Comparative Pathology of Ranaviral Disease among Amphibians, Reptiles and Fish

Debra L. Miller, DVM, PhD

Center for Wildlife Health and Department Pathobiology University of Tennessee

Amphibians

Swelling (most often edema)  Erythema, Ulcerations

Photo courtesy Nathan Haislip

Photo, Betsie B. Rothermel
May vary by life stage
[adults most reported from Europe, but elsewhere too]

Varies by host (species)-susceptibility & isolate
(e.g., mortality: RI [ranaculture isolate] vs FV3)

Cope’s tree frog (~70% RI; ~40% FV3)

Wood frog (~100% for both)

Bullfrog (~10%; 0% FV3)
Internal lesions

Hemorrhage

Fat bodies

Spleen

Pale, swollen organs

Tan areas [necrosis] on organs

Histology
In North Georgia concurrent in morbid *Notophthalmus viridescens* and *Lithobates clamitans*.

Ranavirus-positive animals plus: Parasites increased

In Tennessee: Die-off in *L. clamitans*, *L. catesbeianus*, *N. viridescens*
What about reptiles?

SCWDS case
(slides courtesy of Dr. Mark Ruder)
Eastern box turtle (*Terrapene carolina carolina*)
Gross Findings (cont.)

Some microscopic findings

- Ulcerated crust on oral mucosa
- Disrupted muscle fibers
- Myofibers disrupted
- Heterophilic vasculitis
Diagnostics

- *Ranavirus* isolated in tissue culture
  - Partial sequencing yielded Frog virus 3
- PCR on oropharyngeal swab and nasal flush
  - *Ranavirus* - positive
  - *Herpesvirus* and *Mycoplasma* - negative
- *Mycoplasma* culture of nasal flush
  - Negative

What about water turtles?
Concurrent infections compound the diagnosis

- Parasitism
  - Soft shells
    - Spirorchid eggs (often systemic)
    - Entomeoba spp trophozoites (intestines only)

- Bacterial Enteritis
  - Sliders

Current investigation:
What about Fish?

- Ecchymosis and petechiation on the ventral surface
- Pale gills and liver
- Friable kidneys and liver
- Lesions/organs PCR positive for ranavirus

Photo courtesy Emilie Travis
Pallid Sturgeon Isolate from mortality event

Photos Courtesy Tom Waltzek

Hematopoietic necrosis; tubular epithelial necrosis

Endothelial necrosis
Liver: Portal triad: endothelial necrosis (arrow)
Also: hematopoietic necrosis (arrow head).

Planned investigation:

Pilot study: fish challenges (Fall 2011)
Acknowledgements

- Matt Gray
- Jason Hoverman
- Betsie Rothermel
- Mark Ruder
- Tom Waltzek
- Nate Hilzinger
- Becky Hardman
- Nathan Haislip
- Roberto Brenes
- Sean Roon
- Sandy Baldwin
- Lisa Whittington
- Dallas Ingram
- Diane Rousey
- Kim Bridges
- Melissa Gandy
- Eloise Styer
- Emilie Travis
- Kevin Keel
- Various zoos and aquaria

Questions?