FIBROPAPILLOMATOSIS

Animal Group(s) Affected	Transmission	Clinical Signs	Severity	Treatment	Prevention and Control	Zoonotic
Sea turtles, especially green sea turtles.	Unknown; viral etiology, water-bourne, direct contact and *Ozo-branchus* leech are suspected. Horizontal transmission experimentally proven	Masses on the skin and viscera	Depends on location of nodules and immune function. Morbidity can reach 92%. Mortalities can reach 88%.	Supportive care; surgical debridement/ debulking; euthanasia.	None; in captivity, quarantine affected individuals.	No

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Susceptible animal groups: Predominantly green turtles (*Chelonia mydas*) are affected. However, Kemp's and olive Ridley (*Lepidochelys kempii* and *L. olivacea*) and loggerhead sea turtles (*Caretta caretta*) also may be. Rarely hawksbill turtles (*Eretmochelys imbricata*) have been affected. The problem has not been reported in leatherback sea turtles (*Dermochelys coriacea*).

Causative organism: An alphaherpesvirus (chelonid fibropapilloma-associated herpesvirus, CFPHV) consistently is detected and lesions can be transmitted using cell-free tumor extracts, but the virus has not been isolated in culture. Virus types appear to cluster based on geographic origin, rather than host species: western Atlantic (Florida, Barbados, recently reported from Texas); Atlantic (Puerto Rico, recently reported from Gulf of Guinea); midwest-Pacific (Hawaii, Australia, Indonesia); and eastern Pacific (Costa Rica, California). It is possible that other viruses such as tornovirus, retroviruses, and reoviruses are involved. Changes in the environment, co-infections, or ecological factors affecting disease expression, or virus transmission, are likely causes for the recent emergence of FP epizootics at multiple locations around the world.

Zoonotic potential: None.

Distribution: Worldwide, but primarily circumtropical. Prevalence of disease varies with location (0 – 92%). It may be associated with eutrophic coastal ecosystems with high human population densities and agricultural run-off. The issue was first documented in the 1930s. Reported increase in prevalence in the late 1950's, especially in specific areas such as the Florida Keys and Indian River Lagoon, Florida, and Hawaii. Prevalence seems to be decreasing in Hawaii while increasing in other regions.

Incubation period: Clinically apparent FP developed 15 – 43 weeks after experimental inoculation. Initiation of tumor growth was positively correlated with water temperature. Inoculated turtles developed antibodies to CFPHV in < 1 year if they developed tumors. Turtles that did not develop tumors, did not seroconvert.

Clinical signs: White/grey/black nodules, 0.1 to >30 cm diameter, focal or multifocal, often involving the head, neck, and limbs, develop as fibropapillomas. Internal nodules (fibromas) are less common. Many fibropapillomatous lesions will resolve spontaneously. Number and severity may increase with curved carapace length (CCL) then decrease as CCL increases further. When tumors are numerous or large in size, they may impinge on function of affected structures which leads to progressive debilitation and death. Larger or ulcerated masses often have secondary infections.

Postmortem, gross, or histologic findings: Fibropapillomas are raised, sessile or polypoid masses with

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verrucous or smooth surfaces. Internal tumors can be found on the heart, lungs, liver, gall bladder, kidneys, skeletal muscle, and gastrointestinal tract, and are generally described as fibromas, myxofibromas, and fibrosarcomas of low-grade malignancy. Common histologic descriptions include vacuolation of the cytoplasm, balloon degeneration of epidermal cells, and benign papillary epidermal hyperplasia (especially in the stratum spinosum) occurring on thick stalks of proliferating fibrovascular stroma characterized by disorganized collagen fibers. Perivascular mononuclear cell inflammation is often observed in the deeper layers of the dermis.

Diagnosis: Clinical diagnosis is usually based on presence of skin or oral masses consistent in appearance with fibropapillomas. Endoscopy, laparoscopy, radiography, ultrasonography, MRI, and coeliotomy can be useful diagnostic modalities for identifying visceral tumors.
Definitive diagnosis requires compatible histopathology findings. Further support of a diagnosis occurs if intralesional DNA of CFPHV are detected by polymerase chain reaction (PCR) from tissue obtained from tumors. *In situ* hybridization (ISH) can be used to detect CFPHV in nuclei of infected epithelial cells.

Material required for laboratory analysis Formalin-fixed tissue for histology and frozen tissue for PCR.

Relevant diagnostic laboratories: All histopathology laboratories can assess tissues for compatible lesions. Herpesviral PCR and sequencing is available at the University of Florida and Hubbs-SeaWorld Research Institute.

Treatment: Supportive care (appropriate temperature, good water quality, low stocking density, fluid therapy, adequate nutrition, and, as needed, systemic antibiotics). The lesions may be excised surgically; laser surgery followed by second intention healing is usually recommended. Controlled studies on improved outcomes are lacking. Acyclovir has been found anecdotally to be useful. Tumors on and around the eyes are most important to remove. Turtles with internal tumors may require euthanasia.

Prevention and control: Currently no prevention and control measures for wild populations are available. In captivity, fibropapillomatous turtles should be quarantined from unaffected turtles, including by a separate water system. Some turtle rehabilitation centers will not accept turtles affected by fibropapillomas.

Suggested disinfectant for housing facilities: Standard disinfectants effective for herpesviruses should be effective against CFPHV.

Notification: None.

Measures required under the Animal Disease Surveillance Plan: None.

Measures required for introducing animals to infected animal: Unaffected individuals should not be introduced to affected turtles.

Conditions for restoring disease-free status after an outbreak: None known. It is probable that affected turtles are CFPHV carriers for life. Experienced marine turtle rehabilitation facilities consider release of animals if they remain tumor-free for one year after surgical removal, although sufficient long-term housing is rarely available in large stranding events to accommodate this approach.

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UF Diagnostic Lab
Tissue PCR for herpesvirus – notify laboratory before shipping for submission forms and parameters; use ice packs or dry ice via FedEx, UPS, or DHL
Costs (July 2013): $100.00/test/sample. Turnaround time is 2-3 weeks.
http://labs.vetmed.ufl.edu/sample-requirements/microbiology-parasitology-serology/zoo-med-infections/
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References:

1. Aguirre, A.A., and P.L. Lutz. 2004. Marine turtles as sentinels of ecosystem health: is fibropapillomatosis an indicator. Ecohealth 1: 275-283.
2. Balazs, G.H., and S.G. Pooley (eds.). 1991. Research plan for marine turtle fibropapilloma. N.O.A.A. U.S. Dept. Commerce, Honolulu, HI. 110 pp.
3. Chaloupka, M., G.H. Balazs, and T.M. Work. 2009. Rise and fall over 26 years of a marine epizootic in Hawaiian green sea turtles. J. Wildl. Dis. 45: 1138-1142.
4. Croft, L.A., J.P. Graham, S.A. Schaf, and E.R. Jacobson. 2004. Evaluation of magnetic resonance imaging for detection of internal tumors in green turtles with cutaneous fibropapillomatosis. J. Am. Vet. Med. Assoc. 9: 1428-1435.
5. Duarte, A., P. Faisca, N.S. Loureiro, R. Rosado, S. Gil, N. Pereira, and L. Tavares. 2012. First histological and virological report of fibropapilloma associated with herpesvirus in *Chelonia mydas* at Principe Island, West Africa. Arch. Virol. 157: 1155-1159.
6. Ene, A., M. Su, S. Lemaire, C. Rose, S. Schaff, R. Moretti, J. Lenz, and L.H. Herbst. 2005. Distribution of chelonid fibropapillomatosis associated herpesvirus variants in Florida: molecular genetic evidence for infection of turtles following recruitment to neritic developmental habitats. J. Wildl. Dis. 41: 489-497.
7. Fei Fan Ng, T., C. Manire, K. Borrowman, T. Langer, L. Ehrhart, and M. Breitbart. 2009. Discovery of a novel single-stranded DNA virus from a sea turtle fibropapilloma by using viral metagenomics. J. Virol. Mar: 2500-2509.
8. Foley, A.M., B.A. Schroeder, A.E. Redlow, K.J. Fick-Child, and W.G. Teas. 2005. Fibropapillomatosis in stranded green turtles (*Chelonia mydas*) from the eastern United States (1980-98): trends and associations with environmental factors. J. Wildl. Dis. 41: 29-41.
9. Guimaraes dos Santos, R, A.S. Margins, E Torezani, C. Baptistotte, J. Farias, P.A. Horta, T.M. Work, G.H. Balazs. 2010. Relationship between fibropapillomatosis and environmental quality: a case study

with *Chelonia mydas* off Brazil. Dis. Aquat. Org. 89: 87-95.

10. Guimaraes, S.M., H.M. Gitirana, A.V. Wanderley, C. Monteiro-Neto, and G.L. Hajdu. 2013. Evidence of regression of fibropapillomas in juvenile green turtles *Chelonia mydas* caught in Niteroi, southeast Brazil. Dis. Aquat. Org. 102: 243-247.
11. Herbst, L.H., E.C. Greiner, L.M. Ehrhart, D.A. Bagley, and P.A. Klein. 1998. Serological association between spirorchidiasis, herpesvirus infection, and fibropapillomatosis in green turtles from Florida. J. Wildl. Dis. 34: 496-507.
12. Herbst, L.H., E.R. Jacobson, R. Moretti, T. Brown, J.P. Sundberg, and P.A. Klein. 1995. Experimental transmission of green turtles fibropapillomatosis using cell-free tumor extracts. Dis. Aquat. Org. 22: 1-12.
13. Kang, K.I., F.J. Torres-Velez, J. Zhang, P.A. Moore, D.P. Moore, S. Riverax, and C.C. Brown. 2008. Localization of fibropapilloma-associated turtle herpesvirus in green turtles (*Chelonia mydas*) by *in situ* hybridization. J. Comp. Path. 139: 218-225.
14. Murakawa, S.K.K., and G.H. Balazs (eds.). 2009. Bibliography of fibropapillomas in marine turtles. N.O.A.A. U.S. Dept. Commerce, Honolulu, HI. 47 pp. http://www.turtles.org/FIBROBIBLIO20091108.pdf Accessed 2 August 2013.
15. Patricio, A.R., L.H. Herbst, A. Duarte, X. Veleez-Zuazo, N. Loureiro, N. Pereira, L. Tavares, and G.A. Toranzos. 2012. Global phylogeography and evolution of chelonid fibropapilloma-associated herpesvirus. J. Gen. Virol. 93: 1035-1045.
16. Tristan T, D.J. Shaver, J. Kimbro, T. deMaar, T. Metz, J. George, and A. Amos. 2010. Identification of fibropapillomatosis in green sea turtles (*Chelonia mydas*) on the Texas coast. J. Herp. Med. Surg. 20: 109-112.