

Bluetongue surveillance methods in the United States of America

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Summary

Historical surveillance for bluetongue virus (BTV) exposure in the United States of America (USA) has relied on periodical serological surveillance using samples collected from cattle at slaughter. Most of this surveillance has been focused on the north-eastern portion of the USA due to the lack of competent vectors of BTV in this region. For most of the states tested in this region, the prevalence of seropositive animals has been less than 2%. Recently, a study was conducted in north-central USA using sentinel cattle herds. Results of serological testing showed an increasing gradient of exposure from north to south. In addition, detection of *Culicoides sonorensis* showed a similar gradient with detection in the northern areas being relatively rare. The results of these studies indicate that cattle herds in the northern and north-eastern areas of the USA are likely to be free of BTV.

Keywords

Bluetongue virus – *Culicoides* – Sentinel herds – Serology – Surveillance – United States of America – Vector trapping.

Bluetongue (BT) viruses (BTV) have been and continue to be a significant impediment to international livestock trade. Various activities have been undertaken over the years to develop information on the risk associated with movement of animals from certain geographic areas to other areas thought to be free of BTV infection. The United States of America (USA) has used a variety of methods to monitor the prevalence and distribution of BTV infection of cattle in various parts of the country. Historically, surveillance has been

conducted in the USA on alternate years by testing serum collected from adult cattle at slaughter (1, 2). This programme has focused on the north-east segment of the country where the vector for the United States serotypes of BTV has been absent. Generally, the prevalence of seropositive animals in these studies has been 2% or less in each of the states with samples tested. The results for the most recent serological survey are reported elsewhere in these proceedings by Ostlund *et al.* (3).

More recently, a BT Surveillance Pilot Project (BSPP) was designed and implemented to evaluate a sentinel herd surveillance system for BTV and to evaluate the ecology of BTV and the vector of BTV in the north-central part of the country. Cattle herds in North Dakota, South Dakota and Nebraska were selected to participate in the study. Blood samples were collected from cows in each of the herds before and after a vector season. Blood samples were tested for antibody to BTV using a commercial competitive enzyme-linked immunoassay (c-ELISA). When only a single animal on an operation gave a positive result to the c-ELISA, that sample was tested by virus neutralisation (VN) to five BTV serotypes (BTV-2, BTV-10, BTV-11, BTV-13 and BTV-17). Operations were considered positive if they produced two or more c-ELISA positive samples or a single c-ELISA positive sample that was also positive to the VN test. Insect traps were set on approximately half of the operations to determine the presence of *Culicoides sonorensis*, the primary North American vector of BTV. Data were also collected on operation management, proximity to vector habitats and animal characteristics.

Overall, 149 operations were initially included in the study, most of which (93%) were beef cattle operations. Of the 144 operations where blood samples were collected prior to the vector season, 7 226 samples were tested. Of these, 1 018 samples (14.1%) gave positive results to the c-ELISA test and 54 (37.5%) operations were considered positive (two or more c-ELISA positive results or one c-ELISA positive that was also positive by VN). Fewer operations were positive in the northern reaches of the study area than in southern latitudes. Of the 128 operations with blood samples collected after the vector season, 49 (38.3%) were classified as positive. Again, a similar geographic pattern of positive results was seen as before the vector season. For the second sampling, 975 (17.3%) of the 5 627 animals tested were positive using the c-ELISA.

Insect (vector) trapping was conducted on 68 operations. Of these, 32 (47.1%) had catch samples with *C. sonorensis*. The spatial distribution of *C. sonorensis*-positive catch samples was similar to that of the positive cattle blood samples, as fewer samples were positive in the more northern and eastern parts of the study area.

The results of the BSPP suggest the following:

- the prevalence of BTV infection in the more northern latitudes is very low or zero
- the distribution of *C. sonorensis* is consistent with previously drawn maps
- the sentinel cattle herd system is useful to explore the spatial distribution of infectious agents and vectors and to generate hypotheses regarding the ecology of animal diseases.

Plans for the future include further descriptive analysis of the data and epidemiological modelling to evaluate risk factors of BTV. In addition, the data will be analysed for geo-spatial factors (weather and topographical) related to vector distribution.

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