GoatBSE:

Susceptibility-based assessments of prion infectivity in goats and improvements in diagnosis

CENTRAL VETERINARY INSTITUTE
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SIXTH FRAMEWORK PROGRAMME

Why goatBSE project

Bovine spongiform encephalopathy (BSE) in cattle has alarmed society. This infectious agent is able to cross many species barriers including the human. In goats (and not in sheep) only two cases of BSE have been encountered. Occurrence of this agent represents a potential risk of food-born contamination to human consumers of goat milk and meat products.

What kind of research

The project aimed at determination of tissue distribution of BSE in exposed goats and simultaneous generation of indispensable data on genetic susceptibility in the most commonly used production breeds. Intrinsic to this research is the crucial role of the prion protein (PrP) in disease transmission, and an adequate BSE diagnosis.

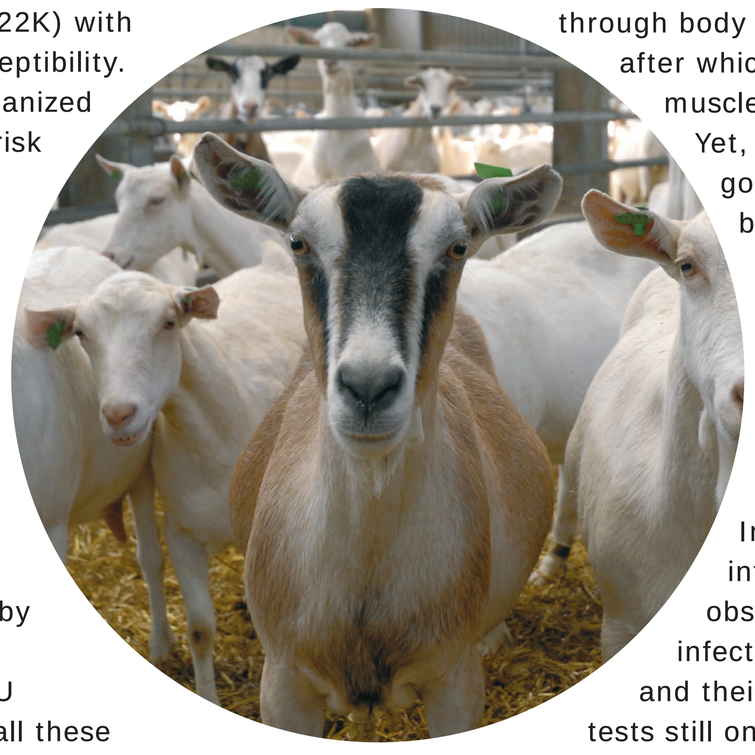
Approach and Results

Data collection for evaluation of risks associated with BSE passaged in goat

transgenic mouse line producing PrP species	bovine BSE	goat BSE	goat scrapie
human PrP	~	Y	N
bovine PrP	Y	Y	Y
ovine PrP^{VRQ}	Y	Y	Y
porcine PrP	~	Y	N
caprine PrP	Y	Y	Y

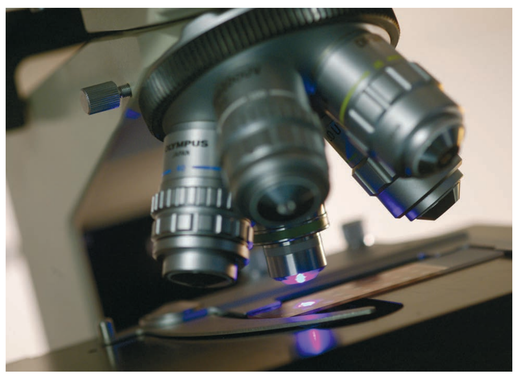
Table: To estimate transmission barrier between species: bio-assaying goat TSE isolates in mice producing PrP from different animal species, including human PrP. Transmissions at 1st passage: Y =100%, N = 0%, ~ = <20%.

Field studies in infected herds together with experimental studies in goats of varying PrP genetic background lead to detection of a PrP variant allele (222K) with a high level of unsusceptibility. As established in humanized transgenic mice: the risk in humans for a potential goat-BSE agent should not be underestimated



Testing presence and level of infecitvity in tissues from BSE infected goats

BSE infectivity is spreading throughout the body at a late stage (at least more than 42 months) after oral intake moving from gut through body nerve cells to brain after which it can spread to muscle and lymph nodes. Yet, in 222K carrier goats this has not been observed.



Validating our ability to adequately recognize caprine BSE

European prion strain variability was documented in goats by recruiting many goat isolates from seven EU countries. Until now, all these isolates could be clearly discriminated from a BSE infection with existing and new tools. Importantly, tested field samples were found not to be transmissible to humanized transgenic mice.

Figure: TSE agent field studies in European countries. Scrapie in goats does exist already for a long time, but was however not well studied. The project selected twenty four from more than sixty cases for in-depth analyses by biochemical, microscopic and rodent bioassays. All isolates were non-BSE like and they represent various forms of scrapie.

Estimating BSE self-maintenance in goats by maternal/horizontal transmission

In milk until now no infectivity has been observed in any of the infected mother goats and their lambs (some tests still on-going).

General conclusions

- The data point to breeding with 222K PrP carrier goats should highly reduce the risk of scrapie and BSE among European goat populations[1].
- This and other studies indicate that BSE if appearing in the small ruminant population remains a concern because of a potential risk to transmit towards other species including humans.
- Efforts are now on-going in the EMIDA ERA-net project “GOAT-TSE-FREE” to preparing the goat sector in Europe to find, safeguard and use for breeding TSE-resistance allele carrying goats.
- Information to public, stakeholders and policy makers is available on the website: www.goattse.eu.

[1]In Cyprus - where an EU-supported breeding program is running - occur two unique resistance alleles (146S and 146D) that should reduce scrapie incidence.

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some facts:

duration: 72 months
support: EU budget FOOD-CT-2006-36353; € 3,850,000
animal use: ~3400 rodents; ~190 goats
gender ratio: 48%(f)/52%(m)

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