Ranaviruses in European reptiles

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IVs in Reptiles in Europe

- Invertebrate iridovirus-like viruses in lizards
- Erythrocytic viruses in lizards, snakes and turtles
- Ranaviruses in chelonians and lizards
Ranaviruses in Reptiles in Europe

- Chelonians
- Lizards
First reports

- In the 1980’s in Switzerland (Heldstab and Bestetti, 1982; Müller et al., 1988)
- In Hermann’s tortoises (*Testudo hermanni*),
- In Switzerland (1 x imported from Yugoslavia)
- Associated with mass die-off with stomatitis, necrosis in the liver and spleen
- Virus detected by EM
First case: chelonians
(Marschang et al., 1999)

• Group of 7 juvenile Hermann’s tortoises (*Testudo hermanni*) from a zoo in Switzerland
• All housed together
• All died (1996)
• Tissues from 2 examined virologically
Pathological lesions

- Hyperemic, ulcerated mucosa covered by yellowish fibronectotic material in:
  - Oral cavity
  - Tongue
  - Pharynx
  - Esophagus
  - Small and large intestine and cloaca
Histology

- Basophilic round to ill defined intracytoplasmatic inclusions in:
  - Epithelial cells of the gastrointestinal tract
  - Hepatocytes
  - Pulmonary epithelium (1 animal)

Epithelial cells of the tongue, HE
Diagnosis

• Virus isolated in cell culture (TH-1) from:
  – Animal 1:
    • Tongue, trachea, lung, liver, esophagus, stomach, small intestine, large intestine, cloaca, spleen, kidney, gonads
    • NOT from heart, brain, spinal cord
  – Animal 2:
    • Tongue
    • NOT from brain
Second case: chelonians

(Benetka et al., 2007)

- Adult leopard tortoise (*Geochelone pardalis*)
- Imported into Austria from Ethiopia
- Necrotizing stomatitis, dehydration, apathy, and anorexia
- Animal treated and recovered after 4 months
Diagnosis

- Ranavirus detected by PCR (MCP gene)
  - From pharyngeal swab and necrotic material from oral cavity
  - 513 bp 99.4% identical to FV3
- Herpesvirus also detected
Fourth case: chelonians

(Blahak, unpubl; Uhlenbrok, 2011)

- Egyptian tortoise (*Testudo kleinmanni*) in Germany 1996
- 2 animals affected, one died, other recovered
- Pathology:
  - Rhinitis, Conjunctivitis, hyperemic mucous membranes in the oral cavity, enlarged liver and spleen
- Virus isolation in cell culture (TH-1)
  - From the tongue
Beginning in 2007 in Germany
Several different tortoise collections
All purchased healthy female Hermann‘s tortoises (*Testudo hermanni*) inexpensively prior to outbreak
Hermann‘s tortoises, spur-thighed tortoises (*T. graeca*) and marginated tortoises (*T. marginata*) affected
Clinical signs

- Some but not all tortoises in each collection affected, some recovered, some died
- Inapetence, apathia, conjunctivists, nasal discharge, plaques in oral cavity
• Diphtheroid-necrotic stomatitis
• Enlargement of the spleen
• In individual cases:
  – Inflammation of the colon
  – Petechial hemorrhage of serosa and muscles
• Intracytoplasmic inclusion bodies in epithelial cells of tongue, lung and kidney in individual cases
Diagnosis

- Virus detection by PCR (MCP gene) and cell culture (TH-1)
- In many different tissues, tongue most often positive
- Oral swabs in live animals
First case: lizards

(Marschang et al., 2005)

- Leaf tailed gecko in Germany, captive bred
- Kept together with other reptiles and a toad
- Died after 2 weeks of anorexia
- Other reptiles and toad as well as offspring healthy
Pathological signs

• Granulomatous lesions on the tongue and tail:
  – ulcerative necrotizing glossitis with bacterial colonies

• Focal necrosis in the liver with periferal bacterial colonies
Diagnosis

• Virus isolated in TH-1 from:
  – Liver
  – Stomach

• No other tissues tested

• Healthy toad and other lizards from
  collection tested by oral and cloacal
  swabs, all negative
Second case: lizards

(Alves de Matos et al., 2010)

Lacerta monticola, Portugal
Viral erythrocytic infections
Ranaviruses in lizards

- Isolated from a *Lacerta monticola* in Portugal
- Wild caught
- With erythrocytic virus
Diagnosis

- Virus isolated in IgH2 from blood
- Clear CPE observed after 5 passages
Summary

- Ranaviruses reported in 7 different reptile species
  - *Testudo hermanni*, *T. kleinmanni*, *T. graeca*, *T. marginata*, *G. pardalis*, *Uroplatus fimbriatus*, *Lacerta monticola*
- From 4 different European countries
  - Austria, Germany, Switzerland, Portugal
- From captive animals in 5 cases, 1 wild-caught lizard
Characterization and comparison

- Ranaviruses from 4 different reptile species
- From 4 different European countries
- From captive animals in 4 cases, 1 wild-caught lizard
Summary

• Ranaviruses found in multiple countries and multiple species in Europe
• Associated with disease in all cases reported so far
• Reptile viruses distinct from one another
Future Research

• Further comparison of reptilian and amphibian ranaviruses
  – Host specificity?
• Diagnosis and prevalence of ranaviruses in reptiles
• Study of erythrocytic viruses (Cooperation with A.P. Alves de Matos and M.F. Caeiro)
  – Virus characterization, isolation in cell culture, identification of vectors
• Environmental persistence and inactivation of ranaviruses
Thank you for your attention!