



Ranaviruses in European reptiles

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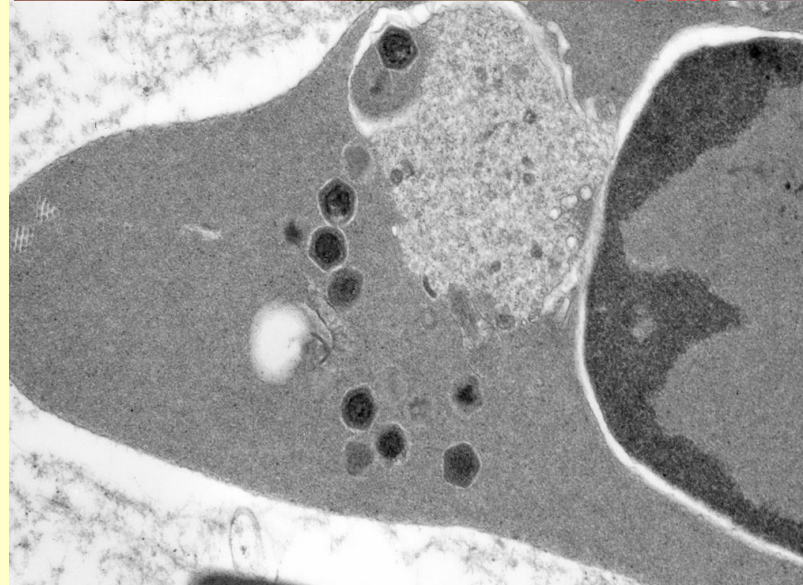
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IVs in Reptiles in Europe

- 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

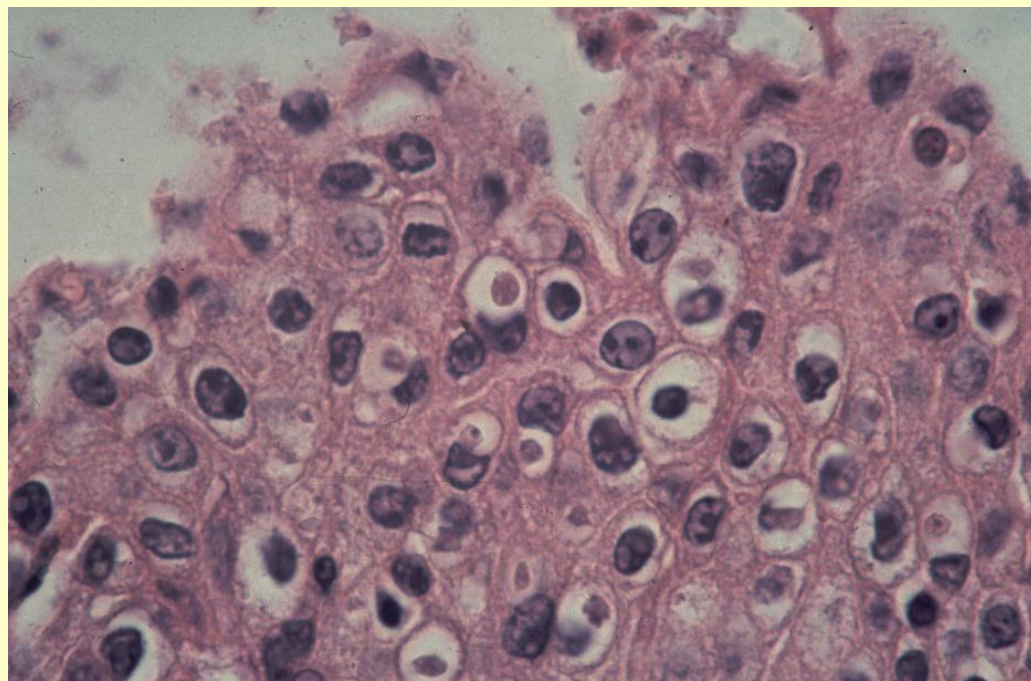
- Hyperemic, ulcerated mucosa covered by yellowish fibronecrotic material in:
 - Oral cavity
 - Tongue
 - Pharynx
 - Esophagus
 - Small and large intestine and cloaca





Histology

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

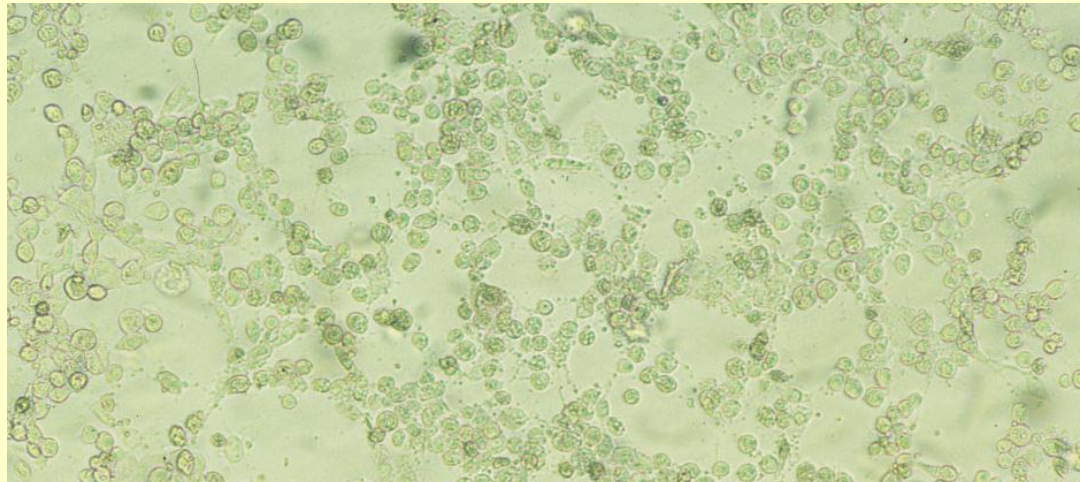


Epithelial cells of the tongue, HE



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



Third case: chelonians

(Blahak and Uhlenbrok, 2010; Uhlenbrok, 2011)

- 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
- Inappetence, apathia, conjunctivitis, nasal discharge, plaques in oral cavity



Pathological lesions

- 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





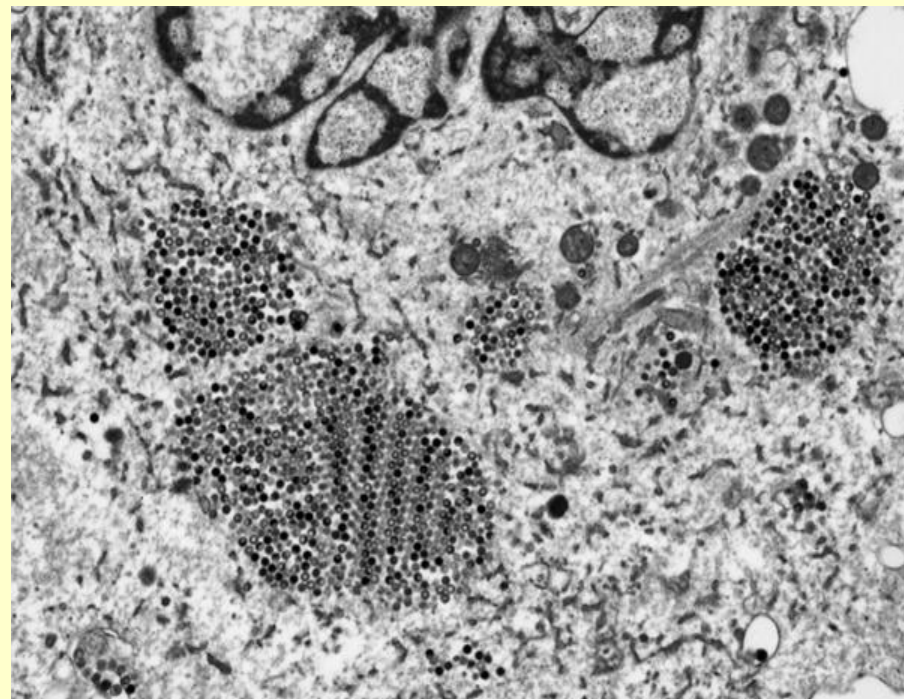
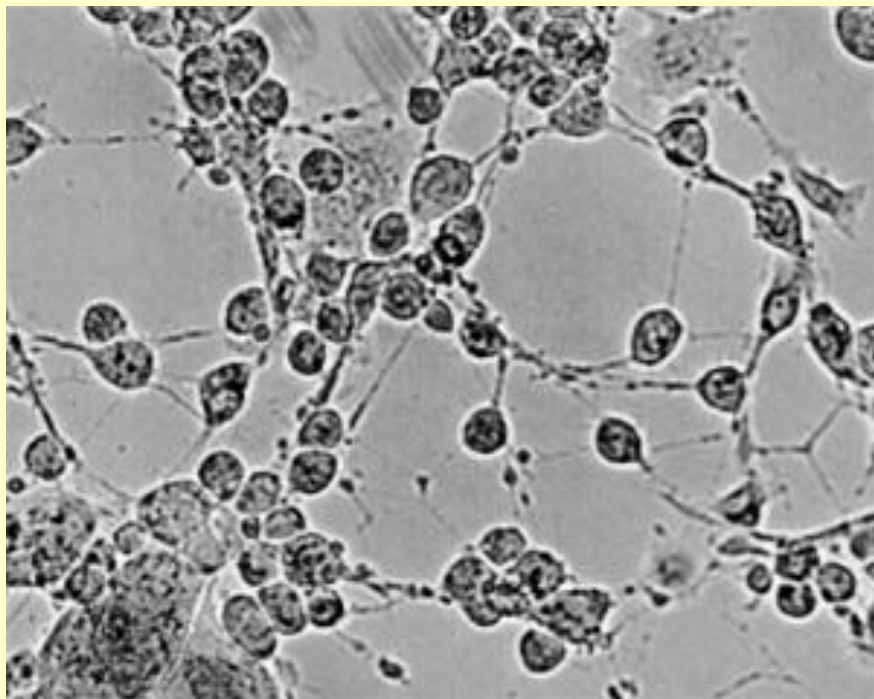
Ranaviruses in lizards

- 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!

