

# **Qualitative Risk Assessment Blue Tongue Virus Distribution in Australia**

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## **Introduction**

This report evaluates the probability that the Bluetongue Virus (BTV) has a limited geographic distribution among cattle in Australia, leaving cattle from all other parts of the country free from risk of BTV infection, as defined in the Organization International des Epizooties (OIE) Animal Health Code. This report is based on an evaluation of the 11 risk factors identified in the Policy Statement accompanying the APHIS Regionalization Final Rule. Information for the assessment was provided by the Government of Australia.

The 11 risk factors are:

- Authority, organization, and infrastructure of veterinary services;
- Disease surveillance;
- Diagnostic laboratory capabilities;
- Disease outbreak history and disease prevalence;
- Active disease control programs, if any;
- Vaccination status;
- Disease prevalence and outbreak history in adjacent regions;
- Separation from regions of higher risk through physical or other barriers;
- Control of movements of animals and animal products from regions of higher risk;
- Livestock demographics and marketing practices; and
- Animal health policies and infrastructures for animal disease control.

## **Definitions**

OIE Animal Health Code Chapter 2.1.9. Bluetongue (1)

Article 2.1.9.1 states:

“For the purposes of this Code...

“The BTV status of a country or zone ... can only be determined by a continuous surveillance and monitoring programme (carried out in accordance with Chapter 1.4.5.) using a statistically sound sample of BTV susceptible cattle. The programme should provide at least a 95% level of confidence of detecting a seroconversion incidence of 2%.”

Article 2.1.9.2 states:

“For the purposes of this Code:

BTV-free country or zone

“A country or a zone may be considered free from BTV when bluetongue is compulsorily noticeable in the whole country and a surveillance and monitoring programme has demonstrated no evidence (either virological or serological) of BTV (in susceptible animals) in the country or zone during the past two years, nor have any ruminants been vaccinated against bluetongue in the country or zone during the past 12 months.”

Article 2.1.9.4 states:

“When importing from BTV free countries or free zones, Veterinary Administrators should require: for ruminants and other BTV susceptible herbivores the presentation of an international animal health certificate attesting that the animals:

- 1) were kept in a BTV free country or zone since birth or for at least 60 days prior to shipment; or
- 2) were kept in a BTV free country or free zone for at least 28 days, then were subjected, with negative results, to a serological test to detect antibody to the BTV group, such as the BT competition ELISA or the BT AGID test, and remained in the BTV free country or free zone until shipment; or
- 3) were kept in a BTV free country or free zone for at least 7 days, then were subjected, with negative results, to a BTV isolation test or nucleic acid detection test (polymerase chain reaction technology [PCR]) on a blood sample, and remained in a BTV free country or free zone until shipment;

AND

- 4) were not subject to Culicoides attack during transportation to the place of shipment.”

**Risk factors affecting the geographic distribution of Blue Tongue Virus in Australian cattle**

*Authority, organization, and infrastructure of veterinary services in the region*

Australian States and Territories are responsible for disease control and eradication within their own boundaries. The Commonwealth provides advice and coordination, and in some circumstances, financial assistance for national disease eradication programs. Each State/Territory is subdivided into veterinary regions or divisions under the control of a government veterinary officer. Each region or division is further subdivided into either Animal

Health Districts or Rural Lands Protection Boards, which are administered by inspectors who may be veterinarians or qualified animal health technicians.

Australia has about 6,700 professionally qualified veterinarians. About 78 percent are engaged in private practice and 8 percent are employed by the State and Federal governments; the remainder are employed mainly by universities, laboratories, and industry. These veterinarians are assisted by about 4,400 animal health technicians working as animal health assistants, auxiliary staff, meat inspectors, and food hygienists (2).

Specifically addressing BTV, Australia has developed the National Arbovirus Monitoring Program (NAMP), an integrated national program jointly funded by industry and government to monitor the distribution of economically important insect-borne viruses of livestock and their vectors. NAMP data are gathered by monitoring sentinel cattle herds throughout the country. These are herds of young cattle previously unexposed to arboviral infections; their blood is tested at regular intervals to detect the incidence of infection with various viruses. Sampling frequency is proportional to the probability of arbovirus activity. Insect traps located near the animals indicate whether *Culicoides* vectors were present during the period for which they were tested. Sentinel sites are selected to allow plotting of the distribution of infections. Most are positioned in areas along the border between expected infected and uninfected areas or where infection occurs irregularly. Cattle in areas expected to be free of infection are monitored to verify that status. Cattle in areas where infection exists are sampled to assess the seasonal intensity of infection with each virus. At one site in the Northern Territory, virus isolation is conducted to detect incursions of viruses from overseas (3).

BTV is considered enzootic only in the infected zone. Throughout the rest of Australia, BTV is considered an exotic disease. Suspected BTV infection is a reportable disease in all of Australia. Reporting of sick animals is the responsibility of the owner. If a veterinarian attending an animal suspects that the animal has an exotic or notifiable disease, he or she is required by law to report it to the local or State authority. Penalties for non-reporting are prescribed under State and Territorial law. The Australian Veterinary Emergency Plan (AUSTVET) outlines a response plan for suspected and confirmed disease, as well as for managing contact premises in the control of BTV (4).

Evaluation: Australia has the appropriate infrastructure to detect BTV and the authority to respond appropriately to control the spread of disease should an outbreak occur.

#### *Disease surveillance*

It is important to note that BTV infection in Australia does not present any clinical symptoms in infected cattle. BTV serotypes found in Australia can infect sheep experimentally, but infection of sheep in the field is rare, and the disease has never been recorded in commercially raised sheep (5). Therefore, all BTV surveillance in Australia is based on serology and not on identification of clinically affected animals. Since 1969, Australia has conducted active surveillance for

antibodies to BTV and for the *Culicoides* vector. In addition, serosurveys have been conducted on a State/Territory basis. Data from these surveillance systems have been used to establish sites for sentinel herds that form the basis of NAMP, which conducts BTV and vector surveillance (6). These data are also used to map areas of BTV activity annually. Annual variations in these areas of BTV activity during almost 30 years of monitoring have been used to identify three zones within Australia: BTV-free zone (no known BTV activity ever identified); a buffer zone (also no known BTV activity ever identified within this buffer zone); and a zone where BTV transmission is possible (7).

Through the NAMP surveillance system, the *Culicoides* vectors of BTV are also mapped (1,8). Four *Culicoides* species are recognized as vectors of BTV in Australia: *C. brevitarsis*, *C. wadai*, *C. fulvus* and *C. actoni*. While *C. brevitarsis* has the widest distribution of the vectors and is occasionally found in low numbers in the buffer and BTV-free zones, it is also the least efficient vector of BTV. Vector ecology has shown that the sporadic presence of small numbers of vectors does not result in virus transmission, since the number of midges must exceed a critical minimum population in order for BTV to cycle between susceptible livestock and vectors (2). An evaluation of the statistical validity of the serology data yields a 99 percent confidence level that the maximum seroprevalence across Northern Australia is 1.9 percent or less (9).

Evaluation: NAMP and associated State/Territory BTV and vector surveillance activities yield excellent and up-to-date information on the geographic distribution of BTV and competent vectors. The annual variations influenced by environmental factors (temperature, moisture, winds and storms) have been mapped for nearly 30 years and offer exceptional support for the BTV zones established by Australia. An evaluation of the statistical validity of the serologic data supports these conclusions (9) The statistical validity exceeds the requirements of the OIE Animal Health Code [95% confidence level of prevalence equal or less than 2%].

#### *Diagnostic laboratory capabilities*

At least one diagnostic lab in every state or territory is able to test for BTV with the AGID test. Tasmania and South Australia, areas in which BTV has never been reported, have no other test capability for BTV at the State level. Western Australia and Queensland can conduct the ELISA test, in addition to AGID. New South Wales and the Northern Territory can conduct four separate BTV tests (AGID, SNT, ELISA, and either CFT or PI). Victoria can conduct all four BTV tests. The Subcommittee on Animal Health Laboratory Standards (SCAHLs) sets standards for diagnostic tests and establishes quality control arrangements for laboratories in Australia and New Zealand. The Subcommittee also publishes the Australian Standard Diagnostic Techniques for Animal Diseases (5) and administers the Australian National Quality Assurance Program, which evaluates national reference antisera and a panel of interlaboratory samples. Labs in Victoria, Queensland, New South Wales, Western Australia, and Northern Territory are approved for BTV isolation (2).

Evaluation: The diagnostic lab capacity is sufficient to identify the causative agent, if it were present in samples submitted through various surveillance or epidemiological programs.

#### *Disease outbreak history and disease prevalence*

Bluetongue disease has never been diagnosed in commercial flocks in Australia (2). Bluetongue viral activity, as documented by seroconversion, is limited to the zone where the transmission of BTV is possible, in the far northern and western coastal regions of Australia (7). Within this zone, seropositive prevalence varies greatly from year to year and from herd to herd. Sentinel herds have reported seroconversion rates ranging from 5 percent to 100 percent in different years (10). However, in the BTV buffer zone and in the BTV-free zone, neither seroconversion nor clinical disease has ever been documented.

Evaluation: In the regions designated as BTV-free zones by Australia, BTV transmission has never been shown to occur throughout at least 30 years of recorded testing and surveillance.

#### *Active disease control programs, if any, if the agent is known to exist in the region*

No disease control programs for BTV exist in Australia. The focus is on serological monitoring and control programs to prevent the introduction of BTV into Australia from foreign sources. Active disease control programs would be initiated if BTV or clinical disease attributed to BTV were ever detected outside the enzootic zone of possible BTV transmission (4).

Evaluation: BTV transmission is dependent on vector populations, which is in turn dependent on environmental conditions. Due to natural ecological factors and geographic barriers within Australia (described below), the region of possible BTV transmission is limited to a narrow band along the northern and western coasts. The outer boundaries of the geographic range of BTV transmission has been stable for decades, throughout a variety of ecological changes, and in the absence of any control programs. Control programs would be largely ineffective for BTV in Australia due to the absence of any clinical disease and its non-contagious nature.

#### *Vaccination status of the region*

No vaccine for BTV is used in Australia.

#### *Disease prevalence and outbreak history in adjacent regions*

No regions are adjacent to Australia. The closest noncontiguous land mass to Australia is Papua New Guinea, which is separated from Australia by the 120-kilometer-wide Torres Straits (11). Cattle do not move across the Torres Straits. Competent vectors may be wind-borne across the Torres Straits. The last documented introduction of a new vector species occurred in 1974 (2). Monitoring of sentinel cattle herds along the northern coast indicates the occasional introduction of a new strain of BTV, with the last being introduced in 1986. However, none of these new

strains have become established, and none have produced any clinical disease, being detected through serological surveillance only just vanishing from the local vector population.

Evaluation: Adjacent regions pose a slight risk for the introduction of additional vectors and additional BTV strains. However, experience has shown that introduced BTV strains do not survive and propagate among local vector and cattle populations. Therefore, the slight risk of introducing additional BTV strains does not translate into any change in risk of infection for cattle either inside the BTV-infected region or the rest of the BTV-free region of Australia.

*Separation of the region from regions of higher risk through physical or other barriers*

Australia is an island nation, completely separated from all other regions by ocean on all sides. The closest land mass, Papua New Guinea, is 120 kilometers distant. Strict quarantine measures prevent the introduction of BTV from any higher risk, noncontiguous region.

Within Australia, the zone where BTV transmission is possible is effectively separated from the rest of the country by the Great Dividing Range and the Great Sandy Desert. These features establish a clear division between zones of possible BTV transmission and BTV-free zones. The Great Dividing Range, which extends along most of the eastern seaboard of the continent, is particularly significant, since it separates the dry interior from the wet eastern and southern coasts. The Great Sandy Desert is situated in the northern and central parts of Western Australia and is bounded by the Kimberly Mountains to the north, the Pilbara Desert to the southwest, and the Gibson Desert to the south. This extensive desert lies between a region of high rainfall to the north and one of low rainfall (a BTV-free zone) in the south (2).

Evaluation: Oceans provide sufficient physical barriers to isolate Australia effectively from any areas of higher risk, except as described above. Physical barriers within the country help define ecological regions that restrict the distribution of the *Culicoides* vector.

*Control of movements of animals and animal products from regions of higher risk*

Australia allows the importation of cattle, bovine semen, and camelids from the United States and Canada, camelids from Peru and Chile, and ovine and caprine embryos from the Republic of South Africa. Potential transmission of BTV via semen or embryos is considered rare and “is considered to be of no consequence to virus ecology” (1). The Australian Quarantine and Inspection Service (AQIS) imposes strict pre-entry quarantine and testing and post-entry quarantine conditions on the importation of live animals and germ plasm (2).

Evaluation: Import requirements are stringent enough to ensure that Australia is highly unlikely to be reinfected with BTV by importing live cattle.

### *Livestock demographics and marketing practices in the region*

Australia requires that every cattle herd in the country be identified by a unique tailtag. There are approximately 145,000 cattle herds in Australia. Some commercial enterprises may have more than one herd on a property. The Australian Bureau of Agriculture and Resource Economics (ABARE) has identified 44,600 enterprises with cattle whose agricultural operations are valued at over \$22,500 (Australian dollars), so smaller or less economically viable enterprises would not be represented in this count. The 1997 census for cattle in Australia is summarized in the table below:

**Table 1: Cattle Numbers (x 1,000) by Type and State/Territory, 1997**

	<i>NSW</i>	<i>Vic</i>	<i>Qld</i>	<i>SA</i>	<i>WA</i>	<i>Tas</i>	<i>NT</i>	<i>ACT</i>	<i>Aus</i>
<i>Beef</i>	6038	2519	10071	1049	1859	536	1204	11	23287
<i>Dairy</i>	397	1849	302	164	128	226	1	0	3057
<i>Total</i>	6425	4368	10373	1213	1987	762	1205	11	26344

The majority of cattle in Australia are beef cattle, with the largest populations in Queensland (40%) and New South Wales (24%), which together account for more than two-thirds of all the cattle in Australia. Major livestock markets are situated in major rural towns and adjacent to capital cities within each region. A general trend exists for movement towards domestic and export abattoirs located near the major population centers on the coast and towards ports from which sheep and cattle are exported. Movement of finished stock for slaughter or feeder/slaughter animals for live export normally takes place within the zone where the transmission of BTV is possible or from the BTV-free zones to the zone where the transmission of BTV is possible.

Movements of store stock are influenced by seasonal conditions. Periods of good rainfall or of prolonged drought in an area can result in extensive movements of livestock counter to the normal movement pattern. Due to the large size of the Australian continent, livestock movement patterns are different for each region. In the continuously free parts of Queensland and northern New South Wales the predominant movement is to the north and east towards coastal markets, export abattoirs and ports from which cattle are exported. In the continuously free parts of central and southern New South Wales, Victoria, and South Australia, the predominant movement of both cattle and sheep is to east and south, towards the major cities and export abattoirs. In the BTV-free parts of Western Australia, the predominant movement is to the south and west, towards Perth and the ports of Fremantle, Albany, and Esperance. In the BTV-free parts of the Northern Territory, the predominant movement of cattle is to the north, towards the ports at Darwin and Wyndham (2).

Evaluation: Animal movements and marketing patterns are essentially irrelevant because BTV infection does not result in disease, and BTV is not contagious. Marketing patterns could have

relevance if live cattle were to be shipped to, and held in, the zone where the transmission of BTV is possible, during the peak vector season prior to being shipped to the United States.

#### *Animal health policies and infrastructure for animal disease control*

AUSTVETPLAN (Disease Strategy, Bluetongue) is the reference for procedures to be used in the eradication of any occurrence of bluetongue disease (4). BTV infection in Australia has never caused a case of clinical disease in cattle or commercial sheep flocks.

Evaluation: Legislation provides sufficient authority and funding to respond to any suspected outbreak, and veterinary infrastructure and expertise are such that it is highly likely that BTV activity outside the zone of possible BTV transmission would be quickly identified if it were present.

#### **Qualitative Risk Characterization**

Based on the evidence presented above, APHIS finds that:

1. Australia has sufficient legal authority, organization, and veterinary infrastructure to identify the zone of possible BTV activity within the country and to respond adequately to any occurrence of BTV transmission or disease outside of the identified zone of possible BTV transmission.
2. Australia has adequate surveillance to detect BTV transmission outside of the zone of possible BTV transmission, and the serosurveys are statistically valid.
3. Australia has adequate laboratory capability to identify BTV infection through serologic sampling.
4. Australia has had no reports of bluetongue disease in cattle or commercial sheep flocks, and no transmission of BTV outside of the zone where the transmission of BTV is possible.
5. Australia is competent to implement an active bluetongue control program if clinical disease were to occur or transmission outside the zone of possible transmission were documented.
6. Cattle in Australia are not vaccinated for BTV.
7. Australia has no adjacent regions or countries in which BTV is known to exist; wind-borne vector transmission across the Torres Straits does not result in the establishment of new vector species.
8. Australia has physical and quarantine barriers that provide adequate separation from regions and countries of higher risk for BTV; within Australia, physical and ecological barriers provide adequate separation between the zone of possible BTV transmission and a buffer zone.
9. Australia has adequate import restrictions to control movement of animals and animal products from regions or countries where BTV is known to exist.
10. Australia has an adequate system for identifying cattle and cattle herds.
11. Australia has adequate policies and infrastructure for controlling and preventing bluetongue disease or the spread of BTV outside of the zone of possible BTV transmission.

APHIS believes that 30 years of documented freedom from BTV transmission in the BTV-free and buffer zones yield a high level of confidence that BTV transmission is limited to the enzootic

area acknowledged by Australia as the zone of possible BTV transmission. APHIS believes that the strong and capable veterinary infrastructure, reliable diagnostic capacity, and active surveillance would be sufficient to detect any occurrence of BTV transmission in the buffer or free zones, if it were to occur. APHIS also believes that the probability of inadvertent introduction into the free or buffer zones is low. Australia's BTV-free zones meet the requirements outlined by the OIE Animal Health Code, Chapter 2.1.9. APHIS concludes that the probability that animals and animal products imported into the United States from the BTV-free zones of Australia would introduce BTV into the U.S. is negligibly and acceptably low.

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