V 28 TBE diagnostics in veterinary medicine – a good tool for epidemiological observations?

Christine Klaus[a], Martin Beer[a], Regine Saier[b], Wolf Bader[c], Thomas Miller[d], Jochen Süss[a]

[a] Friedrich-Loeffler-Institute, Jena and Greifswald-Insel Riems, Germany
[b] Institute of Food Science and Biotechnology, University of Hohenheim, Stuttgart, Germany
[c] Sheep Health Service Baden-Württemberg, Aulendorf, Germany
[d] Aulendorf State Veterinary Diagnostic Centre, Germany

The reason for the spreading of tick-borne encephalitis virus (TBEV) infections like a patchwork pattern is not quite clear and can range from very small to larger areas. To know more about TBEV circulation in a given area despite the confirmed human TBE cases and TBE virus prevalence in ticks, it is interesting to examine the seroprevalence in animals living in a region as an additional tool for characterizing a local epidemiological situation. Especially free-ranging ruminants may play an important role and sera collected for other diagnostic questions are easily available. However, there are only a few diagnostic methods available for TBEV antibody detection in animal samples. Therefore, defined TBEV-positive sera of different relevant animal species would be very helpful as a reference to improve and validate the different tests.

Two goats and 2 sheep were immunized 4 times each (week 0, 1, 3, 11) with FSME IMMUN (Baxter Deutschland GmbH, Unterschleißheim, Germany) according to the short immunization scheme in humans, and sera were tested for TBEV-specific antibodies up to 15 weeks after the first immunization. Reference sera were also generated by immunizing cattle, dogs, pigs, rabbits, mice, and a horse.

Two commercially available so-called ‘all species’ ELISA kits for the detection of TBEV antibodies were tested by examining the reference samples as well as 163 sera of goats. All positive and borderline results were retested by a serum neutralization test (SNT) as a gold standard to exclude false-positive results. Subsequently, the more suitable test system (Immunozym FSME IgM Kit, PROGEN, Heidelberg), with a sensitivity of 89% and a specificity of 91%, was used to test additional 394 sera of free-ranging sheep of 6 districts classified as TBE risk areas in Baden-Württemberg (Germany). In all districts ELISA-positive (n=49, 12.4%) or borderline sera (n=63, 14.4%) could be detected. All 112 suspicious sera were retested by SNT, and 25 sera were confirmed to be positive for TBEV-specific antibodies (6.3%). Interestingly, all these confirmed TBEV-reactive sera originated from only one district (Bodenseekreis). In the other 5 districts, no TBEV-specific antibodies could be confirmed. Most of the sera in the district Bodenseekreis were collected from 4 different flocks of sheep with 20 or more animals. TBEV seroprevalence in these 4 flocks differs in an impressive way (between 0 and 40%).

In conclusion, investigation of the TBEV-specific seroprevalence in free-ranging ruminants as ‘sentinels’ might be a very valuable additional tool for making epidemiological observations and risk analysis concerning the occurrence of TBEV in a given area.