

## HERPESVIRUS INFECTION IN TORTOISES

ANIMAL GROUP AFFECTED	TRANSMISSION	CLINICAL SIGNS	FATAL DISEASE ?	TREATMENT	PREVENTION & CONTROL
Tortoises	The virus is most likely excreted through the oro-pharynx and ingested.	Conjunctivitis, glossitis, pharyngitis, rhinitis, tracheitis...	May be epizootic with high mortality	Control secondary bacterial infection, acyclovir	<i>In houses</i>  <i>in zoos</i> Strict quarantine for a minimum of 6 months in conjunction with laboratory testing of animals prior to translocation

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<b>Susceptible animal groups</b> Probably all Testudines. Has been described in many species including: Hermann's tortoises ( <i>Testudo hermanni</i> ), Horsfield tortoises ( <i>Testudo horsfieldii</i> ), Spurthighed tortoises ( <i>Testudo graeca</i> ), Marginated tortoises ( <i>Testudo marginata</i> ), Leopard tortoises ( <i>Geochelone pardalis</i> ), Argentine tortoises ( <i>Geochelone chilensis</i> ), Desert tortoises ( <i>Gopherus agassizii</i> ), Pancake tortoises ( <i>Malacochersus tornieri</i> ).	
<b>Causative organism</b> Probably an alpha herpesvirus. There are at least two different sero- and genotypes of herpesviruses that infect tortoises.	
<b>Zoonotic potential</b> No.	
<b>Distribution</b> Worldwide.	
<b>Transmission</b> The route of transmission is unknown. Infected animals may shed large numbers of virus orally. Infection probably occurs via ingestion	
<b>Incubation period</b> In tortoises hyperimmunized with HV1976, seroconversion was not detectable earlier than 4 weeks postexposure when using either the ELISA or SN test.	
<b>Clinical symptoms</b> Clinical signs range from a mild conjunctivitis to a severe, mostly epizootic disease characterized by proliferative and diphtheroid-necrotizing glossitis, pharyngitis, rhinitis, and tracheitis, often occurring with pneumonia and encephalitis. Diphtheritic plaques can be observed on the dorsal surface of the tongue and on the hard palate. Regurgitation, anorexia, lethargy, abscesses in the oral cavity.	
<b>Post mortem findings</b> Marked epithelial hyperplasia, necrotizing lesions, severe mixed inflammatory infiltrate in the epithelium of the oral, nasal, tracheal mucosae, internal nares, intestinal tract, with cutaneous and ocular lesions. Serous atrophy of fat and fatty degeneration of the liver may be noted. <u>Histologic examination:</u> large eosinophilic intranuclear inclusion bodies may be present in epithelial cells. Eosinophilic to amphophilic inclusion bodies may be visible in the liver, spleen, adrenal glands, stomach, lungs, kidneys, small and large intestines, pancreas, and cerebrum.	
<b>Diagnosis</b> <ul style="list-style-type: none"> <li>• Typical clinical progression.</li> <li>• Histopathologic evaluation of lesions.</li> <li>• Electron microscopy can show enveloped viral particles in epithelial cells (size, shape, and distribution)</li> </ul>	



pattern).

- Swabs from the pharynx and various tissues, particularly tongue, esophagus, and trachea can be cultured for virus.
- Several PCRs using swabs and tissues have been described. Antemortem diagnosis can be made using swabs or biopsy specimens of oral lesions.
- Neutralizing antibodies against these viruses can be detected using a serum neutralization (SN) test.
- An enzyme-linked immunosorbent assay (ELISA) has also been developed for the detection of antibodies against herpesviruses in certain tortoise species, but is not commercially available at this time. Serology is limited by the fact that some tortoise species (e.g. *T. graeca*, *T. marginata*) seroconvert more readily than others (e.g. *T. hermanni*, *T. horsfieldii*).

**Material required for laboratory analysis**

Swabs or biopsy specimens of oral lesions, serum or plasma for serological tests.

**Relevant diagnostic laboratories**

- Dr. Rachel E. Marschang, Institut für Umwelt- und Tierhygiene (460), Hohenheim University, Stuttgart, Germany
- Dr. Silvia Blahak, Staatliches Veterinäruntersuchungsamt, Detmold, Germany
- Sally Drury, Veterinary Laboratories Agency, United Kingdom
- Francesco Origi, Department of Immunology and Infectious Diseases, Human Virology Unit, San Raffaele Scientific Institute, Milan, Italy.

It is best to contact the laboratory before collecting and sending the samples to optimise chances of success.

**Treatment**

Control of secondary bacterial infection is the suggested therapy. Broad spectrums antimicrobial such as enrofloxacin, amikacin and/or ceftazidime are the most useful drugs for preventing most secondary infections. Application of 5% acyclovir ointment appeared to improve oral lesions in the spur-thighed tortoises. Acyclovir, 80 mg/kg/day orally, has been reported effective in clinical cases in the California desert tortoise (*Gopherus agassizii*) that showed clinical and histopathologic lesions suggestive of herpesvirus infection. Aciclovir and ganciclovir were effective when tested in vitro against one of the herpesvirus isolates.

**Prevention and control in zoos**

- Newly acquired animals should be kept isolated for a minimum of 6 months and should undergo thorough physical examinations both before and after quarantine. Serological tests and tests for virus detection should also be carried out during quarantine. Serological tests should be repeated at least once after several weeks.
- Enclosures and all equipment should be disinfected regularly.

Herpesviruses can cause latent infections, so that any infected animals should be considered life-long carriers.

**Suggested disinfectant for housing facilities**

Solution of 0.15% sodium hypochlorite. Disinfectants containing organic acids according to manufacturer. Wash facilities well following disinfection.

**Notification****Guarantees required under EU Legislation****Guarantees required by EAZA Zoos****Measures required under the Animal Disease Surveillance Plan****Measures required for introducing animals from non-approved sources****Measures to be taken in case of disease outbreak or positive laboratory findings****Conditions for restoring disease-free status after an outbreak****Contacts for further information****References**

1. Marschang, R. E., J. W. Frost, M. Gravendyck, and E. F. Kaleta. 2001. Comparison of 16 chelonid herpesviruses by virus neutralization tests and restriction endonuclease digestion of viral DNA. *J. Vet. Med. B* 48: 393-399.
2. Marschang, R. E., M. Gravendyck, and E. F. Kaleta. 1997. Herpesviruses in tortoises: investigations into virus isolation and the treatment of viral stomatitis in *Testudo hermanni* and *T. graeca*. *Zentralbl. Veterinärmed. [B]* 44: 385-394.
3. Muro, J., A. Ramis, J. Pastor, R. Velarde, J. Tarres, and S. Lavin. 1998. Chronic rhinitis associated with



- herpesviral infection in captive spur-thighed tortoises from Spain. *J. Wildl. Dis.* 34: 487-495
4. Origi, F. C., P. A. Klein, K. Mathes, S. Blahak, R. E. Marschang, S. J. Tucker, and E. R. Jacobson. 2001. Enzyme-linked immunosorbent assay for detecting herpesvirus exposure in Mediterranean tortoises. *J. Clin. Microbiol.* 39: 3156-3163.
  5. Pettan-Brewer, K. C., M. L. Drew, E. Ramsay, F. C. Mohr, and L. J. Lowenstine. 1996. Herpesvirus particles associated with oral and respiratory lesions in a California desert tortoise (*Gopherus agassizii*). *J. Wildl. Dis.* 32: 521-526.
  6. Schumacher, J. 1996. Section III: Special topics, Chapter 19: Viral diseases. *In: Reptile Medicine and Surgery*, D. R. Mader (ed.). W. B. Saunders Company, Philadelphia, USA. Pp. 224-234.
  7. Ue, Y., K. Uemura, Y. Nakano, J. Kamiie, T. Ishibashi, and Y. Nomura. 1999. Herpesvirus infection in tortoises (*Malacochersus tornieri* and *Testudo horsfieldii*). *Vet. Pathol.* 36: 624-627.