

MYCOBACTERIOSIS IN FISH

ANIMAL GROUP AFFECTED	TRANSMISSION	CLINICAL SIGNS	FATAL DISEASE?	TREATMENT	PREVENTION & CONTROL
Virtually all fish: warm and cold freshwater environment, warm and cold brackish or marine environment.	Ingestion, direct infection of the skin. In certain species transovarian transmission has been demonstrated.	Non specific symptoms as poor growth, reduced appetite, emaciation, ulcerative dermatitis, exophthalmia.	Yes, chronic morbidity and mortality.	So far the only realistic method of control is elimination of infected fish and disinfection.	Stress reduction, quarantine, avoidance of feeding raw potentially infected fish. Vaccination is in an experimental stage.

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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 <i>Mycobacterium marinum</i> , <i>M. fortuitum</i> , <i>M. chelonae</i> (primarily isolated from Salmonids). <i>M. neoaurum</i> , <i>M. scrofulaceum</i> , <i>M. shottsii</i> and <i>M. simiae</i> 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 <i>Nocardia</i> or <i>Legionella</i>) 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

Quarantaine, 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

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Guarantees required under EU Legislation

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Guarantees required by EAZA Zoos

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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

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