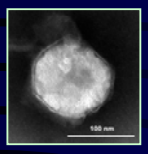
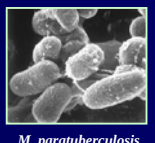
Amphibian Disease Research at the University of Tennessee



Frog Virus 3



M. paratuberculosis

Matthew J. Gray
Institute of Agriculture

Amphibian Disease Program

Interactions of Cattle and Amphibians

Food Safety

Amphibian Conservation

Justification: Amphibians may increase prevalence of foodborne pathogens in beef products.

Goal: Determine if amphibians can function as reservoirs of foodborne pathogens.

Justification: Cattle may negatively influence amphibians, which are declining globally.

Goal: Determine if cattle use of farm wetlands increases pathogen prevalence in amphibians.

Collaborator: University of Georgia Veterinary Diagnostic and Investigational Lab

Amphibian Disease Program

Food Safety and Public Health

Current Research: An Untested Hypothesis

USDA **NIH**

'Spill-over' Reservoirs

Infected Individual

- E. coli O157:H7
- Salmonella
- L. monocytogenes
- C. parvum
- M. paratuberculosis

Dispersal

Foodborne Pathogens

>$35 Billion

76 Million Cases

Amphibian Disease Program

NSF | **Amphibian Conservation** | **NIH**

Current Research: An Untested Hypothesis

Goal

Establish a link between human land use and recent increases in emerging infectious diseases

Hypothesized

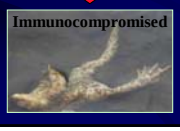
Anthropogenic environmental stressors increase pathogen prevalence in wildlife populations by compromising immunity

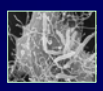
Decrease Water Quality

Decreases in Lymphocytes

FV3 Type

Ranavirus



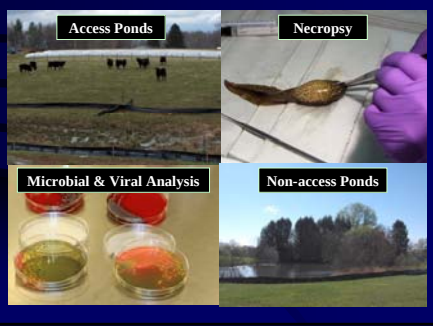


Aeromonas hydrophila

Amphibian Disease Program

8 Ponds (4 per land use) | **Amphibian Conservation** | **Plateau REC**

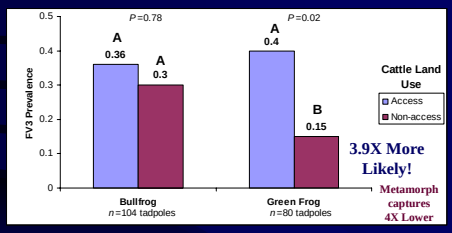
Pilot Study Results: Land-use Effect



Amphibian Disease Program

8 Ponds (4 per land use) | **Amphibian Conservation** | **Plateau REC**

Pilot Study Results: Land-use Effect



3.9X More Likely!

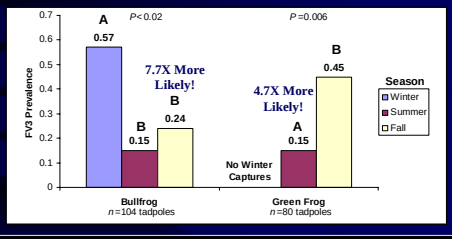
Metamorph captures 4X Lower

First Documentation of an Association between a Human Land Use and Increased Pathogen Prevalence in a Wildlife Species

Amphibian Disease Program

Amphibian Conservation

Pilot Study Results: Season Effect



First Documentation of Seasonal Trends in FV3 Prevalence

Funded by: •Tennessee Wildlife Resources Agency $102,212
•UTIA Start-up Funds •UGA In-kind Contributions

Funding Pursuits

2005–2006

1) National Science Foundation: $1,573,583

Epidemiology of pathogens in amphibian populations inhabiting agricultural landscapes.

Location: Plateau REC, UT and UGA Campuses

•E. coli O157:H7
•C. parvum
•Frog virus 3
•A. hydrophila

2) USDA, National Research Initiative: $667,314

Examining the role of amphibians inhabiting farm ponds as reservoirs of foodborne pathogens.

Location: Plateau, Dairy and Middle TN RECs; UT and UGA Campuses

•E. coli O157:H7
•Salmonella
•Camplyobacter
•C. parvum
•L. monocytogenes
•M. paratuberculosis

➡ Field sampling and Controlled Experimental Infections

co-PIs: UT = Dr. Graham Hickling
UGA = Drs. Debra Miller, Sreekumari Rajeev, and Charles Baldwin

Acknowledgments

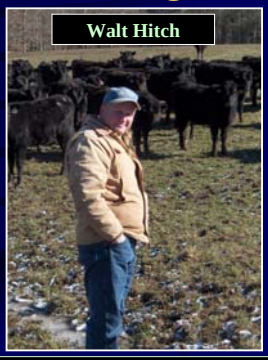
Dr. Debra Miller, UGA

Chandler Schmutzer, MS Candidate

Liz Burton, MS Candidate

Acknowledgments

Walt Hitch



Director, University of Tennessee Plateau Research and Education Center