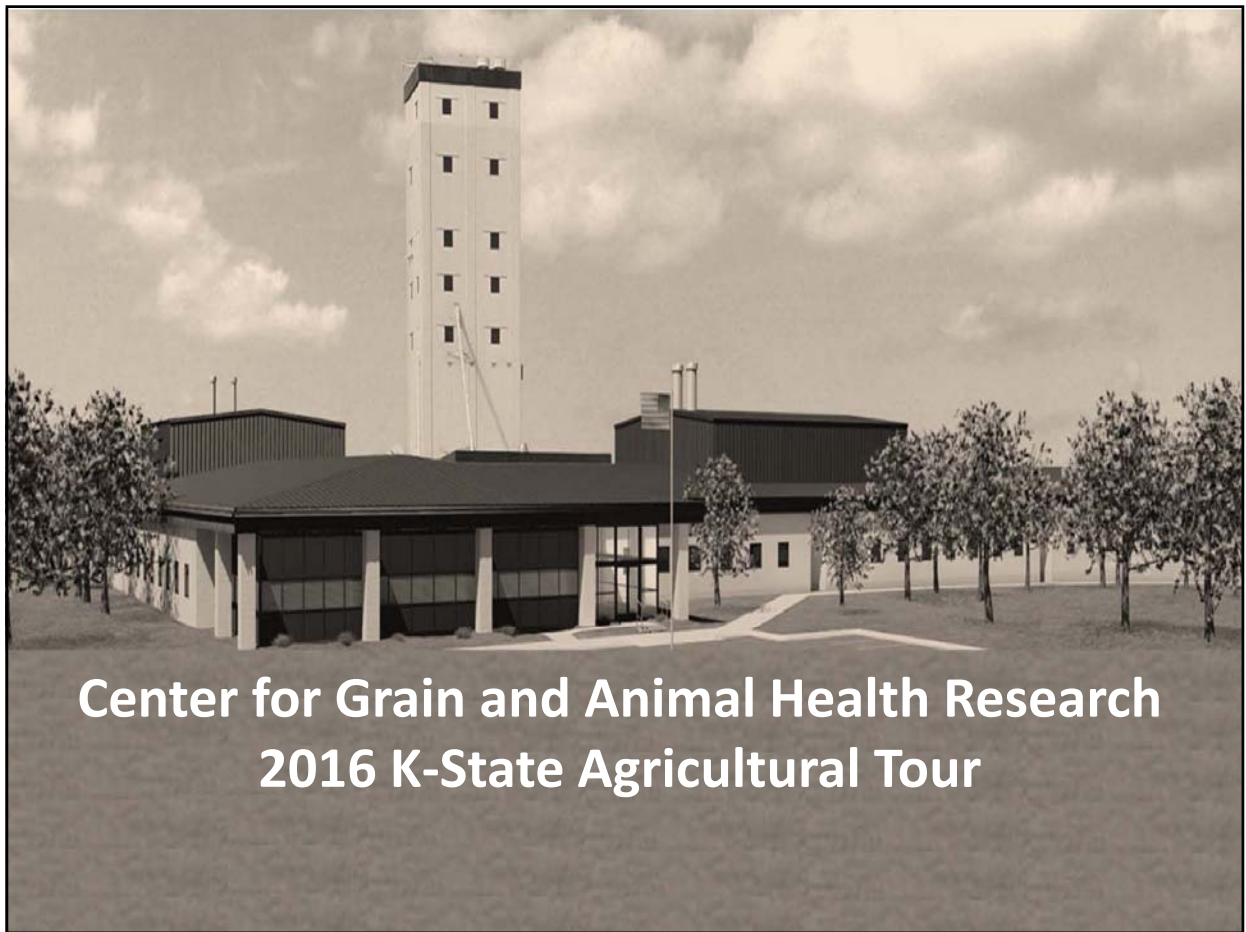


Overview of the Arthropod-Borne Animal Diseases Unit – OCT 2016 USAHA

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**Center for Grain and Animal Health Research
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

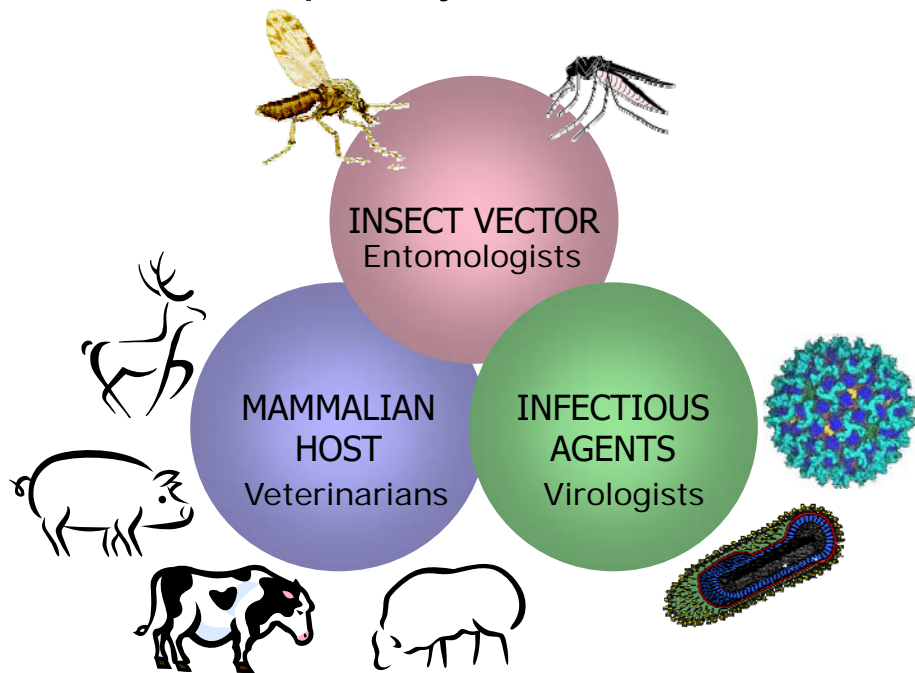
Understand disease transmission and progression

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



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 mechanistics
 - Mosquito population genetics
 - Epidemiological-based modelling of transmission

Research Program - 2

- Flaviviruses
 - Infection of mosquitos – 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

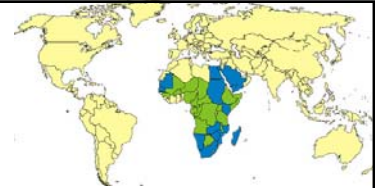
Concern Over BTV-8

- 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

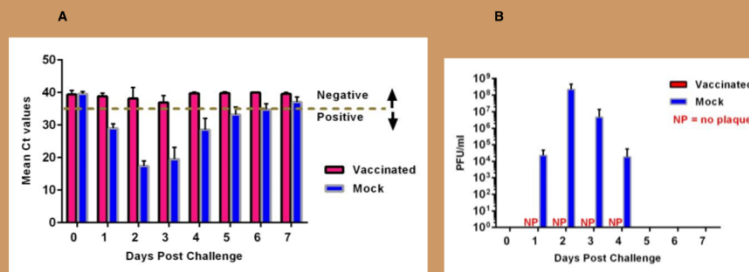
Rift Valley Fever



- 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

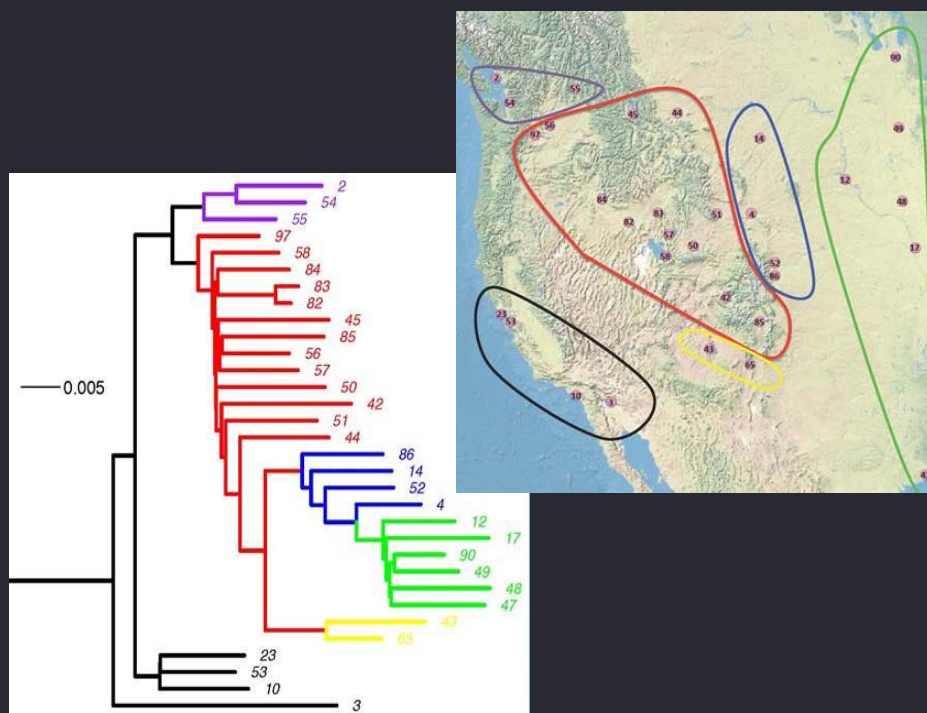
qRT-PCR and Virus Titration Sheep vaccine trial 2015

Figure 3

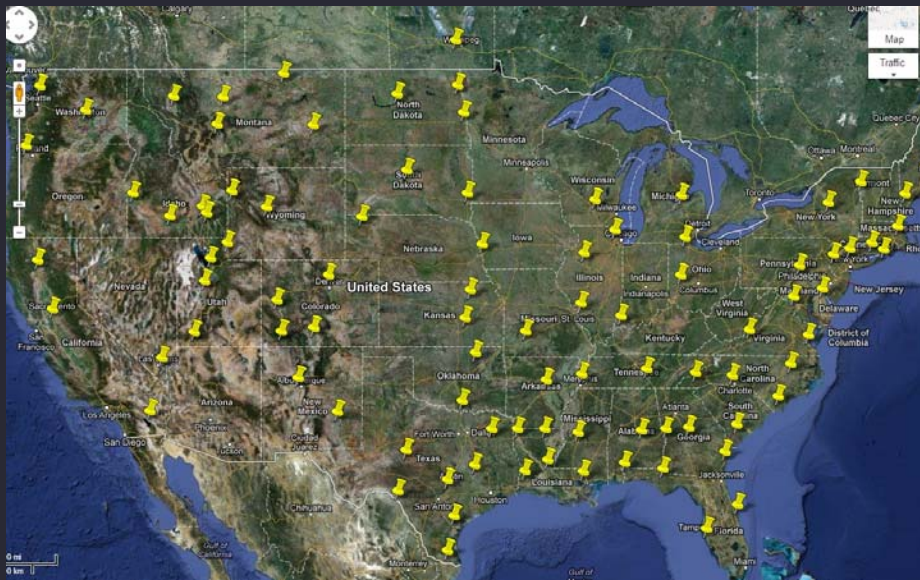


Faburay et al., *Scientific Reports* 6: 27719. 2016.

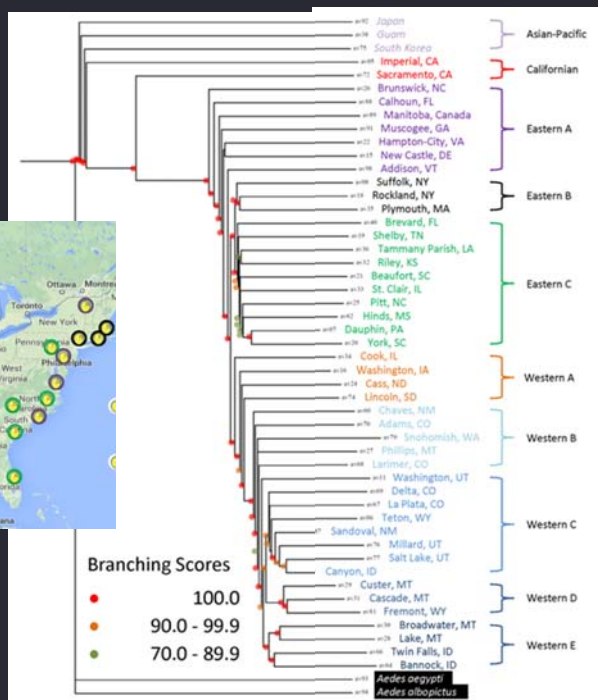




Populations - *C. tarsalis*

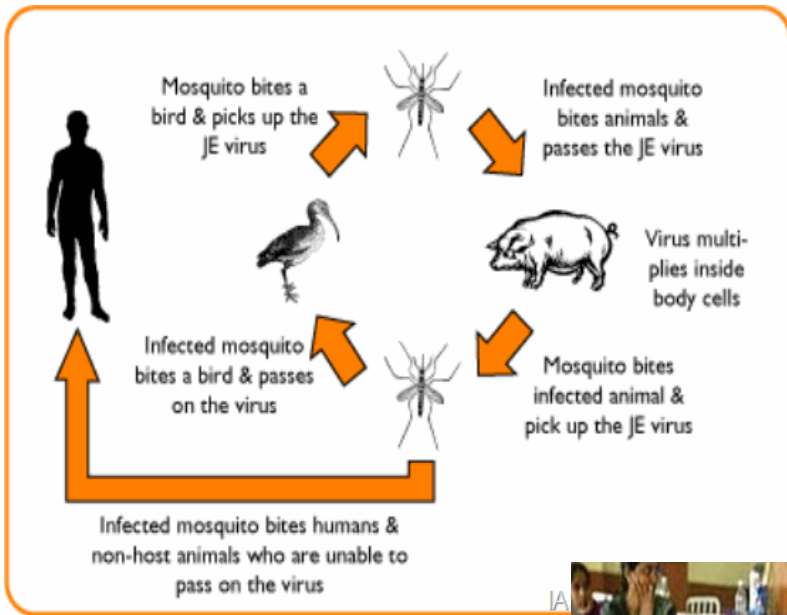


***Aedes vexans* collections**



Populations – *A. vexans*

JEV



1. Potential introduction/spread models.
2. Infection models in swine
3. Viral infection of mosquitos 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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