Report of the Committee on Bluetongue and Related Orbiviruses
Chair: Paul Gibbs, FL
Vice Chair: David Scott McVey, KS

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The Committee met on 26 OCT 2015at the Rhode Island Convention Center in Providence, Rhode Island from 1:00 PM to 5:50 PM. There were 20 members and 21 guests present.

Drs. Paul Gibbs and Scott McVey as committee chairs welcomed members and guests. The first order of business was a discussion of the 2014 resolution on surveillance for bluetongue. Dr. Brian McClusky and Dr. David Dargatz outlined the APHIS response to the 2014 Committee Resolution. Dr. McClusky is the Executive Director – Science, Technology and Analysis Services, APHIS, Veterinary Services. Dr. Dargatz is a Veterinary Epidemiologist at the Center for Epidemiology and Animal Health, APHIS, Veterinary Services.

APHIS Draft Plan Outline

1. Available Information

- Large serosurveys using slaughter samples for brucellosis
    - Annual to biannual from 1977-2002
        - Determined low (always <2.0% positive samples with 95% CI) v medium/seasonal (>2.0% positive samples w/ 95% CI in some studies) incidence States- delineations that are **still used**
            - Low- ME, NH, VT, MA, RI, CT, NY, NJ, DE, MD, WV, PA, OH, MI, IN, WI, MN, ND, AK, HI, and Western WA
            - Medium/ seasonal- CO, ID, IL, IA, KS, KY, MO, NE, NM, NC, OK, OR, SD, TN, UT, VA, WA, and WY
        - Multiple subsequent small scale studies
            - ND/SD/NE
            - IL/IN
            - CA
- Gap Analysis Workshop 2013
    - Identified knowledge gaps
        - Redefine regional virus zones/ distribution

2. Proposing pilot study to begin to address 2014 USAHA combined resolution 6 and 11

- Reassess historical regionalization/boundaries
    - Sentinel and vector surveillance
        - **Sentinel**- Start with herds in four states (MI, MN, WI, NY)
            - Low incidence and border medium/seasonal incidence states
            - Each herd 10-20 animals
                - Choose based on location and producer willingness

        - Ideal- all counties w/ cattle in each state represented (299)
      - Animals 6-12 mo at sampling (Reduce maternal antibody interference)
      - Bled once after vector season
      - Samples analyzed w/ BTV cELISA at state NAHLN lab
    - State considered positive if >2.0% of samples (+) with 95% CI
  - **Vector surveillance**
    - CDC blacklight traps
    - One trapping period (48h?) per operation per vector season
    - Trap at each establishment with sentinel herd
    - Samples analyzed in Manhattan, KS for vector presence/absence
    - +/- Pooled RT-PCR on catch samples for presence of BTV
      - Questionable value
      - Complicates collection/shipping procedures
      - **May not do PCR**

3. Other

- Looking to be able to repeat this study for at least 3 years, if not longer

Time-Specific Paper

Dr. Chris Oura of The School of Veterinary Medicine, Faculty of Medical Sciences, University of the West Indies presented a time-specific paper on **Bluetongue and Related Orbiviruses: A Global Update**.

Historically BTV has been confined to various parts of the world and its vectors (C*ulicoides* sp.) have been found in relatively distinct global ecosystems. In recent years however, the situation has become far more complicated with midge species moving to new areas of the world and BTV strains / serotypes appearing in new geographical areas, causing serious outbreaks of disease in naïve ruminant populations. Additionally, novel virulent strains of BTV have appeared which are pathogenic in cattle and have alternative transmission mechanisms (transplacental, oral and direct contact). This has transformed BTV into a potentially more virulent, reproductive pathogen, with more serious consequences for policy makers and international trade. It is clear that some strains of BTV are potentially more 'dangerous' than others, so countries need to be on their guard, through continued surveillance, in order to monitor which of the BTV serotypes and strains are present and circulating.

In this presentation, he provided some insights and lessons learnt (or not) from this 2006-2010 BTV-8 outbreak in Europe and a summary of recent research-based findings related to BTV that may affect the current risk status for the USA. The recent emergence of two unique BTVs [BTV-8) and BTV-26] has changed scientific thinking related to the epidemiology and transmission of BTV. The research behind these new discoveries and the resultant consequences for international trade will be presented and discussed. Dr. Oura also provided an update of BTV circulation in Trinidad (West Indies) where he is currently working, as well as in Europe in 2014 and 2015, concentrating on the current outbreaks of BTV-4 in the South-Eastern Europe and the recent re-emergence of BTV-8 in France.

Presentations & Reports

Bluetongue virus (BTV) and epizootic hemorrhagic disease virus (EHDV) isolations/PCR positives Calendar year 2014

Eileen Ostlund
USDA/APHIS/VS/STAS National Veterinary Services Laboratories

Bluetongue virus or RNA was detected in 11 samples submitted or collected during calendar year 2014. The positive bluetongue virus isolation (VI) and polymerase chain reaction (PCR) test results from submissions to the National Veterinary Services Laboratories (NVSL) in 2014 are listed in Table 1.

Table 1. BT virus isolation (VI) / PCR positives, calendar year 2014

State	***No.***	***Species***	***PCR***	***VI***	
CO	1	Goat	BTV-11	BTV-11	
FL	1	White-tailed deer	BTV-18	BTV-18	SCWDS submission for typing; confirmed NVSL VI *(NVSL testing March 2015, collected October 2014)*
ID	1	Alpaca	BTV Positive	Not done	High Ct; insufficient virus for typing or VI
ID/WI	1	Cattle	BTV-10	BTV-10	In quarantine in WI, recently shipped from ID
MO	1	Cattle	BTV Positive	Not done	High Ct; insufficient virus for typing or VI
NE	2	White-tailed Deer	BTV-17	BTV-17	BTV-17 isolated from 1 deer
NE	1	Bighorn sheep	BTV-10	BTV-10	
NJ	3	White-tailed Deer	BTV-17	BTV-17	2 were SCWDS positive cases submitted for type confirmation

During calendar year 2014, 6 samples tested positive for EHDV by virus isolation and/or PCR. The positive EHDV isolation and PCR test results from submissions to NVSL in 2014 are listed in Table 2.

Table 2. EHDV isolation (VI)/ PCR positives, calendar year 2014

State	*No.*	*Species*	*PCR*	*VI*	
FL	1	Deer	EHDV-2	EHDV-2	
FL	1	White-tailed Deer	EHDV-6	EHDV-6	
NE	1	Bison	EHDV	Not done	Suspect Ct; insufficient virus for typing or VI
NC	2	White-tailed Deer	EHDV-6		Rollins Laboratory isolates submitted for typing
TX	1	Eld's Deer	EHDV-2	EHDV-2	

Part-year 2015 data for NVSL orbivirus identifications is shown in Tables 3 and 4. As of October 23, BTV has been identified in 38 samples from 8 states and EHDV has been identified in 13 samples from 5 states.

Table 3. Bluetongue virus (BTV) isolations/PCR positives during Calendar year 2015 (January 1 through October 23)

STATE	*NO.*	*SPECIES*	*PCR*	*VI*	
AZ	1	Bighorn sheep	BTV-10	Neg	
CA	5	Sheep	BTV-10	Pending	CAHFS-UC Davis BTV-pos PCR submission for typing
CA	1	Mule deer	BTV-17	Pending	WADDL BTV-pos PCR submission for typing
CA	2	Sheep	BTV-17	Not done	CAHFS-UC Davis BTV-pos PCR submission for typing; insuff for VI
FL	1	White-tailed deer	BTV-6	Pending	Also positive EHDV-6
FL	1	White-tailed deer	BTV-10	BTV-10	
FL	1	White-tailed deer	BTV-19	Neg	Bacterial contamination in cell culture
FL	1	White-tailed deer	BTV-22	Pending	TVMDL BTV-pos PCR submission for typing
FL	1	White-tailed deer	BTV-24	Pending	
ID	1	Cattle	BTV-17	Pending	WADDL BTV-pos PCR submission for typing
ID	4	Sheep	BTV-17	Pending	WADDL BTV-pos PCR submission for typing
ID	2	White-tailed deer	BTV-17	Pending	WADDL BTV-pos PCR submission for typing

ID	1	Yak	BTV-17	Pending	WADDL BTV-pos PCR submission for typing
NV	1	Cattle	BTV-13	Pending	WADDL BTV-pos PCR submission for typing
NV	3	Bighorn sheep	BTV-17	BTV-17	WADDL BTV-pos PCR submission for typing
OK	1	Sheep	BTV-13	Not done	High Ct, insufficient virus for VI
TX	1	Cattle	BTV-3	BTV-3	TVMDL BTV-pos PCR submission for typing
TX	1	White-tailed deer	BTV-3	BTV-3	TVMDL BTV-pos PCR submission for typing
WA	2	Mule deer	BTV-17	Pending	WADDL BTV-pos PCR submission for typing
WA	7	White-tailed deer	BTV-17	Pending	WADDL BTV-pos PCR submission for typing

Table 4. Epizootic hemorrhagic disease virus (EHDV) isolations/PCR positives during calendar year 2015 (January 1 through October 16)

State	***No.***	***Species***	***PCR***	***VI***	
FL	1	White-tailed deer	EHDV-6	Pending	Also positive BTV-6
IL	1	White-tailed deer	EHDV-2	Neg	
IA	2	Cattle	EHDV-2	Pending	
IA	5	White-tailed deer	EHDV-2	EHDV-2	Isolate from 1 case; 2 cases pending VI; 2 cases VI not done
KS	1	White-tailed deer	EHDV-2	Neg	Bacterial contamination in cell culture, no VI
OK	1	Elk	EHDV-2	Not done	Tissue autolyzed, no VI
OK	2	White-tailed deer	EHDV-2	EHDV-2	Isolate from 1 case; 1 case VI not done

Update - the Arthropod-Borne Animal Diseases Unit – *Orbivirus* and *Culicoides* Research

David Scott McVey
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The Arthropod Borne Animal Diseases Research Unit's (ABADRU) research mission is to solve major endemic, emerging, and exotic arthropod-borne disease problems in livestock. The Unit completed the move to Manhattan, KS in 2010 and now the ABADRU is well established at the Center for Grain and Animal Health Research (CGAHR). All ABADRU research falls under the ARS National Research Programs: NP103 and Animal Health and NP104, Veterinary, Medical, and Urban Entomology. The areas of research range from vector biology to virus-host interactions.
The viruses that cause bluetongue (BT) and epizootic hemorrhagic disease (EHD) are of concern to livestock producers in North America because of 1) the emergence of new serotypes, 2) increased reports of spillover and clinical disease in cattle, and 3) increased spread and adaptation to new geographical areas. Current projects in ABADRU include virus genotyping of more recent isolates, virus transmission and related pathogenesis, development of fluorescent microsphere assays for detection of virus-specific antibody and RNA, EHDV infection and transmission of whitetail deer, vector genetics, vector proteomics, vector transcriptomics, vector ecology/biology and vector control.
The United States Animal Health Association (USAHA) passed Resolution 16 in October 2012 requesting the United States Department of Agriculture (USDA) and the United States Department of Interior (DOI) to organize a diverse panel of experts including industry stakeholders, university and federal researchers, and federal and state regulatory agency representatives to determine research needs and identify and prioritize intervention strategies. In response to USAHA Resolution 16, USDA in collaboration with DOI organized a gap analysis workshop composed of international experts on *Orbiviruses*. The workshop participants met at the Arthropod-Borne Animal Diseases Research Unit in Manhattan, Kansas, May 14–16, 2013, to assess the available scientific information and countermeasures to effectively control and mitigate the impact of an outbreak of an emerging *Orbivirus* with epizootic potential, with special emphasis given to bluetongue virus (BTV) and epizootic hemorrhagic disease virus (EHDV).

The report of this workshop can be obtained through:

Orbiviruses, Bluetongue and Epizootic Hemmorhagic Disease: Gap Analysis Workshop Report. 2013. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC. The work has been published in *Vector-Borne and Zoonotic Diseases*.

Report:
http://go.usa.gov/BJ5F

Journal:
http://online.liebertpub.com/toc/vbz/15/6#utm_source=ETOC&utm_medium=email&utm_campaign=vbz

SCWDS *Culicoides* Surveys Update

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Since late 2007 the Southeastern Cooperative Wildlife Disease Study (SCWDS) has been conducting surveys for *Culicoides* biting midges, a group that includes vectors of bluetongue virus (BTV) and epizootic hemorrhagic disease virus (EHDV), across the Southeastern United States. From November 2007 – September 2015 *Culicoides* surveys were conducted at 318 sites across eleven states: Florida, Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Missouri, Tennessee, North Carolina, and

South Carolina. These surveys account for over 6,900 trap-nights of insect collections. Surveys are conducted by deploying a series of eight to twelve CDC light traps (equipped with UV light and ethanol filled collection jars) at an individual site in the late afternoon. The traps run overnight, and are collected the next morning. Most surveys have been conducted in the late summer and early fall (August and September) to coincide with the peak BTV/EHDV virus transmission period.

At the SCWDS lab, insects from 6,600 traps have been sorted and over 276,000 biting midge specimens have been counted. Of those, over 4,200 individual *Culicoides* specimens have been slide-mounted, and over 8,500 individuals have been identified to species. Total *Culicoides* identified to date include representatives of 55 species. New county and/or state records have been recorded for 11 species; *Culicoides beckae, C. oklahomensis*, *C. alachua*, *C. hollensis, C. neopulicaris, C. butleri, C. insignis, C. sonorensis, C. barbosai, C. loisae, and C. kirbyi*. Of these species, *C. insignis* is of particular importance due to its implication in bluetongue virus transmission in the Neotropics. Since 2007, we have collected *C. insignis* from increasingly northern and western locations within the Southeastern United States. We have identified *C. insignis* from an increasing number of sites in Alabama and Georgia, and have recorded new state records for this species in Mississippi (2008) and Louisiana (2014).

Culicoides sonorensis, the primary North American vector of BTV/EHDV, continues to be a rare collection in light trap surveys across the Southeastern United States. Of the 318 sites surveyed, *C. sonorensis* was collected from ten sites. Of those ten sites, seven of them were associated with livestock and/or captive cervids. The remaining three sites were Wildlife Management Areas (Louisiana, Alabama, and South Carolina). One sample of *C. sonorensis* was captured in one trap during one trapping year at both the Louisiana WMA and the South Carolina WMA. At the final site, a WMA in Alabama, *C. sonorensis* has been consistently collected during 2011, 2012, and 2013 surveys.

SCWDS Hemorrhagic Disease Update

During 2014, there were 27 viruses isolated from 114 virus isolation attempts made, representing 22 states and 6 species (98 white-tailed deer, 6 bison, 4 mule deer, 3 big horn sheep, 2 black-tailed deer, and 1 elk). Isolations were made from white-tailed deer in Florida (EHDV-6, BTV-18), Georgia (EHDV-2), Idaho (EHDV-2), Kentucky (EHDV-2), Louisiana (EHDV-2 and -6), Mississippi (EHDV-2), Montana (EHDV-2), New Jersey (BTV-17), and North Carolina (EHDV-6). In addition, EHDV-2 was isolated from a black-tailed deer in Oregon. The isolation of BTV-17 represents the first isolation of any BTV serotype from New Jersey.

As of September 30, 2015, there have been 40 viruses isolated from 113 virus isolation attempts made, representing 19 states and 5 species (103 white-tailed deer, 4 mule deer, 3 elk, 2 key deer, and 1 bison). Isolations were made from white-tailed deer in Florida (EHDV-1 and -6), Idaho (BTV-17), Indiana (EHDV-2), Kansas (EHDV-2), Kentucky (EHDV-2), Louisiana (EHDV-2), Mississippi (EHDV-2), Missouri (EHDV-2), Montana (BTV-17), and North Carolina (EHDV-6).

BTV8 infection in France: Implications

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Bluetongue and other Culicids-borne viruses have a track record of multiple introductions into Europe at remarkably unpredictable intervals. Since 1999 Southern Europe was subject to several introductions of the virus, with serotypes 2, 4, 9 and 16, that were linked to climate change. Between 2006 and 2011, large outbreaks of serotypes 8 and 1 broke out and spread over Northern Europe, in regions that had never been affected by the disease before. In 2014, Southeastern Europe reported an outbreak due to serotype 4. In August 2015, serotype 8 unexpectedly re-emerged in the center of France, in the Allier department. The country had been declared free of the disease on its mainland since 2012. The authorities have created a large restriction zone and are implementing wide spread vaccination. The origin of the re-emergence of the disease remains unclear. The unpredictability of BTV serotypes

introduction and re-emergence in Europe has set a number of challenges for vaccine development and manufacturing:

- Each introduction of a new serotype means development of a new product that becomes available only after the first wave of infection
- The cyclical nature of the market represents a challenge for management of inventory and available capacity.

Cervidae Health Research Initiative

Dr. Gibbs presented information provided by Dr. Samantha Wisely about the Cervidae Health Research Initiative. This initiative seeks to promote interdisciplinary science, education and outreach that increase the health and production of captive cervids in a sustainable manner and promotes the health of native wildlife and the ecosystems in which they live. This program will include epizootic hemorrhagic disease as a focus of study.

Committee Business:

In light of Dr. McClusky's report, the 2014 resolution was amended by a unanimous vote of the committee to include Epizootic Hemorrhagic Disease and the need to include serotype identification as part of the surveillance program. Dr. Peter Kirkland provided a history and overview of the Australian surveillance program for bluetongue and discussed the financial structure much of which comes from the livestock industry.

A possible change in the name and mission of the committee to include other arbovirus diseases was discussed. The committee decided that the committee's mission should remain as stated.

The meeting adjourned at 5:50 PM.