Susceptibility of common fish and chelonians to ranavirus

Tucker, J. L.1, R. Brenes1, D. L. Miller1,3, T. B. Waltzek2, R. P. Wilkes3, M. D. Brand1, J. C. Chaney1, R. Hardman1,3, N. Hilzinger1,3, R. Huether3, and M. J. Gray1
1Center for Wildlife Health, University of Tennessee, Knoxville
2College of Veterinary Medicine, University of Florida
3College of Veterinary Medicine, University of Tennessee

Introduction
Ranaviruses have been associated with mortality of lower vertebrates around the world. FV3-like ranaviruses have been isolated from different ectothermic vertebrate classes; however, few studies have demonstrated whether this pathogen can be transmitted among classes.

Objective
Our objective was to determine occurrence of ranavirus transmission (infection prevalence) and relative susceptibility (percent mortality) for five fish and four turtle species exposed to FV3-like ranaviruses isolated from three different ectothermic vertebrate classes.

Virus
The challenges were conducted using FV3-like ranavirus isolates obtained from three different ectothermic hosts; fish (pallid sturgeon), turtle (Box Turtle), and amphibian (American Bullfrog).

Fish
We tested five species of fish from five families: Tilapia (Oreochromis niloticus niloticus); Channel catfish (Ictalurus punctatus), Mosquito fish (Gambusia affinis), Bluegill (Lepomis macrochirus); and Fathead minnow (Pimephales promelas). These species can be found in association with turtles and amphibians, and some are important in aquaculture and sport fisheries.

Methods
Fish and turtle hosts were exposed to a ranavirus isolated from an amphibian (Lithobates catesbeianus), a turtle (Terrapene carolina carolina), and fish (Scaphirhynchus albus) species.

Exposure was administered via water bath (10^3 PFU/mL) for three days and survival was monitored for 28 days. Individuals were monitored daily for survival and morbidity. Experiments lasted 28 days.

Ranavirus Testing
Necropsy: individuals were dissected and gross signs were recorded. Sections of liver and kidney were extracted and frozen at -80°C for real-time PCR analysis, and rest of the body was stored in 10% buffered formalin for histopathology.

Results

Turtles
We tested four species of turtles from two families: Red-eared slider (Trachemys scripta) Eastern Spiny Soft-shell Turtle (Apalone spinifera), Eastern river cooter (Pseudemys concinna) and Mississippi Map Turtle (Graptemys kohni). Red-eared slider: • 5% mortality when exposed to the turtle isolate

Mosquito fish:
• 10% mortality when exposed to the turtle and amphibian isolates
• 5% mortality and 5% subclinical infection from the fish and amphibian isolates.

Discussion
Our results demonstrate that FV3-like ranaviruses are capable of infecting hosts from different ectothermic classes. Although substantial mortality did not occur in our experiments, the occurrence of subclinical infections in mosquito fish, soft-shelled and map turtles, suggests that fish and chelonians may function as reservoirs for FV3-like ranaviruses.

Moreover, these species may contribute to pathogen pollution via the pet trade or mosquito fish releases for insect control.

Our study is the first to report that a chelonian species can be infected by a ranavirus originating from a fish.

Acknowledgments
We thank the UT Institute of Agriculture, Society of Wetland Scientists, and JARTU Facility for support of this research. The following individuals assisted with this study: Dr. Melissa Kennedy, Roger Long, Lauren Henderson, and Chris Lituma.