EXECUTIVE SUMMARY

year 6

FOOD-CT-2006-36353

goatBSE

Proposal for improvement of goat TSE discriminative diagnosis and susceptibility based assessment of BSE infectivity in goat milk and meat.

www.goatBSE.eu

PROJECT OBJECTIVES

In light of the known ability of the BSE agent to cross the animal/human species barrier, latest evidence establishing the presence of BSE in goat is especially alarming, as it represents a new potential risk of food-born contamination to human consumers of goat milk and meat products. The main objective is to determine the tissue distribution of BSE after oral exposure of goats while simultaneously generating indispensable data on genetic susceptibility in the most commonly used production breeds. This proposal aims:

(i) at providing data to allow evaluation of human risk associated with BSE passaged in goat,

(ii) at providing pathogenesis data and biological material from first and second passage BSE in goats,

(iii) at evaluating the possibility of BSE self-maintenance in goats by maternal/horizontal transmission,

(iv) at validating and improving our ability to detect and discriminate caprine BSE from goat scrapie.

Our approach will integrate the predicted influence of PrP gene polymorphisms on scrapie and BSE susceptibility so that it could potentially be used for the control of field TSE outbreaks in goats. We will also document European field TSE strain variability in goats by recruiting a large number of TSE goat isolates from affected European countries. Already established or specifically created animals models (strain typing) and biochemical tools (PrP^{Sc} typing), will be investigated for their ability to efficiently discriminate goat BSE/scrapie in goats. Finally, by measuring infectivity in various tissues (including skeletal muscle) and secretions (milk), collected from goats at different stages of BSE infection, we will provide indispensable data for quantitative risk assessment. The intended work is spread over five work packages which setting is shown in the pert diagram on the next page.

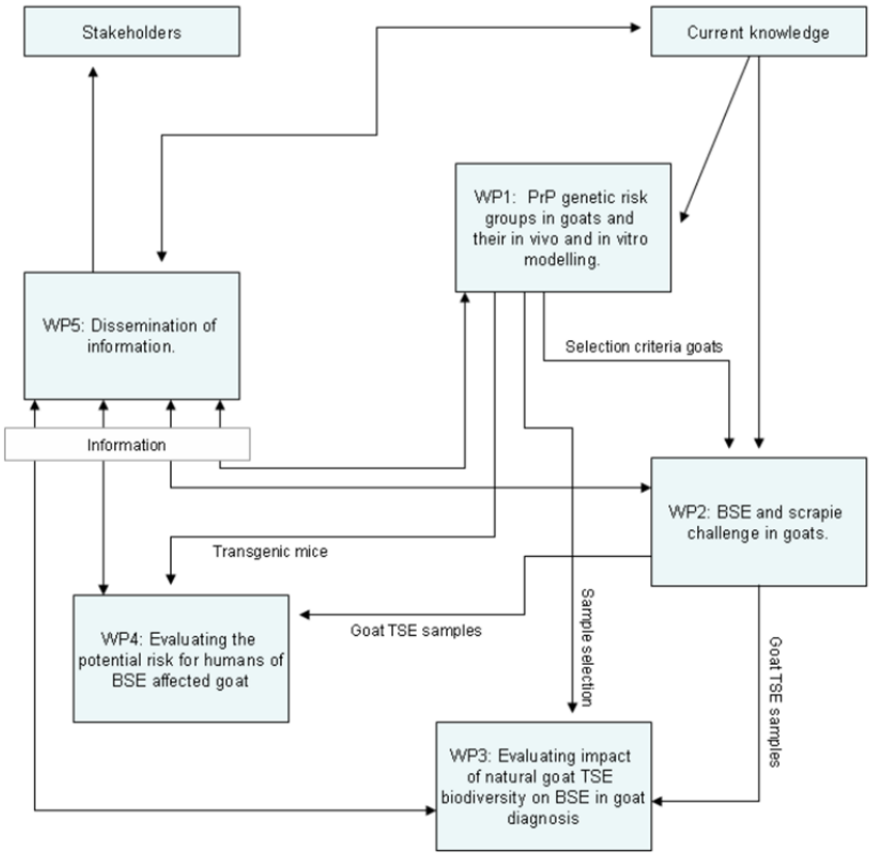

Figure: Pert diagram to show the exchanges and interactions between the individual Workpackages of the project. Collaborations were started in 2009 year 3 with: T. Baron ANSES Lyon FR, Spiropoulos and DEFRA VLA-Weybridge New Haw UK, P. Toumazos Veterinary Center Nicosia Cyprus.

Contractors

This consortium consists of 10 partners from 7 EU Member states;

Partner 1: Central Veterinary Institute of Wageningen UR (former CIDC-Lelystad), Lelystad, The Netherlands
Partner 2: Institut National de la recherché Agronomique (INRA), France
P2.a: UMR INRA/ENVT 1225 Interactions Hôtes Agents Pathogènes, Toulouse
P2.b: INRA-Tours, UR 918 - Laboratoire de Pathologie Infectieuse et Immunologie (PII), Research Centre of Tours-Nouzilly
P2.c: INRA SAGA-LGBC, Toulouse
Partner 12: Roslin Institute and R(D)SVS, University of Edinburgh, Edinburgh, UK.
Partner 4: INIA, Madrid, Spain.
Partner 5: UNIZAR, Zaragoza, Spain.
Partner 6: FLI-INEID, Riems, Germany.
Partner 7: IZSPLV, Turin, Italy.
Partner 8: ISS, Rome, Italy
Partner 9: CERTH-INA, Thessaloniki, Greece
Partner 10: CEA, Saclay, France.

Co-ordinator contact details

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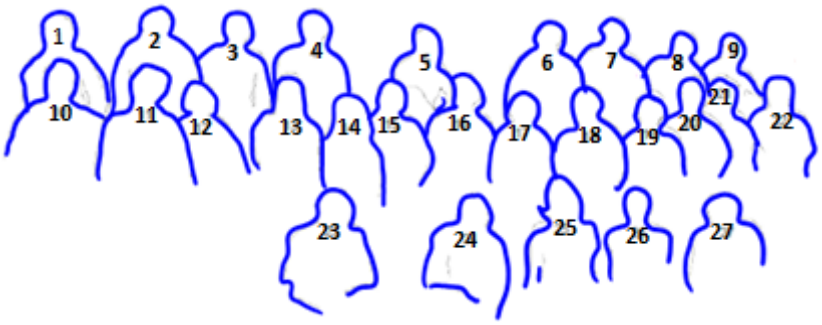
Who are we?



1 Peter Moonen (P1 CVI NL, has left), 2 Theodoros (P9 CERTH-INA GR), 3 Alex Bossers (P1 CVI NL), 4 Simone Peletto (P7 IZSTO IT), 5 Eva Monléon (P5 UNIZAR SP), 6 Jacques Grassi (P10 CEA FR), 7 Marti Eiden (P6 FLI GE), 8 Romolo Nonno (P8 ISS IT), 9 Herve Cassard (P2b INRA-Tours FR, has left), 10 Martin Groschup (P6 FLI GE), 11 Umberto Agrimi (P8 ISS IT), 12 Cindy Panagiotidis (P9 CERTH-INA GR), 13 Cristina Acin (P5 UNIZAR SP), 14 Kelly Ryan (P12 UEDIN-Roslin UK), 15 Wilfred Goldmann (P12 UEDIN-Roslin UK), 16 Patricia Berthon (P2b INRA-Tours FR), 17 Isabelle Lantier (P2b INRA-Tours FR), 18 Frederic Lantier (P2b INRA Tours FR), 19 Juan Maria Torres (P4 INIA SP), 20 Olivier Andreoletti (P2a INRA-ENVT Toulouse FR), 21 Francis Barillet (P2c INRA-SAGA Toulouse FR), 22 Hugue Caillat (P2a INRA-ENVT Toulouse FR), 23 Jan Langeveld (P1 CVI NL), 24 Gabriele Vaccari (P8 ISS IT), 25 Penelope Stylianou (visiting member Veterinary Services Cyprus), 26 Nathalie Kasal (P2a INRA-ENVT FR, has left), 27 Pavlos Toumazos (visiting member Veterinary Services Cyprus, retired). Contributors not on picture: John Spiropoulos (associate member AHVLA Weybridge UK), Thierry Baron (ANSES Lyon FR).

WORK PERFORMED / ACHIEVEMENTS

- In this sixth and last period the practical work of the project has been brought to completion. Testing in rodent models of goat natural scrapie isolates from seven countries (Italy, Spain, France, Netherlands, Greece, Cyprus and United Kingdom) have led to important conclusions: different scrapie “sub-strains” or “components” might be present in each isolate, and for some models geographical variation is present. All isolates so far seem to be different from BSE.
- Similar to intracerebral challenges oral challenges in goats with BSE also pointed to susceptibility of the 142M and 211Q allele carriers in contrast to the 222K allele. Intracerebral challenges in 222K homozygous and heterozygous goats are needed to further confirm the candidacy of this allele for goat TSE resistance breeding, which contributes a good level of resistance.
- Testing goat scrapie and BSE in mice transgenic for several species PrPs including human so far showed that experimentally goat derived BSE is transmissible. This also is confirmed in in vitro conversion studies using PrP variants produced in over-expressing mammalian cell lines.

- Goats with wild type PrP are very susceptible to oral goat-BSE, with dispersion of the infectivity towards peripheral tissues already within their first years of life.
- Sensitivity and specificity of routine diagnostic tests have been studied.
- Detailed molecular characterization of the selected panel of TSE goat isolates showed promising results in view of a possible molecular identification of goat scrapie strains. New methods able to categorise scrapie isolates on molecular ground have been developed. Discriminatory tests using immunoblotting or immunohistochemistry have been developed to differentiate European goat TSE isolates from experimental goat BSE.
- Tests on cheese making procedures indicated that spiked prions will largely remain in the curd.
- The consortium will continue to work in an EMIDA ERA-NET (GOAT-TSE-FREE) project for transferring the experience towards a science based application for resistance breeding.
- The public website enjoys again an increasing interest www.goatBSE.eu.
- A highly attended 5th animal TSEs workshop was organized as a satellite meeting prior to the international prion conference Prion2012 in Amsterdam, The Netherlands.
- The consortium organized the 9th international TSE conference Prion 2012, Amsterdam, The Nethelrands (www.prion2012.org).
- More major publications appeared in peer-reviewed journals, while other communication activities were materialized in oral presentations and posters.

EXPECTED END RESULTS

It is expected that the project will have a number of important outcomes with immediate relevance to the “European” problem of BSE in goats:

- BSE infectivity distribution in goat tissues and goat products.
- Improved animal models for detection & discrimination of BSE from other goat TSEs.
- Improved and validated (existing) diagnostics for goat BSE and scrapie.
- Improved guidelines for control goats TSEs by selective breeding-culling strategies.
- Goat TSE reference regarding geographical distribution of natural goat TSE strains.
- TSE in goat reference point for stakeholders: producers, scientific community, policy makers, end-users.

INTENTIONS FOR USE AND IMPACT

The strategic impact of this project is providing sound scientific information to be used to quantitatively assess risk of human exposure to BSE via goat products. The scientific insights gained will contribute to promoting food quality and safety through control of goat TSEs within EU Member states and regions. This will benefit EU consumer driven concerns with regard to food safety and animal welfare and it will assist EU milk and meat producers, by reinforcing competitiveness in a global market. Objectives and deliverables of this project will provide essential information allowing quantification of the risk to humans that BSE potentially presents if in goats and their products. In addition, it will facilitate the initiation of direct control of TSEs in goats, since currently limited control of goat TSEs is based solely on our knowledge of TSE in sheep. The cases of caprine BSE found in France and the UK might indicate that, with respect to TSEs, goats respond differently than sheep. As has been seen with sheep, improved genetic and diagnostic tools for controlling goat TSEs should lead to significant reductions of scrapie, and perhaps even to control of caprine TSEs in EU regions with high TSE outbreaks. Such an outcome would greatly reduce both food safety concerns and welfare problems in infected animals. Moreover, it would contribute to the sustained development of the dairy and meat sector of EU agri-food business by decreasing and eventually eliminating the load of TSEs entering the food chain. Besides EU interests, this project is serving a world with intentions to reduce prion risks for human consumers and animals.