BLUETONGUE VIRUS (BTV)
EPIZOOTIC HEMORRHAGIC DISEASE VIRUS (EHDV)

Animal Group(s) Affected	Transmission	Clinical Signs	Severity	Treatment	Prevention and Control	Zoonotic
BTV: All ruminants are susceptible; camelids; other mammals positive on serological tests without disease; recent evidence of possible BTV disease in carnivores EHDV: primarily white-tailed deer but also elk, prong-horn, mule deer, cattle; rarely camelids but likely all ruminants can be infected	Insect vector primarily (biting midges of genus *Culicoides*; *C. sonorensis* principally in US); iatrogenic; *in utero*; possibly oral in carnivores	Pyrexia, oral and nasal ecchymoses and ulcerations, facial edema, conjunctivitis, rhinorrhea, ptyalism. BTV: Hoof slough and wool loss in sheep EHDV: Hoof slough in deer	BTV: variable, dependant on species, isolate, geographic location; sheep, white-tailed deer and pronghorn most likely to be severely affected. EHDV: variable; white-tailed deer and pronghorn most likely affected In cattle EHDV/ BTV un-common, generally mild; however, more severe disease associated with specific subtypes or outbreaks reported	Symptomatic	Insect control which is realistically difficult; potential to vaccinate for some strains of BTV; no vaccines available for EHDV	No
Fact Sheet compiled by: Allison Wack						
Sheet completed on: 25 January 2011; updated 19 March 2013						
Fact Sheet Reviewed by: David Stallknecht, Holly Haefele						

BLUETONGUE VIRUS (BTV)
EPIZOOTIC HEMORRHAGIC DISEASE VIRUS (EHDV)

Susceptible animal groups:
BTV: Ruminants: sheep, goats, cattle, bison, deer, antelope, bighorn sheep, North American elk, camelids, greater kudu, muntjac, topi; perinatal infection in Grant's gazelle, gemsbok, sable, buffalo, ibex, hartebeest, addax. Many other ungulates serologically positive without evidence of disease. Clinical signs common in sheep, occasional in goats, and rare in cattle. White-tailed deer, pronghorn and desert bighorn sheep may have severe disease. Abortions caused by BTV contaminated vaccine in dogs. Seropositivity in a variety of large African carnivores. Report of infection and death in 2 Eurasian lynx fed ruminant fetuses and stillborns.
EHDV: Ruminants: white-tailed deer most severely affected, less frequently in mule deer and pronghorn; Black-tailed deer, red deer, wapiti, roe deer, fallow deer, bison, black and white rhinoceros, black bear have been found seropositive. Rare outbreaks in cattle; sheep experimentally infected but rarely develop clinical signs.

Causative organisms: Family Reoviridae, Genus *Orbivirus*
BTV: 26 serotypes worldwide, 15 identified in US (2, 10, 11, 13, 17 considered endemic; 1,3, 5, 6, 9,12, 14, 19, 22, 24 sporadically) in domestic or wild ruminants
EHDV: 7 serotypes, 3 endemic to US (1, 2,and 6), EHDV-6 was first identified in 2006

Zoonotic potential: None; one anecdotal unconfirmed report of BTV infection in a laboratory worker

Distribution:
BTV: World-wide where vectors are present (generally between latitudes of 40°N and 35°S, although may be moving north). Mostly southern and western, also southeastern, US.
EHDV: Disease in North America, Australia, Asia, Africa; seropositive animals in South America

Incubation period:
BTV: 5-10 days in domestic sheep; typically infectious to insect vector for several weeks
EHDV: 5-10 day incubation in deer. May remain viremic for up to 2 months

Clinical signs:
BTV: Variable and species dependent.
Sheep: pyrexia, ptyalism, depression, dyspnea, panting, hyperemia and edema of muzzle, lips, tongue, ears, ulcerations and erosions in mouth, sloughing of hooves, abortion, loss of wool 3-4 weeks post infection. Recrudescence possible, severity partially dependant on serotype.
Cattle: pyrexia, rarely hyperemia, vesicles or ulcers in mouth, hyperemia of coronary band, dermatitis, hydranencephaly or cerebral cysts in calves.
Pronghorn and whitetail deer: hemorrhage and sudden death.
EHDV: Three distinct syndromes in deer:
Peracute: fever, anorexia, weakness, swelling of head and neck, respiratory distress; death within 8-36 hours
Acute/classical: multi-organ hemorrhage, ptyalism, rhinorrhea, oral and GI ulcerations; mortality may be high
Chronic: ill for several weeks with gradual recovery; may have hoof damage/slough or enough scarring from rumen ulcerations to cause emaciation
Typically subclinical in cattle, but clinical signs include fever, oral ulcers, salivation, lameness associated with coronitis, and weight loss. Fetal resorption and hydranencephaly possible; death uncommon in North America, although lameness and unthriftiness may be prolonged.

Post mortem, gross, or histologic findings:
BTV and EHDV: Clinical signs similar in affected animals, but both highly variable. Sheep: edema of face and ears, crusty exudates on nostrils, hyperemia of coronary bands, ulcers and erosions of oral cavity +/- necrosis and cyanosis; hyperemia, hemorrhage and edema throughout internal organs possible. Hemorrhage at base of pulmonary artery

BLUETONGUE VIRUS (BTV)
EPIZOOTIC HEMORRHAGIC DISEASE VIRUS (EHDV)

EHDV: In deer, gross findings differ with form of disease, consistent with clinical presentation. Histologic findings include widespread vasculitis with thrombosis, endothelial swelling, hemorrhages, degenerative changes, and necrosis in many organs.

Diagnosis: **S**erologic tests are only diagnostic with paired serum.
BTV: AGID, ELISA, CF, PCR, VI, VN
EHDV: AGID, PCR, VI, VN

Material required for laboratory analysis:
Serum for AGID, ELISA, CF, VN
Whole blood or spleen for PCR
Whole blood, spleen, or lung for VI
ELISA (if pre and post serum available), PCR, VI may be most useful clinically; positive serology does not correlate well with viremia.

Relevant diagnostic laboratories:
NVSL http://www.aphis.usda.gov/animal_health/lab_info_services/downloads/AmesDiagnosticTestingCatalog.pdf
TVMDL http://tvmdl.tamu.edu/schedule2.php

Treatment: Symptomatic; analgesics and anti-inflammatories may help address clinical signs

Prevention and control:
BTV: Limiting vector exposure, number and habitat. Pyrethroids or organophosphates effective against *Culicoides.* Vaccination for sheep available in some areas, typically serotype specific MLV (Serotype 10 available throughout US; combo of serotypes 10, 11, 17 in CA; 17 available in Texas). Vaccination recommended in spring prior to vector season in endemic areas; contraindicated in pregnant ewes and during outbreaks. Quarantine of imported animals, serologic screening, and vector control during transport are important for preventing introduction into bluetongue-free areas.
EHDV: Limiting vector exposure, as above. No vaccines available.

Suggested disinfectant for housing facilities: Primarily vector borne, unlikely to contaminate environment. However, sodium hypochlorite or 3% sodium hydroxide are effective if disinfection is warranted.

Notification: Required in certain states; check with AVIC or state veterinarian

Measures required under the Animal Disease Surveillance Plan: None

Measures required for introducing animals to infected animal: Seronegative animals (two negative test results >28 days apart with no vector exposure between), vaccinated animals or naturally immune animals (positive serologic test for all applicable serotypes >60 days prior) pose minimal risk for introduction. Introduction of an actively infected animal to a naïve population/area should be avoided. A viremic animal should become negative on PCR or VI prior to being introduced, which should take no longer than 60 days. During that time, the viremic animal should be kept without vector access and treated with insecticides (both animal and environment).

Conditions for restoring disease-free status after an outbreak: Seasonal in endemic areas, unlikely to be eradicated once established in vector population. OIE has firm guidelines for being classified as a BTV free country. Infection by one serotype of either virus usually offers lasting immunity for that serotype, though may not be protective against others.

Experts who may be consulted: NVSL, OIE, state veterinarian

References:

1. http://www.cfsph.iastate.edu/Factsheets/pdfs/bluetongue.pdf. Accessed 5 July 2013.
2. http://www.cfsph.iastate.edu/Factsheets/pdfs/epizootic_hemorrhagic_disease.pdf. Accessed 5 July

2013.
3. http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.01.03_BLUETONGUE.pdf. Accessed 5 July 2013.
4. http://www.eaza.net/activities/tdfactsheets/007%20Bluetongue.doc.pdf. Accessed 5 July 2013.
5. http://www.aphis.usda.gov/import_export/animals/oie/downloads/tahc_sep11/tahc_bluetongue_ch8_3_uo_80_sep11.pdf. Accessed 7 July 2013.
6. Committee on bluetongue and related Orbiviruses. 2009. Annual Report. Proc. USAHA. Pp. 182-205.
7. Howerth, E.W., Stallknecht, D.E., and P.D. Kirkland. 2001. Blue tongue, epizootic hemorrhagic disease, and other orbivirus-related diseases. *In*: William, E.S., and I.K. Barker (eds.). Infectious Diseases of Wild Mammals, 3rd ed. Manson Publishing Ltd., London, UK. Pp. 77-97.
8. Jauniaux, T.P., De Clercq, K.E., Cassart, D.E., Kennedy, S., Vandenbussche, F.E., Vandemeulebroucke, E.L., Vanbinst, T.M., Verheyden, B.I., Goris, N.E., and F.L. Coignoul. 2008. Bluetongue in Eurasian lynx. Emerg. Infect. Dis. 14: 1496-1497.
9. Maclachlan, N.J. 2011. Bluetongue: history, global epidemiology, and pathogenesis. Prev. Vet. Med. 102(2): 107-111.
10. Savini, G., Afonso, A., Mellor, P., Aradaib, I., Yadin, H., Sanaa, M., Wilson, W., Monaco, F., and M. Domingo. 2011. Epizootic hemorrhagic disease. Res. Vet. Sci. 91 (1): 1-17.