ANIMAL HEALTH DISEASE CARDS

Bluetongue

Names

Pathogen(s)

Preferred Name : Bluetongue virus

Disease/Parasitosis

Preferred Name : Bluetongue

Common Names :

Spanish: Lengua azul

French: Fievre catarrhale du mouton

Overview

Bluetongue virus is an arbovirus (arthropod borne) that naturally infects domestic and wild ruminants, camelids and some other herbivores such as elephants. Bluetongue virus is transmitted by several species of Culicoides (biting midges). Bluetongue is almost exclusively a disease of sheep, although white-tailed deer, pronghorn and desert bighorn sheep may suffer disease in North America. In cattle and goats clinical disease is rare, and, when present, is much milder than in sheep (Verwoerd and Erasmus, 1994).

Bluetongue can cause spectacular disease outbreaks and is placed in the Office International des Epizooties (OIE) List A disease category. Affected sheep may die after acute or chronic disease, or may recover with weight loss and/or wool breaks.

Bluetongue was first described in South Africa after Merino sheep from Europe were introduced in the late eighteenth century (Verwoerd and Erasmus, 1994). The disease was considered confined to South Africa and for many years research efforts on the virus and the disease were exclusively undertaken in that country, mostly at the Onderstepoort Veterinary Institute. The viral nature of the disease was established, as was its insect spread and multiple virus serotypes (Howell, 1960; 1970). There are now 24 serotypes of bluetongue virus recognized worldwide.

Bluetongue virus is the type species of the genus orbivirus in the family Reoviridae. Initially the virus was classified as an arbovirus but it appeared to share some properties with reoviruses and was provisionally classified as a reovirus. However, bluetongue virus differs in some respects from reoviruses and, along with a number of other related viruses, was classified in a separate genus by Borden et al. (1971).

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Animals Affected Table

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Animals Affected

Bluetongue is an arbovirus, infecting vertebrates and invertebrates cyclically.

Bluetongue virus naturally infects domestic and wild ruminants, camelids and some other herbivores such as elephants. Historically, the primary cycle may have involved species of African antelope, but this role has now been taken over by cattle (Erasmus, 1990).

Midges of the genus Culicoides act as biological vectors of bluetongue virus. Of the approximately 1400 species of Culicoides world-wide, less than 20 are considered actual or possible vectors (OIE, 1998; Mellor, 1990). The most well-studied vector species are C. variipennis and C. insignis in the USA, C. fulvus, C. wadai, C. actoni and C. brevitarsis in Australia, and C. imicola in Africa and the Middle East (Erasmus, 1990). It is possible that additional vector species will be identified in countries such as China and Bulgaria where bluetongue has been recognized only recently.

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Epidemiology

Bluetongue virus is an arbovirus that has evolved a life cycle where alternate cycles of virus replication in vertebrate and invertebrate hosts are essential for virus persistence. There is no evidence of vertical transmission of the virus in the invertebrate host. Observations on the placental transmission of virus in the vertebrate host are contradictory (Roberts, 1990) and therefore any vertical transmission in vertebrates is considered to be of no consequence to virus ecology. There is little evidence of direct or indirect contact transmission in either host, other than rare instances of seminal transmission in vertebrates (OIE, 1998). The virus cannot be spread by meat, milk or dairy products. Cattle are the primary vertebrate hosts (Erasmus, 1990) and a small number of species of Culicoides midges are the only insect hosts (Mellor, 1990). The rare recovery of bluetongue virus from other insects is of no ecological significance.

The insect vectors of bluetongue virus breed in moist conditions in a variety of habitats, particularly damp, muddy areas and in faecal and plant matter. They have nocturnal feeding habits, preferring still, warm conditions, pastures and open pens. At least some speciesØpreferentially feed on cattle. Females take a blood meal prior to egg laying, feed at roughly 4-day intervals and live for aboutØ2 toØ3 weeks. The eggs hatch inØ2 toØ3 days and depending on the temperature, the larval stage lasts 12 to 16 days. Adults emergeØ2 toØ3 days after pupation and take a blood mealØ1 day later and they also mate during this time (Roberts, 1990). The activities of the midge are influenced by temperature and the optimum lies between 13o and 35oC (Sellers, 1981).

As summarized by Gibbs and Greiner (1994), bluetongue is a common, generally subclinical infection of ruminants throughout the tropics and subtropics, within a number of separate ecosystems. Seasonal incursions of the virus into more temperate latitudes, sometimes accompanied by disease, may occur under favourable climatic conditions at certain key locations. There is evidence that infected midges are carried on the wind for long distances (Sellers, 1981). It has been postulated that the major epidemics of bluetongue, in regions where disease occurs only sporadically, can often be traced to windborne carriage of infected Culicoides from distant areas (Gibbs and Greiner, 1988).

Critical in the understanding of the epidemiology of bluetongue is knowledge of the virus competence of the Culicoides species in different ecosystems, but vector competency research is a very

specialised discipline. Not only may different populations of a species of midge have varying susceptibilities to a strain of virus, but a single strain of the vector may have differing susceptibility to different virus serotypes (Mellor, 1990).

Competent midges may be infected when biting viraemic vertebrates. The chance of infection depends in part on the genotype of the midge, the strain of virus, the level of viraemia, and environmental factors (Mellor et al., 2000). The extrinsic incubation period (the period between feeding on infected blood and the appearance of virus in the saliva of the midge) is 1-2 weeks.

The colonised USA vector, C. variipennis, is able to ingest approximately 10-4ml of blood (Mellor, 1990), whereas the most widely distributed Australian vector, C. brevitarsis, has a blood meal volume of around 10-4.5ml (Muller et al., 1982). Therefore viraemia must be of the order of 104 infectious units of virus per ml or greater for feeding midges to have much chance of infection. OIE (1998) summarized reported peak levels of viraemia, in virus infectious units per ml of blood, as 104.4 to 106.3 for cattle, 106.4 to 108.0 for sheep and 106.0 for goats, though levels reached are mostly much lower. Viraemia peaks in the first two weeks after infection, before the appearance of serum antibody. Virus titres then drop rapidly and are very low if infections persist for a month or more.

The duration of viraemia in the infected vertebrate is an important factor in the transmission of bluetongue virus to biting, competent midges. Bluetongue is no longer considered a persistent infection of ruminants, especially cattle (MacLachlan, 1994). Singer et al. (2001) analyzed a large volume of existing data on the length of bluetongue viraemia of cattle and concluded that this was equal to or less than 9 weeks in >99% of adults. OIE (1998) report the viraemia of most cattle as less than 4 weeks with fewer than 1% exceeding 8 weeks. The maximum viraemia reported for sheep is 54 days (Koumbati et al., 1999), but this is exceptional.

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Distribution Table

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Distribution

In 1943 bluetongue disease was reported in Cyprus, and outbreaks were subsequently reported in Israel, the USA, Portugal, Spain, Pakistan and India (Verwoerd and Erasmus, 1994). Over the past 30 years evidence of regular virus activity, but not necessarily disease, has been found in most countries in the tropics and subtropics with substantial populations of ruminants. The virus may be found in a geographic band between latitudes 40oN and 35oS. The presence of bluetongue virus within this band, whether year round or seasonal, depends on the climatic zone type. Genetic studies (topotyping) indicate that the virus exists in discrete, stable ecosystems, probably the result of co-evolution of different strains of the virus and vectors (OIE, 1998). Numerous countries in the tropics and subtropics have bluetongue virus unknowingly circulating subclinically in cattle and other ruminants. A properly designed serological survey would reveal the presence of the virus. The virus is endemic in areas of some countries, being more or less continuously active. Depending on climatic factors affecting the vector, in most years the virus will seasonally extend to adjacent areas (Gibbs and Greiner, 1988). In exceptionally favourable years the virus will spread even further, such as to Portugal and Spain in 1956, to British Columbia in 1988, to Bulgaria, continental Greece and Tunisia in 1999 and to Algeria, Sardinia, Corsica, Majorca, Minorca, Sicily and continental Italy in 2000.

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Economic Importance and Impact

Bluetongue can be a costly infection for several reasons. The clinical disease in sheep can be severe, resulting in deaths, weight loss and wool break. In some countries where disease is endemic (South Africa and some States of the USA), vaccination is a recurring cost. However the greater cost of bluetongue is to infected countries which export live animals, germplasm and some animal products such as foetal calf serum. Here the presence of bluetongue virus, even if wholly subclinical, causes loss of trade due to restrictions on the source of animals, and the costs of health testing. It has been estimated that in the late 1970s, the ban on US cattle semen exports resulted in an annual loss of $24 million (Gibbs and Greiner, 1988).

Bluetongue is included in the OIE List A diseases, largely because of dramatic outbreaks of disease in Cyprus in 1943 and Portugal and Spain in 1956. The Cyprus outbreak was due to a particularly virulent strain of the virus causing between 60 and 70% losses in some flocks (Gambles, 1949). The Iberian outbreaks were also spectacular. Within the firstØ4 months 46,000 sheep had died in Portugal and 133,000 in Spain (Roberts, 1990). This listing of bluetongue in the most serious of animal diseases exacerbates the trade sensitivity and associated costs to countries with the infection, and has been challenged by some (Gibbs and Greiner, 1994).

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Disease Systems

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Disease Course

Natural bluetongue infection is usually subclinical. Bluetongue disease is the result of a complex interaction between the animal, the virus and the environment. Bluetongue is almost exclusively a disease of sheep, with European breeds most susceptible. Most breeds of sheep, especially in regions where the virus is endemic, are resistant to disease though there is increasing information that native breeds in India and China can be clinically affected. Outbreaks of disease typically occur either when susceptible sheep are introduced to endemic areas, or when infected midges carry the virus from endemic regions to adjacent areas containing populations of immunologically-na¨ve, susceptible sheep.

Many strains of bluetongue virus appear incapable of causing significant disease following natural or experimental infection of breeds of sheep known to be susceptible to disease. Experimental reproduction of disease can be inconsistent, except with the most virulent strains of virus. This could be because exposure of sunlight can have a marked influence on the severity of disease (Erasmus, 1990). Passage of virulent field virus in cell cultures rapidly reduces virus virulence (Gard, 1987).

After introduction by the bite of an infected midge, bluetongue virus first replicates in the local lymph nodes and subsequently induces a primary viraemia which seeds other lymph nodes, spleen, lung and vascular endothelium (Gibbs and Greiner, 1988). Circulating virus associates with blood cells, mostly with erythrocytes and platelets, though virus associated with mononuclear cells is critical for dissemination of virus throughout the animal. Later in viraemia, the virus is exclusively associated with erythrocytes (MacLachlan, 1994). Virus particles appear to be sequestered in invaginations of the erythrocyte membrane, allowing prolonged viraemia in the presence of neutralizing antibodies (OIE, 1998).

Fever is usual but not invariable. Other common clinical signs include oedema (of lips, nose, face, submandibulum, eyelids and sometimes ears), congestion (of mouth, nose, nasal cavity, conjunctiva, skin and coronary bands), lameness and depression. The oedema of lips and nose can give the sheep a 'monkey-face' appearance. There is frequently a serous nasal discharge, later becoming mucopurulent. The congestion of the nose and nasal cavity produces a 'sore muzzle' effect, the term used to describe the disease seen in sheep in the USA before its bluetongue virus aetiology was realized. The mouth is sore and the sheep may champ to produce a frothy oral discharge. Sheep are not strictly anorexic, but eat less because of oral soreness and will hold food in their mouths to soften it before chewing. Affected sheep occasionally have swollen, congested, cyanotic tongues. Lameness, due to coronary band congestion, may occur early in the disease and lameness or torticollis, as a result of skeletal muscle damage, may occur later (OIE, 1998).

If fever occurs, sheep are first pyrexic 4-10 days after infection. The other clinical signs soon follow with acute deaths occurring during the second week following infection. Many of these deaths are the result of pulmonary oedema and/or cardiac insufficiency. Further sheep may die from chronic disease 3 to 5 weeks after infection with bacterial complications, especially pasteurellosis. Under-nutrition arising from lameness and depression may be contributing factors. The production loss due to bluetongue may be the result of deaths, unthriftiness during prolonged convalescence, wool breaks and possibly reproductive wastage (OIE, 1998).

Although the frequency of infection of cattle with bluetongue virus is generally higher than in sheep, disease in cattle is rare. Clinical infection is actually a hypersensitivity reaction, including fever, stiffness or lameness and increased respiratory rate. There may be lacrimation and increased salivation. The skin of the muzzle is often inflamed, and may crack and peel. The lips and tongue may be swollen, with ulcers on the oral mucosa. Similarly, the skin of the neck, flanks, perineum, and teats may be affected (Erasmus, 1990).

Hydranencephaly and congenital deformities may develop in bovine and sheep foetuses of bluetongue virus-infected dams, the severity of lesions depending on the stage of gestation. Foetuses seem to be most susceptible during the period of active brain development (Erasmus, 1990). It is clear that cell culture-adapted virus more readily crosses the placenta than unadapted virus, suggesting that the occasional instances of natural virus-induced teratogenesis may be due to strains of virus derived from live virus vaccines (MacLachlan, 1994).

Bluetongue in dogs associated with use of a contaminated vaccine was reported by Akita et al. (1994). Only pregnant bitches were affected.

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Pathology

All of the pathology of bluetongue can be assigned to vascular endothelial damage resulting in changes to capillary permeability and fragility, with subsequent disseminated intravascular coagulation and necrosis of tissues supplied by damaged capillaries. These changes result in oedema, congestion, haemorrhage, inflammation and necrosis.

In animals dying acutely, the oral mucosa is hyperaemic and petechiae or ecchymoses may be present. Excoriations may be in areas subject to mechanical abrasion; the edges of lips, dental pad, tongue and cheeks opposite the molar teeth. There may be hyperaemia in the fore-stomachs. The lungs may be hyperaemic with severe alveolar and interstitial oedema, froth in the bronchi, and excess fluid in the thoracic cavity. The pericardial sac may have petechiae and excess fluid. A variable sized haemorrhage in the tunica media near the base of the pulmonary artery is almost pathognomonic. Subepicardial and subendothelial haemorrhages, particularly involving the left ventricle, are common. Generalized damage to the cardiovascular system is evidenced by widespread hyperaemia, oedema and haemorrhage (Erasmus, 1990).

Animals that die later than 14 days after infection often show dramatic degeneration and necrosis of the skeletal musculature. Muscles lose pigmentation and the inter-muscular fasciae are infiltrated with a clear gelatinous fluid (Erasmus, 1990).

Microscopic examination of mucosal lesions shows mononuclear cell infiltration, degeneration and necrosis of epithelial cells in which large acidophilic intra-cytoplasmic masses accumulate. Affected muscles have oedema, haemorrhage, hyaline degeneration and necrosis. Infiltration by neutrophils, macrophages and lymphocytes is present in acute cases (Verwoerd and Erasmus, 1994).

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Symptoms Table

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Diagnosis

There is aØsummary of recommended procedures for bluetongue serology and virus isolation (Afshar and Gard, 1995), while Afshar (1994) provides details of the diagnosis methods. The isolation and identification of bluetongue virus is also described in detail by Clavijo et al. (2000).

The recommended tests for the detection of bluetongue serogroup-specific antibodies are agar-gel-immunodiffusion and competitive ELISA, with the latter becoming more popular because of its greater accuracy and adaptation to conventional laboratory rapid testing and reading technology. The recommended test for the detection of serotype-specific antibodies is the virus neutralization test.

Bluetongue virus is usually isolated from tissues, or preferably red blood cells washed free of any antibody, in embryonated chicken eggs. Bluetongue virus may be detected in the inoculated eggs by antigen or nucleic acid detection procedures or by passage to susceptible cell cultures. Cell culture isolates are identified as bluetongue viruses by tests based on group-specific antibodies and using fluorescent or enzyme conjugates. Isolates placed in the bluetongue serogroup are typed by virus neutralization tests using serotype-specific antisera.

Differential diagnosis should include contagious ecthyma, foot and mouth disease, photosensitization, pneumonia, polyarthritis, footrot, foot abscesses, plant poisonings, peste des petits ruminants, coneurosis and epizootic haemorrhagic disease of deer.

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Disease Treatment Table

No data

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Disease Treatment

There is no treatment for bluetongue disease. The recovery of affected animals will be aided by the provision of shade, water, feed and shelter.

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Disease Prevention and Control

Bluetongue is a disease of sheep, but cattle are the principal vertebrate reservoirs of the virus. Once established, it is impossible to actively eradicate bluetongue virus. The virus will circulate, generally subclinically, in cattle and other ruminants, and in midges. In countries marginally suitable for virus persistence, the virus may be maintained for several years before dying out. Bluetongue entered Portugal and Spain in 1956 and appears to have persisted in Portugal until 1959 and in Spain until 1960 (Roberts, 1990). In seasonally infected areas, the onset of cold weather will reduce midge populations to ineffective levels and cause the virus to retreat to regions of year-round activity.

The bluetongue virus cycle could be interrupted by the immunization of vertebrate hosts, especially cattle, removal of vectors or prevention of vector attack. Understandably, the immunization of animals that will not suffer from the disease is not acceptable to farmers. The control of midges by the application of insecticides and larvicides to insect resting and breeding sites, or systemically to cattle, has not been fully investigated but is likely to have local success only. Protecting sheep from exposure to midges is a more practical approach and can be achieved by moving sheep from insect resting and breeding sites, stabling animals overnight or the use of insect repellents. Mixing cattle with sheep will draw vectors with a host preference for cattle from sheep, but may raise the virus infection level of the midge population.

Prophylactic immunization of sheep is the most practical and effective control measure, especially when the threat is from an epidemic due to a single serotype, such as the type 10 outbreak in Portugal and Spain in the 1950s. However, multiple serotypes of virus are usual in endemic situations (Hawkes, 1996), requiring multivalent vaccines because bluetongue vaccines are serotype specific. However, multivalent vaccines have attendant problems resulting from interference between virus strains, differences in immunogenicity and growth rates between various strains, as well as differences in the response of individual animals to the components of such vaccines (Verwoerd and Erasmus, 1994). Additionally, there is growing concern by some scientists about the use of live attenuated bluetongue vaccines. Murray and Eaton (1996) summarized these concerns into four areas. These areas are: the known teratogenicity of attenuated virus for the developing foetus; the propensity for vaccine virus to be excreted in the semen of bulls and rams; the possibility that vaccine virus will infect vectors and establish in the environment; and the generation of recombinant progeny virus with novel genetic and biological properties after the reassortment of genes from wild and vaccine virus in the vaccinated animal or the vector.

Alternatives to live attenuated vaccines are described by Murray and Eaton (1996). Vaccines based on inactivated whole virus,

recombinant virus-like particles or recombinant core-like particles all show promise, but require more research. If a commercial product of any of these is achieved, it will likely cost considerably more than a live attenuated vaccine.

Live attenuated bluetongue vaccines have wide use in South Africa, and more limited use in USA and a few other countries. The vaccines are compromises between attenuation and immunogenicity and may have residual pathogenicity for some vaccinated sheep. The application of the vaccines has to be well managed. Colostral immunity in young sheep can interfere with the development of active immunity to the vaccine and breeding ewes and rams should be vaccinated before mating.

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Vaccines

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Zoonoses and Food Safety

Bluetongue is not a zoonosis.

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Taxonomic Tree

Kingdom "Viruses" [01"VIR]

Family Reoviridae [41REOV]

Genus Orbivirus [51ORBI]

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Hosts Table

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Vectors and Intermediate Hosts

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Pathogen Characteristics

Bluetongue virus is an icosahedral-shaped particle consisting of a segmented double-stranded RNA genome, encapsidated in a double-layered protein coat. Removal of the outer protein layer activates a viral-associated RNA polymerase which transcribes the ten genome segments into 10 mRNAs which are in turn translated into at least seven structural (VP1-VP7) and three non-structural (NS1-NS3) proteins (Huismans and Dijk, 1990). The virions have a diameter of 68-70 nm, comprising an outer capsid around a 54 nm core (Verwoerd and Erasmus, 1994).

The genome segments vary in size from 0.5 kDa to 2.7x10 3kDa, and the viral proteins range in size from 25,000 to 144,000 daltons. VP2 and VP5 form the outer capsid and the other five structural proteins are in the core. VP2 is primarily responsible for the induction of type-specific neutralizing antibodies and its variable sequence results in the 24 recognized serotypes of bluetongue virus (Verwoerd and Erasmus, 1994). The 24 serotypes are designated BLU 1- BLU 24. Variations in other

proteins of the virus are responsible for the innumerable strains of the virus and for their varied biological properties. This genetic diversity of bluetongue virus is a consequence of both drift and reassortment of individual gene segments (OIE, 1998).

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References

Abu Elzein EME, 1985. Bluetongue in camels: a serological survey of the one-humped camel (Camelus dromedarius) in the Sudan. Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 38 (4):438-442; 13 ref.

Abu Elzein EME, Gameel AA, Al-Afaleq AI, Hassanein MM, 1992. Isolation of a virus serologically related to the bluetongue group from an outbreak of haemorrhagic disease among exotic deer in Saudi Arabia. Veterinary Record, 131(19):439-441; 20 ref.

Afshar A, 1994. Bluetongue: laboratory diagnosis. Comparative Immunology, Microbiology and Infectious Diseases, 17(3/4):221-242; 182 ref.

Afshar A, Gard GP, 1992. Working Team report on diagnostics. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 990-993.

Akita GY, Ianconescu M, MacLachlan NJ, Osburn BI, Greene RT, 1994. Bluetongue disease in dogs associated with contaminated vaccine. Veterinary Record, 134(11):283; 5 ref.

Anderson EC, Rowe LW, 1998. The prevalence of antibody to the viruses of bovine virus diarrhoea, bovine herpes virus 1, Rift Valley fever, ephemeral fever and bluetongue and to Leptospira sp. in free-ranging wildlife in Zimbabwe. Epidemiology and Infection, 121(2):441-449; 23 ref.

Apiwatnakorn B, Bura P, Pasavorakul O, 1996. Serological study for bluetongue in Thailand. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 20-22; 4 ref.

Aruni AW, Chandran NDJ, Ramadass P, Prabhakar TC, Lalitha PS, Venkatesan RA, 1994. Comparative evaluation of AGPT and Dot ELISA for the detection of blue tongue virus (BTV) antigens in sheep blood samples. Indian Journal of Veterinary Research, 3 (2):25-29; 9 ref.

Ayoub H, Singh KV, 1970. Identification of bluetongue in UAR (Egypt). Bulletin of Epizootic Diseases of Africa, 18:123-136.

Barr' N, Eramus BJ, Gautier A, R²me A, Valin R, 1985. Bluetongue, a new disease of sheep on Reunion (Indian Ocean). Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 38 (1):16-21; 10 ref.

Barsoum GW, 1992. Bluetongue and African horse sickness situation in Egypt. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 42-43.

Barzilai E, Shimshony A, 1985. Bluetongue: virological and epidemiological observations in Israel. Bluetongue and related orbiviruses, 545-553; [Progress in Clinical and Biological Research volume 178]; 13 ref.

Bi YunLong, Li ChunDi, Li ShiYin, Qing Bo, Zhong Nan, Hu JinFeng, Yang RuiLan, 1996. An epidemiological survey of bluetongue in Yunnan Province, China. Bluetongue disease in

Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 51-56.

Bida SA, Eid FIA, 1974. Blue tongue of sheep in Northern Nigeria. Journal of the Nigerian Veterinary Medical Association, 3(1):12-16.

Borden EC, Shope RE, Murphy FA, 1971. Physicochemical and morphological relationships of some arthropod-borne viruses to bluetongue virus --a new taxonomic group. Physicochemical and serological studies. Journal of General Virology, 13:261-271.

Braverman Y, Galun R, 1973. The occurrence of culicoides in Israel with reference to the incidence of bluetongue. Refuah veterinarith, 30(3-4):121-127.

Burgu I, Urman HK, Akca Y, Yonguc A, Mellor PS, Hamblin C, 1992. Serologic survey and vector surveillance for bluetongue in southern Turkey. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 168-174; 7 ref.

Burton RW, Littlejohns IR, 1988. The occurrence of antibody to bluetongue virus in New South Wales. I. Statewide surveys of cattle and sheep. II. Coastal region and age distribution surveys. Australian Journal of Biological Sciences, 41(4):563-570, 571-578; 16 and 8 ref.

Butenko AM, 1996. Study of arbovirus circulation in Guinea. Meditsinskaya Parazitologiya i Parazitarnye Bolezni, No. 2:40-45; 7 ref.

Castro RS, Leite RC, Abreu JJ, Lage AP, Ferraz IB, Lobato ZIP, Balsamao SLE, 1992. Prevalence of antibodies to selected viruses in bovine embryo donors and recipients from Brazil, and its implications in international embryo trade. Tropical Animal Health and Production, 24(3):173-176; 20 ref.

Charton H, Prunaux O, Guignard A, 1991. Bluetongue in Reunion. Results of a serological survey. Revue de M'decine V't'rinaire, 142 (5):415-418; 7 ref.

Chen LiBiao, Zhong PeiYi, Zhao GuoMing, 1996. A serological survey of bluetongue in cattle in Guangxi Province, China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 76-77; 1 ref.

Clavijo A, Heckert RA, Dulac GC, Afshar A, 2000. Isolation and identification of bluetongue virus. Journal of Virological Methods, 87:13-23.

Cunha RG, Souza DMde, Teixeira AC, 1988. Prevalence of antibodies to bluetongue virus in the serum of goats and sheep in Rio de Janeiro State. Arquivos Fluminenses de Medicine Veterinària, 3(2):53-56; 23 ref.

Dafni I, 1966. Bluetongue in Israel in the years 1964 and 1965. Bulletin of the Office international des Epizooties, 66:319-327.

Davies FG, Mungai JN, Pini A, 1992. A new bluetongue virus serotype isolated in Kenya. Veterinary Microbiology, 31(1):25-32; 6 ref.

Davies FG, Walker AR, 1974. The distribution in Kenya of bluetongue virus and antibody, and the Culicoides vector. Journal of Hygiene, 72(2):265-272.

Della-Porta AJ, Sellers RF, Herniman KAJ et al., 1983. Serological studies of Australian and Papua New Guinean cattle and

Australian sheep for the presence of antibodies against bluetongue group viruses. Veterinary Microbiology, 8:147-162.

Dulac GC, Sterritt WG, Dubuc C, Afshar A, Myers DJ, Taylor EA, Jamieson BR, Martin MW, 1992. Incursions of orbiviruses in Canada and their serologic monitoring in the native animal population between 1962 and 1991. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 120-127; 19 ref.

Ekue FN, Nfi AN, Tsangue P, Taylor WP, Gumm ID, 1985. Bluetongue in exotic sheep in Cameroon. Tropical Animal Health and Production, 317(3):187-188; 2 ref.

Elfatih M, Mohammed H, Taylor WP, 1987. Infection with bluetongue and related orbiviruses in the Sudan detected by the study of sentinel calf herds. Epidemiology and Infection, 99 (2):533-545; 25 ref.

Erasmus BJ, 1990. Bluetongue virus. Virus infections of ruminants., 227-237; 31 ref.

Fayza AO, Abu-Elzein EME, Tag-Eldin MH, Hajer IE, 1990. Susceptibility of Sudanese sheep to a bluetongue virus isolated from apparently healthy cattle in the Sudan. Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 43(3):313-316; 25 ref.

Ferreira ML, Rosinha A, 1986. Preliminary analysis of data from "operation buffalo" (Syncerus caffer) in Mozambique. Reposit»rio de Trabalhos do Laborat»rio Nacional de InvestigaÎao Veterinària, 18:83, 85-100; 32 ref.

Formenty P, Domenech J, Lauginie F, Ouattara M, Diawara S, Raath JP, Grobler D, Leforban Y, Angba A, 1994. Epidemiological study of bluetongue in sheep, cattle and various wild animal species in the CÂte d'Ivoire. Revue Scientifique et Technique - Office International des 'pizooties, 13(3):737-751; 12 ref.

Gambles RM, 1949. Bluetongue of sheep in Cyprus. Journal of Comparative Pathology, 59:176-190.

Gard GP, 1987. Studies of bluetongue virulence and pathogenesis in sheep carried out at Animal Virus Research Institute, Pirbright, England, 1986., iv + 58pp.; [Technical Bulletin No. 103, ISSN 0158-2763].

Gard GP, 1996. Bluetongue viruses in the Asian and southeast Asian region. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 86-89; 19 ref.

Gibbs EPJ, Greiner EC, 1985. Serological observations on the epidemiology of bluetongue virus infections in the Caribbean and Florida. Bluetongue and related orbiviruses, 563-470; [Progress in Clinical and Biological Research volume 178]; 14 ref.

Gibbs EPJ, Greiner EC, 1988. Bluetongue and epizootic hemorrhagic disease. The arboviruses: epidemiology and ecology. Volume II., 39-70; 169 ref.

Gibbs EPJ, Greiner EC, 1994. The epidemiology of bluetongue. Comparative Immunology, Microbiology and Infectious Diseases, 17(3/4):207-220; 47 ref.

Goossens B, Osaer S, Kora S, Chandler KJ, Petrie L, Thevasagayam JA, Woolhouse T, Anderson J, 1998. Abattoir survey of sheep and goats in The Gambia. Veterinary Record, 142 (11):277-281; 27 ref.

Goto Y, Yamakawa M, Miura Y, 1996. An outbreak of bluetongue in cattle in Japan. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 42.

Guo ZhaiJun, Hao JuCai, Chen JianGuo, Li ZhiHua, Zhang KhaiLi, Hu YuLing, Li Gen, Pu Long, 1996. Investigation of bluetongue disease in the Bayannur Meng of Inner Mongolia. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 80-83; 8 ref.

Hafez SM, 1978. Serological survey of bluetongue in Iraq. Bulletin of the Office international des Epizooties, 89(1-2):13-22.

Hafez SM, Ozawa Y, 1973. Serological survey of bluetongue in Egypt. Bulletin of Epizootic Diseases of Africa, 21(3):297-304.

Hafez SM, Taylor WP, 1985. Serotypes of bluetongue virus present in Saudi Arabia. Bluetongue and related orbiviruses, 531-537; [2 maps; Progress in Clinical and Biological Research volume 178]; 12 ref.

Haresnape JM, Taylor WP, Lungu SAM, 1988. The epidemiology of bluetongue in Malawi. Epidemiology and Infection, 100(3):493-499; 13 ref.

Hassan A, 1992a. Status of bluetongue in the Middle East and Asia. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 38-41; 4 ref.

Hassan A, 1992b. Epidemiology of bluetongue virus infection in Malaysia. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 155-161; [11 ref].

Hawkes RA, 1996. The global distribution of bluetongue. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 6-14; 69 ref.

Hilmy Zaki AH, 1965. Suspected bluetongue cases in UAR. Bulletin Office international des Epizooties, 64:667-670.

Homan EJ, Gibbs EPJ, Walker JS, Walton TE, Yuill TM, Gonzàlez J, Barreto CH, Greiner EC, 1992. Central American and Caribbean regional bluetongue epidemiologic study: Antecedents and geographic review. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 99-105; 34 ref.

Howell PG, 1960. A preliminary antigenic classification of strains of bluetongue virus. Onderstepoort Journal of Veterinary Research, 28(3):357-363.

Howell PG, 1970. The antigenic classification and distribution of naturally occurring strains of bluetongue virus. Journal of the South African veterinary medicine Association, 41(3):215-223.

Huang Xiu, Pu ShuYing, Er ChengJun, Yang ChengYu, Wei WanLian, Cheng XiengFu, Zhang ChongXin, Li XiaoCheng, Liu TianBin, 1996. Epidemiological investigations and isolation of bluetongue virus in Gansu Province, China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 65-66; 2 ref.

Huismans H, Dijk AAvan, 1990. Bluetongue virus structural components. Current Topics in Microbiology and Immunology, 162:21-41; 101 ref.

Hussein Hag A, Gallo C, Caracappa S, Vesco G, 1985. Serological survey for antibodies to abortion-producing agents in zebu in Somalia. Atti della Societö Italiana di Buiatria, 17:573-575; 4 ref.

Hyera JMK, Lyaruu VH, 1995. Preliminary evidence of the occurrence of Blue-tongue (BT) virus infection in Tanzanian sheep and goats. Bulletin of Animal Health and Production in Africa, 43 (3):183-186; 18 ref.

Jain NC, Sharma R, Prasad G, 1986. Isolation of bluetongue virus from sheep in India. Veterinary Record, 119(1):17-18; 6 ref.

Jain NC, Gupta Y, Prasad G, 1992. Bluetongue virus antibodies in buffaloes and cattle in Haryana state of India. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 188-192; 10 ref.

Jorgensen PH, Halliwell RW, Honhold N, 1989. Prevalence of serum antibodies to bluetongue virus in indigenous goats in Zimbabwe revealed by a blocking enzyme-linked immunosorbent assay. Tropical Animal Health and Production, 21(1):58.

Kanhai GK, Silva Rda, 1981. A serological survey of bluetongue in Mozambique. Bulletin of Animal Health and Production in Africa, 29 (3):289-291.

Konstantinov OK, 1990. Ticks of the family Ixodidae as arbovirus reservoirs in the Republic of Guinea. II. The arboviruses. Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 43(1):15-22; 13 ref.

Koumbati M, Mangana O, Nomikou K, Mellor PS, Papadopoulos O, 1999. Duration of bluetongue viraemia and serological responses in experimentally infected European breeds of sheep and goats. Veterinary Microbiology, 64(4):277-285; 23 ref.

Kukarni DD, Bannalikar AS, Karpe AG, Gujar MB, Kulkarni MN, 1992. Epidemiologic observations on bluetongue in sheep in the Marathwada region of Maharashtra state in India. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 193-196; 5 ref.

Lancelot R, Calvez D, Waller J, Kremer M, Sanite L, Lef'vre PC, 1989. Epidemiological observations on bluetongue in French Guiana. 'pid'miologie et Sant' Animale, No. 15:103-116; 13 ref.

Lef²vre PC, Calvez D, 1986. Bluetongue in intertropical Africa: influence of ecological factors on the prevalence of infection. Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 39 (3/4):263-268; 19 ref.

Lefevre PC, Taylor WP, 1983. Epidemiological situation of bluetongue in Senegal. Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 36(3):241-245; 8 ref.

Lei HuaiMin, Xu JianMing, He ChongLi, Shao JiangLiang, Shi XiaYun, 1996. The isolation and characterisation of bluetongue virus and its epidemiology in Shanxi Province, China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 72-75.

MacLachlan NJ, 1994. The pathogenesis and immunology of bluetongue virus infection of ruminants. Comparative Immunology, Microbiology and Infectious Diseases, 17(3/4):197-206; 59 ref.

Maiga S, Sarr J, 1992. Epidemiological survey of the main respiratory viruses of small ruminants in Mali. Revue d''levage et de M'decine V't'rinaire des Pays Tropicaux, 45(1):15-17; 10 ref.

Mariner JC, Sama S, Mamini C, Baare K, Stem C, Yedloutschnig RJ, Mebus CA, Sollod AE, 1989. Serosurvey of Sahelian cattle for evidence of epizootic disease. Preventive Veterinary Medicine, 7 (3):163-171; 30 ref.

Mehrotra ML, 1992. Studies on bluetongue in India: distribution and isolation of viruses. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 181-187; 15 ref.

Mellor PS, 1990. The replication of bluetongue virus in Culicoides vectors. Bluetongue viruses., 143-161; [In Current Topics in Microbiology and Immunology, 162]; 101 ref.

Mellor PS, Boorman J, Baylis M, 2000. Culicoides biting midges: their role as arbovirus vectors. Annual Review of Entomology, 45:307-340.

Melo CB, Oliveira AM, Azevedo EO et al., 2000. Antibodies to bluetongue virus in cattle of Paraiba State, Brazil. Arquivo Brasileiro De Medicina Veterinaria e Zootecnia, 52(1):19-20.

Mo ReGen, Ao FuLai, Si Qin, Zhao XinLi, 1996. Serological survey of bluetongue in sheep and cattle in Inner Mongolia. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 78-79; 2 ref.

Moore DL, Kemp GE, 1974. Bluetongue and related viruses in Ibadan, Nigeria: Serologic studies of domestic and wild animals. American Journal of Veterinary Research, 35(8):1115-1120.

Muller MJ, Standfast HA, St George TD, Cybinski DH, 1982. Culicoides brevitarsis (Diptera: Ceratopogonidae) as a vector of arboviruses in Australia. In: St George TD, Kay BH, eds. Arbovirus Research in Australia. Proceedings of the Third Symposium. Brisbane, Australia: CSIRO-QIMR, 43-49.

Murray PK, Eaton BT, 1996. Vaccines for bluetongue. Australian Veterinary Journal, 73(6):207-210; 33 ref.

Mushi EZ, Diteko T, Wibberley G, Kupe D, 1992. Precipitating antibodies to bluetongue virus in Botswana. Bulletin of Animal Health and Production in Africa, 40(2):117; 2 ref.

Mweene AS, Pandey GS, Sinyangwe P, Nambota A, Samui K, Kida H, 1996. Viral diseases of livestock in Zambia. Japanese Journal of Veterinary Research, 44(2):89-105; 77 ref.

Nevill EM, Erasmus BJ, Venter GJ, 1992. A six-year survey of viruses associated with Culicoides biting midges throughout South Africa (Diptera: Ceratopogonidae). Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 314-319; 5 ref.

Obi TU, Taylor WP, Ojo MO, 1983. Prevalence of bluetongue virus precipitating antibodies in sheep and goats in Southern Nigeria. Tropical Veterinarian, 1(4):205-208; 9 ref.

Office International des Epizooties, 1998. Supporting document for the OIE International Animal Health Code chapter 2.1.9 on bluetongue. OIE Ad hoc working group on bluetongue, September 1998.

Office International des Epizooties, 1999. World Animal Health in 1999. Paris, France: OIE.

Papadopoulos O, 1992. Bluetongue and epizootic hemorrhagic disease in Europe and the European community. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 34-37; 12 ref.

Pearson JE, Gustafson GA, Shafer AL, Alstad AD, 1992. Distribution of bluetongue in the United States. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 128-139; 25 ref.

P'rez BM, Siger Jde, Avila JP, Romàn R, Infante G, 1995. Prevalence of antibodies to the bluetongue virus in cattle herds in the county of La Canada de Urdaneta, Zulia State, Venezuela. Revista Cientifica, Facultad de Ciencias Veterinarias, Universidad del Zulia, 5(2):77-85; 47 ref.

Pillai CP, 1961. Suspected cases of bluetongue in sheep. The Sudan Journal of Veterinary Science and Animal Husbandry. 2 (1):47-50.

Prasad G, Jain NC, Mahajan NK, Vasudevan B, 1987. Prevalence of bluetongue-precipitating antibodies in different domestic animals. Indian Journal of Animal Sciences, 57(6):522-524; 9 ref.

Price DA, Hardy WT, 1954. Isolation of the bluetongue virus from Texas sheep - Culicoides shown to be a vector. Journal of the American Veterinary Medical Association, 124(925):255-258.

Puana I, 1996. Bluetongue virus status in Papua New Guinea. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 41.

Qin QiYing, Tai ZhengGuo, Wang LiJin, Luo ZhengQi, Hu Jun, Lin HanLiang, 1996. Bluetongue epidemiological survey and virus isolation in Xinjiang, China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 67-71; 2 ref.

Roberts DH, 1990. Bluetongue: a review. State Veterinary Journal, 44(124):66-80; 40 ref.

Rosadio RH, Evermann JF, DeMartini JC, 1984. A preliminary serological survey of viral antibodies in Peruvian sheep. Veterinary Microbiology, 10(1):91-96; 26 ref.

Sellers RF, 1981. Bluetongue and related diseases. In: Gibbs EPJ ed. Virus Diseases of Food Animals. London, UK: Academic Press, 567-584.

Sendow I, Young P, Ronohardjo P, 1986. Serological studies of bluetongue virus in Indonesia. Arbovirus research in Australia. Proceedings Fourth Symposium May 6-9, 1986, Brisbane, Australia, 271-273; 10 ref.

Sendow I, Daniels P, Soleha E, Hunt N, Ronohardjo P, 1991. Isolation of bluetongue viral serotypes 7 and 9 from healthy sentinel cattle in West Java, Indonesia. Australian Veterinary Journal, 68(12):405-406; 10 ref.

Sharifah SH, Ali MA, Gard GP, Polkinghorne IG, 1995. Isolation of multiple serotypes of bluetongue virus from sentinel livestock in Malaysia. Tropical Animal Health and Production, 27(1):37-42; 12 ref.

Sharma SN, Oberoi MS, Sodhi SS, Baxi KK, 1981. Bluetongue

virus precipitating antibodies in dairy animals in the Punjab. Tropical Animal Health and Production, 13(4):193.

Shimshony A, Barzilai E, Savir D, Davidson M, 1988. Epidemiology and control of bluetongue disease in Israel. Revue Scientifique et Technique, Office International des 'pizooties, 7 (2):311-329; 26 ref.

Silva JAda, Machado TMM, Modena CM, Viana FC, Moreira EC, Abreu VVde, 1988. Frequency of foot and mouth disease, bluetongue and bovine oncovirus antibodies in goats under different production systems in Minas Gerais State. Arquivo Brasileiro de Medicina Veterinària e Zootecnia, 40(6):393-403; 17 ref.

Singer RS, MacLachlan NJ, Carpenter TE, 2001. Maximal predicted duration of viremia in bluetongue virus-infected cattle. Journal of Veterinary Diagnostic Investigation, 13:43-49.

Soliman AM, Hafez SM, Ozawa Y, 1972. Recent epizootics of bluetongue in Egypt. Bulletin of Epizootic Diseases of Africa, 20:105-112.

Sreenivasulu D, Rao MVS, Gard GP, 1999. Isolation of bluetongue virus serotype 2 from native sheep in India. Veterinary Record, 144(16):452-453; 12 ref.

Stanley MJ, 1990. Prevalence of bluetongue precipitating antibodies in domesticated animals in Yemen Arab Republic. Tropical Animal Health and Production, 22(3):163-164; 8 ref.

Tamayo R, Schoebitz R, Alonso O, Wenzel J, 1985. First report of bluetongue antibody in Chile. Bluetongue and related orbiviruses, 555-558; [Progress in Clinical and Biological Research volume 178].

Taylor WP, Sellers RF, Gumm ID, Herniman KAJ, Owen L, 1985. Bluetongue epidemiology in the Middle East. Bluetongue and related orbiviruses, 527-530; [4 maps; Progress in Clinical and Biological Research volume 178]; 3 ref.

Taylor WP, McCausland A, 1976. Studies with bluetongue virus in Nigeria. Tropical Animal Health and Production, 8:169-173.

Thompson LH, Mo CL, Oviedo MT, Homan EJ, 1992. Prevalence and incidence of bluetongue viruses in the Caribbean basin: serologic and virologic findings. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 106-113; 11 ref.

Doyle KA, 1992. An overview and perspective on orbivirus disease prevalence and occurrence of vectors in Australia and Oceania. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 44-57; 29 ref.

Johnson BG, 1992. An overview and perspective on orbivirus disease prevalence and occurrence of vectors in North America. Bluetongue, African horse sickness, and related orbiviruses: Proceedings of the Second International Symposium., 58-61; 5 ref.

Verwoerd DW, Erasmus BJ, 1994. Bluetongue. In: Coetzer JAW, Thomson GR, Tustin RC, eds. Infectious Diseases of Livestock with special reference to Southern Africa. Cape Town, South Africa: Oxford University Press, 443-459.

Viegas de Abreu VL, 1983. Prevalence of reactions to the immunodiffusion test for bluetongue antibodies among cattle and buffaloes in northern Brazil. [Abstract of thesis]. Arquivo Brasileiro de Medicina Veterinaria e Zootecnia, 35(5):759-760.

Ward MP, Flanagan M, Baldock FC, 1995. Infection of cattle Queensland with bluetongue viruses: 1. prevalence of antibodies. Australian Veterinary Journal, 72(5):182-186; 30 ref.

Weitzman GL, Stem EC, Gilfillan RS, Lindenmayer JM, 1991. Preliminary serological survey for bluetongue and toxoplasmosis in sheep in Niger. Tropical Animal Health and Production, 23 (4):258; 2 ref.

Zhang NianZu, Li ZhiHua, Zhang KhaiLi, Hu YuLing, Li Gen, Peng KeGao, Li HuaChun, Zhang FuQiang, Ben Jin, Li XinRong, Zhou FuZhong, Liu Gui, 1996. Bluetongue history, serology and virus isolation in China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 43-50; 26 ref.

Zhou WeiHan, 1995. An epidemiological investigation of bluetongue in Anhui Province [China]. Animal Husbandry and Veterinary Medicine, China, 27(1):3-5; 9 ref.

Zhou WeiHan, 1996. An epidemiological study of bluetongue in Anhui Province, China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 61-64.

Zhu ChangGui, Li YaMin, Shao CuiLi, Xu ShiBai, Zheng TianRan, 1996. Epidemiological investigations and control of bluetongue disease in Jiangsu Province, China. Bluetongue disease in Southeast Asia and the Pacific: Proceedings of the First Southeast Asia and Pacific Regional Bluetongue Symposium, Greenlake Hotel, Kunming, P.R. China, 22-24 August 1995., 57-60.

Huismans H, Dijk AAvan, 1990. Bluetongue virus structural components. Current Topics in Microbiology and Immunology, 162:21-41; 101 ref.

Office International des Epizooties, 1998. Supporting document for the OIE International Animal Health Code chapter 2.1.9 on bluetongue. OIE Ad hoc working group on bluetongue, September 1998.

Verwoerd DW, Erasmus BJ, 1994. Bluetongue. In: Coetzer JAW, Thomson GR, Tustin RC, eds. Infectious Diseases of Livestock with special reference to Southern Africa. Cape Town, South Africa: Oxford University Press, 443-459.

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