Overview of the Arthropod-Borne Animal Diseases Unit – OCT 2016 USAHA

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2016 K-State Agricultural Tour
CGAHR Research Units

**Arthropod-Borne Animal Disease Research Unit:** Identify and solve major endemic, emerging, and exotic arthropod-borne diseases challenges in U.S. livestock

**Hard Winter Wheat Plant Genetics Research Unit:** develop molecular markers and mechanisms for resistance to stresses; improved germplasm (disease resistance and environmental tolerance)

**Grain Quality and Structure Research Unit:** Grain composition and quality traits related to genetics and environment

**Stored Product Insect and Engineering Research Unit:** biology, ecology, management of stored grain insect pests (red flour beetle) and rapid grain sorting technology development
ABADRU Research

Diagnose, understand and control of livestock diseases transmitted by arthropod vectors

**Arthropods**
- biting midges, mosquitoes, flies

**Understand disease transmission and progression**
- *Orbivirus* diseases, Rift Valley fever, vesicular stomatitis, others

**Develop countermeasures for vectors, virus transmission and disease impact (limiting clinical disease and spread)**
- preventative and predictive, diagnostic
Multidisciplinary Problems:
Multidisciplinary Research Team

MAMMALIAN HOST
Veterinarians

INSECT VECTOR
Entomologists

INFECTIOUS AGENTS
Virologists
Research Program - 1

- Orbiviruses
  - Midge infection/transmission
  - Midge biology
  - Pathogenesis – relative virulence via midge transmission
  - Dipteran population genetics – and proteomics genomics, transcriptomics
  - Serological assays for surveillance and diagnostics (multiple species)

- Bunyaviruses
  - RVFV – diagnostics, DIVA vaccines
  - Mosquito transmission mechanics
  - Mosquito population genetics
  - Epidemiological-based modelling of transmission
Research Program - 2

- Flaviviruses
  - Infection of mosquitoes – virus transmission (JEV)
  - Serological assays for surveillance and diagnostics (multiple species)
  - Infection models – swine
  - Mosquito population genetics – virus/vector ecology
  - Epidemiological-based modelling of transmission
- Vesicular Stomatitis
  - Virus/vector ecology
  - Surveillance methodology
Concern Over BTV-8

- The recent outbreak was unprecedented
- High morbidity and mortality in livestock
- Unusually large number of cattle became clinically ill
- Significant vertical transmission in cattle reported
- Significant negative affects on cattle fertility reported

- Are North American deer and sheep susceptible? Yes
- What North American Culicoides species would be able to transmit BTV8? *C. sonorensis*, others?
- Transmission processes, immune responses
Rift Valley Fever

• Currently endemic in Africa but has shown potential to spread outside the continent in 2000
  – Crossed Arabian peninsula to Saudi Arabia and Yemen
  – 100 people died and 800 became ill
  – A few cases reported this year in Saudi Arabia (Mar-Aug) in cattle and sheep

• Limited vaccines are currently available in Africa
• Only conditional licensed vaccines in the US
• No commercialized diagnostics in the US – problems with availability, performance dynamics and standardization

• Vaccine candidates available, serological tools available,
• Work characterizing transmission and virulence continues
qRT-PCR and Virus Titration Sheep vaccine trial 2015

Figure 3

Culex tarsalis collections
Populations - *C. tarsalis*
Aedes vexans collections
Populations – A. vexans
1. Potential introduction/spread models.
2. Infection models in swine
3. Viral infection of mosquitoes and supportive surveillance assays
Vesicular Stomatitis

1. Virus/vector ecology associated with disease emergence.
2. Differential infection of vectors and transmission dynamics
Contact

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