MYCOBACTERIOSIS IN FISH

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<td>Virtually all fish: warm and cold freshwater environment, warm and cold brackish or marine environment.</td>
<td>Ingestion, direct infection of the skin. In certain species transovarian transmission has been demonstrated.</td>
<td>Non specific symptoms as poor growth, reduced appetite, emaciation, ulcerative dermatitis, exophthalmia.</td>
<td>Yes, chronic morbidity and mortality.</td>
<td>So far the only realistic method of control is elimination of infected fish and disinfection.</td>
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Fact sheet compiled by Marian Mensink, DVM, Rotterdam Zoo  
Fact sheet reviewed by Dr. O. Haenen, Head of Fish Diseases Laboratory, CIDC-Lelystad, P.O. Box 65, 8200 AB Lelystad, The Netherlands. Phone: +31 320 238 352.  
Dr. T. Wahli, National Fish Disease Laboratory, Centre for Fish and Wildlife Health, Institute of Animal Pathology, University of Berne, Länggassstr. 122, CH-3012 Berne, Switzerland. Phone: +41 31 631 24 61  
Alexis Lécu, DVM, Paris Zoo

Susceptible animal groups  
Virtually all freshwater and marine fish are susceptible, both from cold and warm environments. Especially members of the freshwater families Anabantidae, Characidae and Cyprinidae seem to be susceptible.

Causative organism  
Mycobacterium marinum, M. fortuitum, M. chelonae (primarily isolated from Salmonids). M. neoaurum, M. scrofulaceum, M. shotsii and M. simiae have also been reported as fish pathogens. Bacteria, non-motile, acid fast, aerobic, Gram-positive rod (although only stainable with a modified Gram stain).

Zoonotic potential  
Yes. Fish-pathogenic mycobacteria can infect humans, usually causing localized, nonhealing ulcers (fish tank granuloma, swimming pool granuloma). The infection can spread to subcutaneous tissues and tendon sheaths. Sometimes a localized infection is followed by the “sporotrichoid” form when regional lymphatic tissues are affected. In immuno-compromised patients respiratory disease, septic arthritis and/or osteomyelitis can occur.

Distribution  
Worldwide

Transmission  
Water and biofilms are natural habitat of Mycobacterium. They can infect other aquatic organisms, as well as protozoans. Ingestion, direct infection of the skin, in certain species (platyfish) trans-ovarian transmission has been demonstrated.

Incubation period  
Probably at least six weeks but can be months and even years.

Clinical symptoms  
Non specific symptoms as reduced appetite, ascites, lethargy, poor growth, retarded sexual maturation, emaciation. Skeleton deformation, uni- or bilateral exophthalmus. Chronic, nonhealing shallow to deep ulcers, fin erosion. Poor buoyancy control.

Post mortem findings  
Mycobacteriosis is strongly suggested by the clinical signs mentioned above in combination with the presence of gross or microscopic miliary grey/white granulomas scattered or grouped in virtually any parenchymatous tissue, but especially in the spleen, kidney and liver. Enlarged organs, peritonitis, and edema may be present. An atypical presentation of mycobacteriosis without typical granuloma formation has also been described.

Diagnosis  
Acid fast staining (Ziehl Neelsen) of granulomas in tissue smears or formalin-fixed material. Take care of false positive (ZN positive as Nocardia or Legionella)  
Cultivation: on Lowenstein-Jensen or Middlebrook 7H10 agar at 25-30°C. Isolation may take up to 30 days or even a few months; sometimes the mycobacteria involved cannot be cultured though large numbers are
present in lesions. Isolation allows biochemical identification and determination of the species. PCR. Immunohistochemistry.

**Material required for laboratory analysis**
Affected tissue, especially the liver, kidney and spleen.

**EU Reference Laboratory**

**State Serum Laboratory**
Hangovej 2
8200-Aarhus
Denmark

**Relevant diagnostic laboratories**
Local veterinary or medical laboratories.

**Treatment**
Presently there are no non-lethal means of detecting carriers except in the case of skin lesions. There is no effective treatment although some studies on antibiotic treatment have been performed. Treatment of valuable species may involved rifampicin, streptomycin, erythromycin and tetracyclines, both orally or by immersion. But antibiotic resistance should be strongly considered as this is not uncommon in species like *M.fortuitum*.

**Prevention and control in zoos**
Quarantine, stress reduction, disinfection

**Suggested disinfectant for housing facilities**
Ultraviolet radiation (effective for *M.marinum*, weak for *M.gordonae*) and/or ozonation (sterilization of water), if possible discard the water and clean the tank with a chlorine-based oxidant (chloramine B or T 10 mg/L for 24 h), 2 % Lyorthol or 2 % NaOH. Heating a few seconds above 80°C is another possibility. *M.marinum* rather resistant to bleach.

**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
  Elimination of infected fish, disinfection and/or sterilizing water.
- Conditions for restoring disease-free status after an outbreak
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**Contacts for further information**
Dr. O. Haenen, Head of Fish Diseases Laboratory, CIDC-Lelystad, P.O. Box 65, 8200 AB Lelystad, The Netherlands. Phone: +31 320 238 352

**References**
1. Austin, B., and D.A. Austin. 1987. Bacterial Fish Pathogens: Disease in Farmed and Wild Fish. Ed. Ellis Horwood LTD, Chichester, United Kingdom.


