

Other fungal and bacterial infections of amphibians

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Other fungal infections

- Fungal infections described in multiple outbreaks in various species
- Opportunistic pathogens
 - Ubiquitous environmental fungi
 - Associated with stress, traumatic skin lesions, water quality issues, chemical irritants
- Mycotic dermatitis
 - Zygomycosis
 - *Mucor* spp., *Basidiobolus* spp., *Rhizopus* spp, *Fusarium* spp.
 - Chromoblastomycosis and phaeophyphomycosis
 - Caused by pigmented or black fungi
 - Ulcerative or granulomatous skin lesions, disseminated granulomas



Hosoya et al. 2015. First report of *Veronaea botryosa* as a causal agent of chromomycosis in frogs. *Med Mycol.* 53:369-377.

Other fungal infections

- Saprolegniasis
 - Caused by water molds (oomycetes)
 - Genus Saprolegnia and others
 - Infect the gills and skin of aquatic amphibians and amphibian larvae (also a problem in aother aquatic species)
 - „Cotton wool disease“
 - Opportunistic
 - Trauma, abrasions, poor hygiene, stress, chemical irritants, malnutrition, temperature shocks
 - Treatment
 - Malachite green (old, no longer used)
 - Improve water quality and husbandry
 - Salt water baths (>30 ppt salinity)
 - Others (formalin, copper, plant extracts)



Source: Hubert Laufer

Bacterial infections

- In many cases opportunistic pathogens
- Disease outbreaks often associated with stress
- Mostly gram-negative
- Red-leg syndrome
 - Bacterial dermatosepticemia
 - Often saprophytic, gram-negative bacteria (*Aeromonas* spp., *Pseudomonas* spp., *Proeus* spp., *Elizabethkingia meningoseptica*, *Klebsiella* spp., *Citrobacter* spp., others)
 - Clinical signs:
 - Lethary, emaciation, ulcerations, cutaneous hemorrhages on legs and abdomen

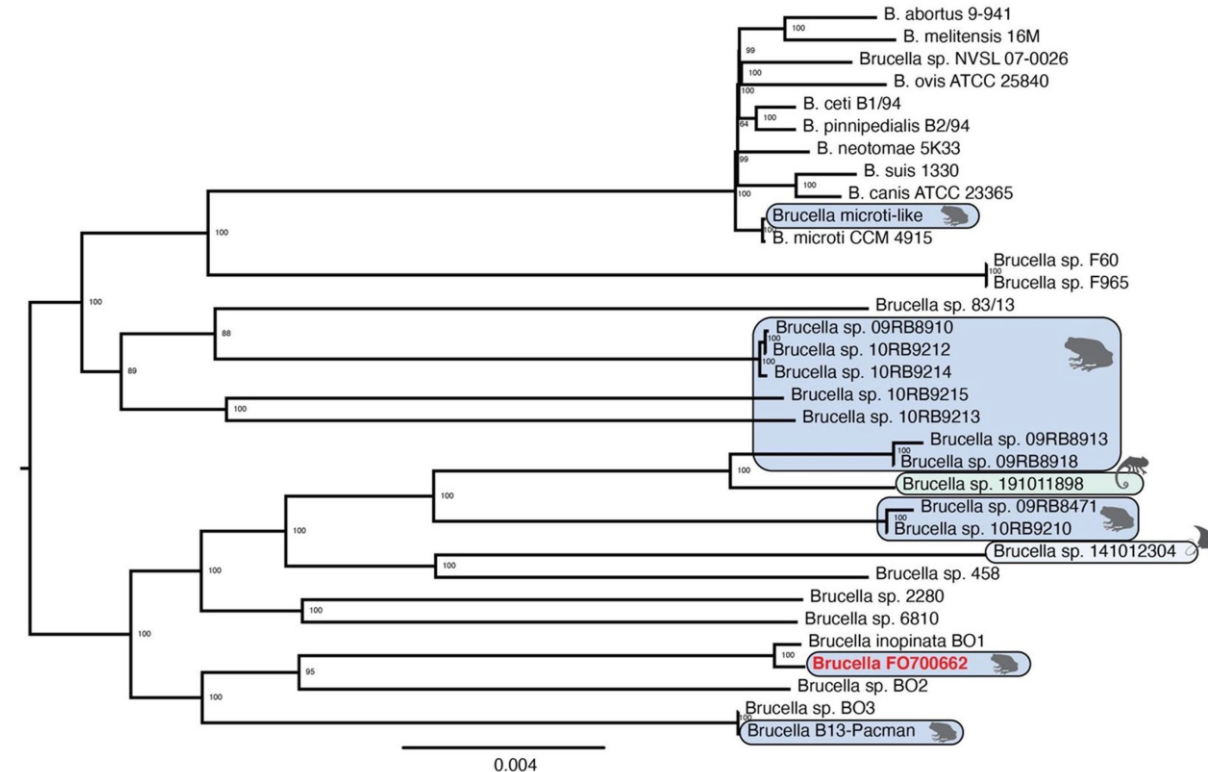


Source: Dr. F. Mutschmann

Brucella



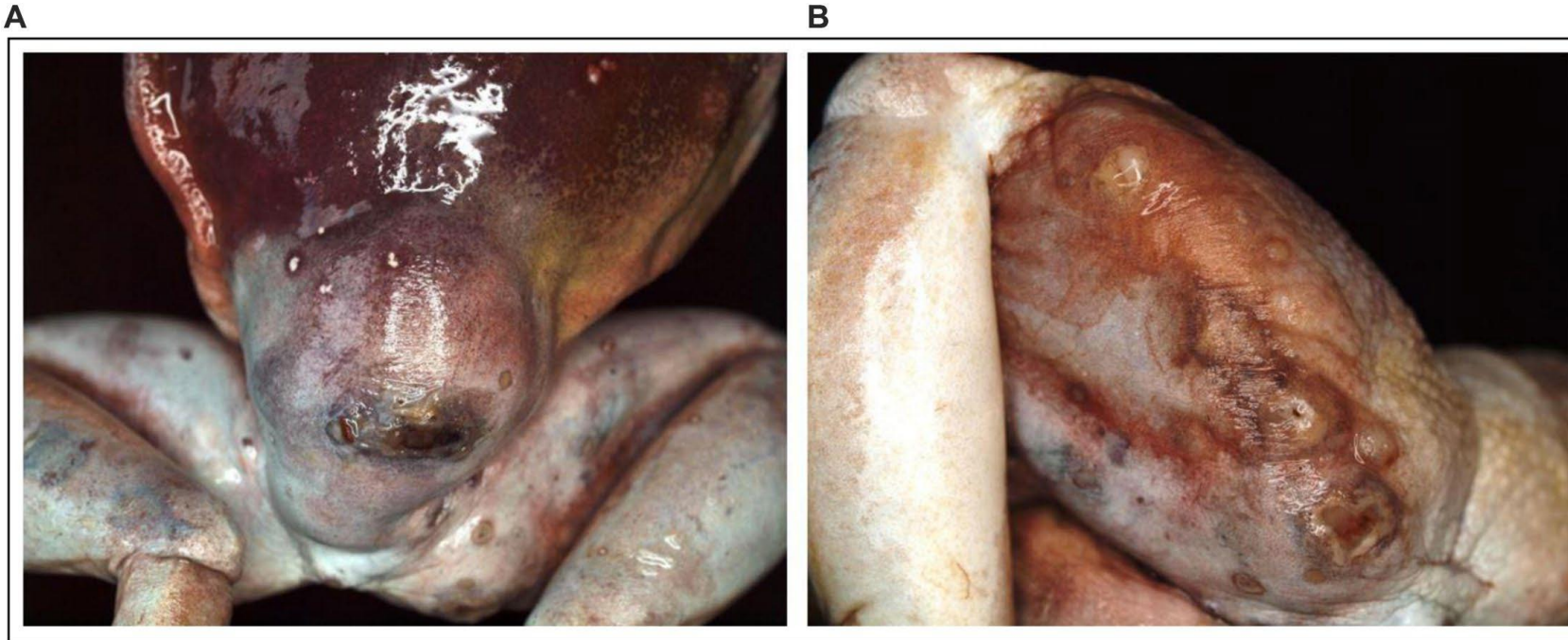
- Atypical *Brucella* spp. discovered in amphibians (Eisenberg et al., 2012)
 - African bullfrogs (*Pyxicephalus edulis*) imported to Europe from Tanzania
 - Animals died or found moribund
- Multiple species detected, *B. inopinata*-like, *B. microti*-like, others
- In various amphibian species (anura) and on various continents



Scholz et al., 2023. Front Microbiol. 14:1173252.

Brucella

- Clinical signs reported:
 - Focal abscessation, weight loss, change in coloration, anorexia, lethargy, granulomas in various tissues
 - Also isolated from clinically healthy animals
- Human infection with an amphibian-type strain (*B. inopinata*-like) has been reported (lymphadenopathy, abscesses, respiratory disease)



Granulomatous inflammation in a White's tree frog (*Litoria caerulea*).

Scholz et al., 2023. Front Microbiol. 14:1173252.

Chlamydia

- Multiple *Chlamydia* spp. detected in amphibians (reviewed in Eisenberg et al., 2020)
 - Chlamydiosis associated with mass mortality event in commercial breeding facility for African clawed frogs (*Xenopus laevis*)
 - Clinical and pathological signs:
 - Lethargy, bloating, ataxia, hepatomegaly, splenomegaly, nephropathies, epicarditis, myocarditis, pneumonia, anaemia, encephalomyelitis
 - Animals with no clinical signs also reported
 - Most often in anuran hosts, but also found in urodeles
 - *C. pneumoniae* most commonly reported
 - Other species also found including *C. psittaci*, *C. suis*, and *C. abortus*-like bacteria as well as undescribed species
 - Infections with other related bacteria also occasionally reported



Mycobacteria

- Non-tuberculous mycobacteria found in various aquatic organisms
- Multiple species:
 - *M. marinum*, *M. fortuitum*, *M. chelonae*, *M. abscessus*, *M. goodii*, others
- Diagnosis can be challenging (reviewed in: Maboni et al. 2024. J Vet Diagn Invest. 36(3):299-311)
- Zoonotic
- Clinical signs:
 - Inapparent, weight loss, granulomas, cutaneous ulcers, abscesses, lethargy, emaciation, edema

Skin lesions in Hakuba salamanders infected with *Mycobacterium* spp.

Source: Komine et al. 2023. Front Vet Sci.

<https://doi.org/10.3389/fvets.2023.1248288>



**Thank you for your
attention!**



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