrialized management practices, with strict observation of microbial hygiene (rodent control, food storage, etc.), there is little or no risk of *Trichinella* transmission, but if the cost to certify these farming systems and separate finishing pigs from alternatively raised pig at slaughter exceeds the cost of the classical inspection techniques, a simple and efficient meat inspection procedure that allows for traceability and thorough epidemiological risk analysis of single findings is likely preferable from an industrial perspective.

It may also be argued that an efficient meat inspection on individual animals has the highest degree of consumer protection in a region like Europe that includes both high- and low-endemic regions and a variety of pig management systems.

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