

A South African overview of the virus, vectors, surveillance and unique features of bluetongue

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Summary

The origin of bluetongue (BT) is probably African and the disease was first recognised in South Africa in Merino sheep in the late 18th Century. Diagnostic and research findings for a number of years have been summarised to obtain data relevant to the distribution of BT and its serotypes in the country.

The role of ruminant game and cattle as maintenance hosts for BT virus (BTV) is mentioned although cattle appear to have largely replaced antelope in this role. Only about 30% of over 1 000 game animals tested for export were found to be BT-antibody positive. An outbreak of a bluetongue-like disease in cattle is mentioned as are the BT and epizootic haemorrhagic disease of deer (EHD) isolates in the outbreak. A summary by serotype and province of sheep isolates is given and it is pointed out that the sheep population in a province does not reflect the number of isolates made and the province with the largest sheep population has almost the smallest number of BTV isolates and vice-versa. South Africa currently has 21 of the 24 BTV serotypes with 17, 20 and 21 being exotic to the country. The recent retrospective typing of serotype 17 in South Africa is being investigated, as type 17 crosses strongly with type 20, which is absent and also with type 4 which is present. 1, 3, 4 and 2 were the most common serotypes while 18, 19, 22 and 23 were not found among the isolates.

Mention is made of BTV isolates made from *Culicoides bolitinos* catches during two devastating outbreaks of African horse sickness in an unvaccinated population. A six-year *Culicoides* monitoring project is mentioned and the many BTV isolates made of a variety of serotypes.

BTV is endemic in Africa and in South Africa unvaccinated indigenous breeds appear to have achieved a balance with the virus. Indeed, it is possible to find virus, antibody and lesions in asymptomatic animals in different situations. Bluetongue creates a significant trade barrier but the virus remains interesting among a number of other uniquely African viruses.

Keywords

Bluetongue virus – *Culicoides* – Distribution – Game – Serotype – Survey – Wildlife.

Introduction

Bluetongue (BT) virus (BTV) is probably of African origin. It was first described in South Africa when the disease was encountered in Merino sheep introduced into the Cape Colony in the late 18th Century. Serotypes of BTV have since spread to other countries to the east, west and north of Africa.

Bluetongue is described as a disease of domestic and wild ruminants and it is thought that cattle have now largely replaced antelope as a maintenance host of the virus. Figures reflecting BT antibodies in

1 511 game exported between 1997 and 2000 range from a low 18.8% to a high 43.4% positive. Consignments varied from 1 up to 10 different species of ruminant game. Protocols required export only in vector free/low seasons and the certification by virus isolation that serologically positive animals were not viraemic at time of export. Obviously, animals were sourced from drier areas of the country where they were expected to be serologically negative.

A more specific and structured survey was undertaken in 1997 and animals were sourced from

areas of different vegetation types and rainfall. These areas varied from semi-desert to forest transition with rainfall of 280-350 mm and >900 mm, respectively. BT antibodies were present in animals from all regions sampled and 10 out of 18 species tested positive (1).

Comparable figures to illustrate the exposure of cattle to BTV do not exist and cattle are not routinely tested or vaccinated. Naïve, imported animals do experience clinical disease although bovine isolates are generally treated with caution. However, in 1996, an exceptionally wet year, BT in cattle was reported from various parts of the country (2). Symptoms of stomatitis, coronitis, lacrimation, salivation, nose and teat sloughs and sometimes haemorrhagic diarrhoea, were recorded. Morbidity and mortality were low but a marked drop in milk production was noted. Thirteen BT and nine epizootic haemorrhagic disease (EHD) isolates were made. Serotypes 2, 3, 6 and 8 of bovine BTV were involved, while the EHD isolates remain to be typed. Sheep and cattle serotypes for that specific season did not correspond and additional serotypes were obtained from sheep (Fig. 1).

Virus

BTV is endemic in South Africa but only wet seasons with large outbreaks serve to raise levels of concern. It is a notifiable disease in terms of the Animal Diseases Act of 1984 but compliance with the act is erratic. Outbreaks reported vary from as few as 21 to almost 100 in the years from 1998 to 2000.

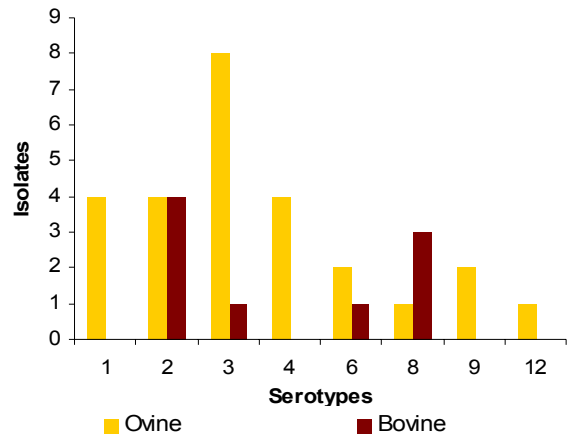


Figure 1
Bluetongue serotypes in sheep and cattle in South Africa, 1996

Twenty-one of the twenty-four serotypes of BTV occur in South Africa and currently types 17, 20 and 21 are exotic to the country. To illustrate distribution of BT in South African sheep, a summary of 20 years of domestic isolations is given below by province and by serotype (Fig. 2). The total sheep population of South Africa is approximately 28.5 million distributed across nine provinces (Fig. 3).

Provincial isolation totals do not follow the sheep population by province (Fig. 4). The province with the smallest number of sheep had the second highest number of isolates while the province with the largest number of sheep had the second lowest number of isolates. This is obviously dependent on the breed of sheep and the type of husbandry practised.

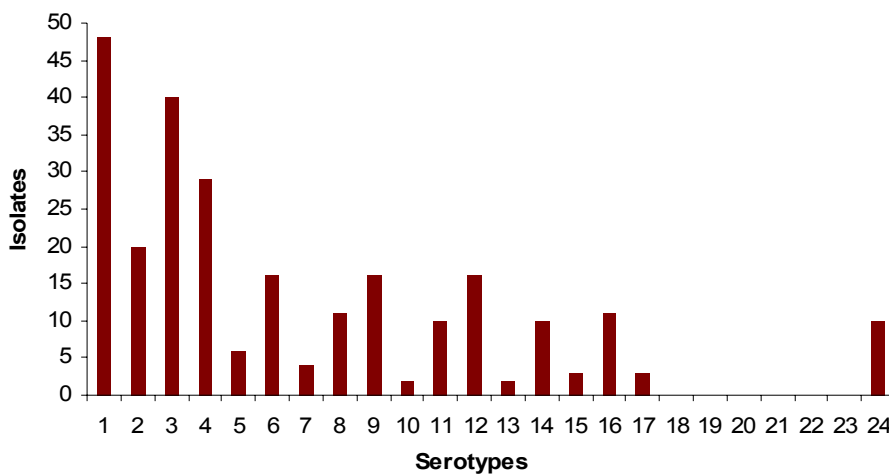


Figure 2
Isolates of bluetongue virus serotypes in ovines, 1983-2003

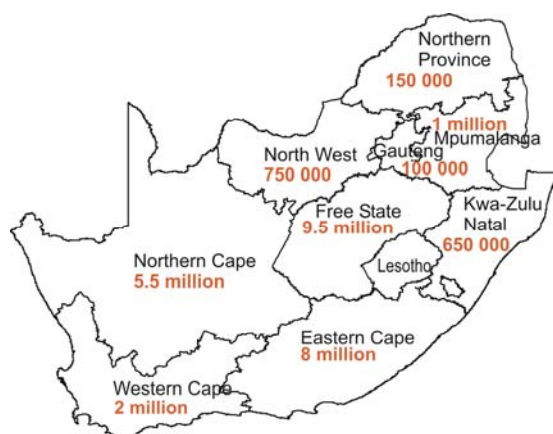


Figure 3
Sheep population of South Africa, 2001

Serotype totals make the most interesting reading with the low denomination serotypes being isolated more frequently and four serotypes not having occurred in 20 years. The most commonly isolated serotypes were BTV-1, BTV-2, BTV-3 and BTV-4 while BTV-18, BTV-19, BTV-22 and BTV-23 were absent (Fig. 2). Serotype 17, thought to be exotic, was typed in 1985, 1986 and 2000. The last two isolates have been retyped and are currently being sequenced to confirm their identity as serotype 17 crosses strongly with both types 4 and 20.

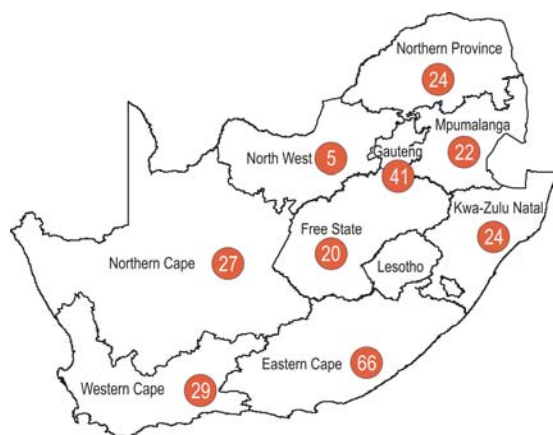


Figure 4
Provincial bluetongue virus isolation totals, 1983-2003

Serotypes are distributed randomly in any given area and season although nine are recognised to have a high epidemic potential, six others occur regularly and a further three only occur sporadically (4).

The distribution of BTV serotypes in a population of both vaccinated and unvaccinated animals is often surprising and also uneven (Fig. 2). In a single flock of sick sheep it is possible for four out of five bloods to all yield type 9 or even six out of six bloods to yield two type 1s, two type 11s, a 10 and a 4.

BTV isolations from asymptomatic animals also occur. In the embryo export programme of sheep and goat donor females, 7 059 animals were bled and tested at the time of embryo flushing. From 1997 to 2002 all donor females tested BTV-negative, except in 1999 when 12 isolates of 5 different serotypes were made from asymptomatic animals.

As the polymerase chain reaction (PCR) is now also an accepted trade test, selected samples in the donor animal testing programme were subjected to side × side isolation and PCR testing. A total of 88 blood samples were tested and all proved to be negative in both tests. The high exposure months of February, March and April were chosen.

Vectors

BTV has been isolated from a number of *Culicoides* species although only two, namely *C. imicola* and *C. bolitinos* are recognised as being vector competent. In 2001 and 2003, *C. bolitinos* was investigated in the field during two devastating outbreaks of African horse sickness (AHS) in the Eastern Cape. *Culicoides* were trapped as part of the AHS investigation and in 2001, BTV-1 and BTV-24 were isolated and in 2003 types 6, 8 and 19 were identified in the *C. bolitinos* catches made near horse stables.

The role of mosquitoes and other biting flies in the mechanical transmission of BTV should not be overlooked. Although not important, 301 mosquito catches were made at Onderstepoort during a six-year *Culicoides* project and 21 catches were positive for BTV. These yielded serotypes 2, 3, 4, 5, 11, 12, 14 and 16.

During the same period, 300 *Culicoides* catches were made, also at Onderstepoort, of which 180 yielded BTV of a variety of serotypes (Fig. 5).

Surveillance

Since BTV is endemic in South Africa, no surveillance per se is carried out. Reference has been made to a six-year *Culicoides* survey conducted between 1978 and 1985 encompassing 25 sites in different provinces and various areas (3). It was accidental that BTV was the most frequently isolated virus, as the approach was multifocal and various isolation systems were used. Eight genera of viruses were isolated, together with a batch of unidentified isolates. Bluetongue made up 58.4% of the final total obtained (810 viruses).

A second single provincial survey being conducted at present is the Rural Livestock Survey where livestock at dip tanks are being targeted. The breeds are mostly

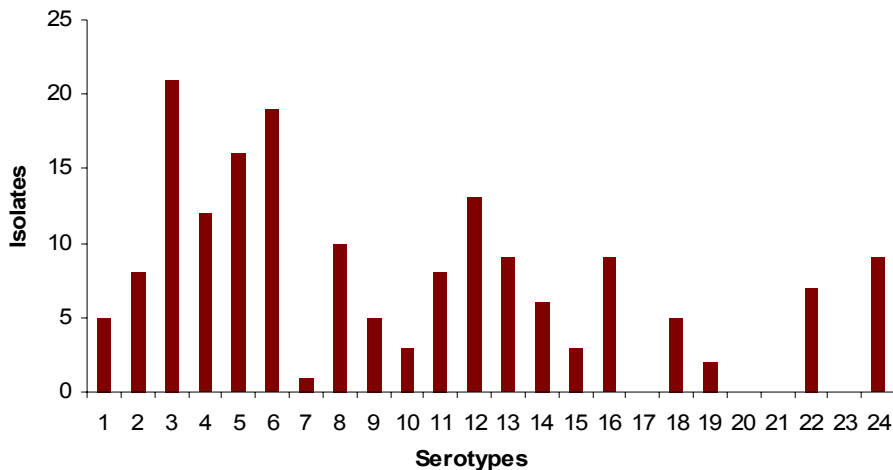


Figure 5
Culicoides isolates of bluetongue virus, 1978-1985

indigenous or crosses thereof and they are an unvaccinated rural/communal type of population.

Sheep and goats are being screened for BT and at present slightly more goats than sheep have been presented for bleeding. Unvaccinated bluetongue seropositive animals total 63.7% in a provincial area, which is low lying, wet and fairly subtropical.

Recent figures are presented for seronegative Merino sheep being sourced from a cold, high-lying area where vaccination is not practised because BT is not recognised. These animals are required for projects requiring susceptible sheep. They were bled in Spring and autumn and varied from less than 1% to 84% antibody-positive sometimes much to the surprise of their owners.

In conclusion, BT is an Office International des Épizooties (OIE) 'List A' disease and remains a considerable trade barrier. An endemic situation exists in South Africa where the population is exposed to many different serotypes of the virus each season. Some sheep are regularly vaccinated and other breeds do not show clinical disease unless mouth lesions are an incidental finding at deworming. Vaccination is either done by the book with concern about temporary infertility in rams and early pregnancy in ewes with associated contra-indications, or a cocktail of all three bottles of vaccine is administered as a single dose.

Heavy rainfall will invariably bring about an explosive increase in vectors and localised outbreaks of BT and the virus always remains interesting among the other uniquely African viruses.

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