


What are Alveolates?

- ☒ Single-celled eukaryotes that have many modes of nutrition
 - ☒ Predation
 - ☒ Photoautotrophy
 - ☒ Intracellular Parasitism
- ☒ Broken into 4 subgroups:
 - ☒ Ciliates
 - ☒ Apicomplexans
 - ☒ Dinoflagellates
 - ☒ Perkinsozoa



What are Alveolates...cont.

- ☒ Ciliates:
 - ☒ 8,000 species
 - ☒ Predators that inhabit intestinal tracts, flesh, and have recently been found in nasal openings of Archey's Frog (*Leiopelma archeyi*) in New Zealand

Journal of Zoo and Wildlife Medicine 42(3): 473-479, 2013
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NEMATODE AND CILIATE NASAL INFECTION IN CAPTIVE ARCHEY'S FROGS (*LEIOPELMA ARCHEYI*)

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(Leander 2008)

What are Alveolates...cont.

- ✕ Apicomplexans:
 - ✕ 6,000 species
 - ✕ Parasitize vertebrates and invertebrates
 - ✕ Can adapt to many different environments depending on the host species
- ✕ Dinoflagellates:
 - ✕ 2,294 species
 - ✕ Some are only photosynthetic with a majority of them being mixotrophic
- ✕ Perkinsozoa:
 - ✕ *Perkinsus marinus* (important pathogen for oysters)
 - ✕ *Parvilucifera infectans* (known to be in warm waters)
 - ✕ *Cryptophagus* spp. (parasite of mollusks)

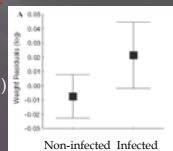
(Gómez 2012, Sina 2007, Mangot 2010)

Declines?

Discovery of a Novel Alveolate Pathogen Affecting Southern Leopard Frogs in Georgia: Description of the Disease and Host Effects

Andrew K. Davis,¹ Michael J. Yahelky,^{1,2} M. Kevin Keel,³ and John C. Mann¹

- ✕ Southern Leopard Frog declines in Georgia
- ✕ 87 tadpoles were taken from 5 ponds
- ✕ Pond 1:
 - ✕ 500+ live tadpoles on day 1 April 2006
 - ✕ Live tadpoles decreased every visit until...
- ✕ **NO LIVE/MOVING TADPOLES WERE SEEN** in May 2006
- ✕ 100,000+ alveolate organisms found in infected individual's liver, increasing liver size by 3x
- ✕ Of 87 individuals taken from the ponds, 22 (25%) were infected with the alveolate pathogen

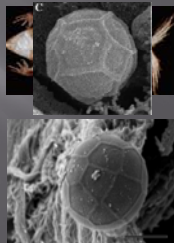


Effects on Amphibians

Granulomatous myositis associated with a novel alveolate pathogen in an adult southern leopard frog (*Lithobates sphenocephalus*)

Morgan E. B. Jones^{1,2}, An-hai G. Arnt¹, a², Robin E. Rothermel², Allan P. Frazee^{1,2}

- ✕ Southern Leopard Frog found with mass/lesion on right quadriceps region
- ✕ Scanning Electron Microscope found this alveolate-like organism
- ✕ Immediate die off is unknown to happen in adults but lesions can affect feeding behavior and mobility



Infection Characteristics

- ☒ Lesions on skin, muscles, gills and other organs
- ☒ Large, whitish liver
- ☒ Slow moving: Especially in tadpoles
- ☒ Alveolates can be found in liver, spleen, muscle, or in nasal openings
- ☒ Kidney and liver necrosis
- ☒ Anorexia in some cases
- ☒ Altered feeding behavior.
- ☒ Bloody stool
- ☒ White streaks in skeletal muscle
- ☒ Bloating
- ☒ Others are unknown...

(Densmore 2007)

Why are Alveolates the main cause?

- ☒ Hundreds of thousands are found in ONE frog liver!?
- ☒ 16,294 species of Alveolates!
- ☒ The Alveolates can acclimate to any climate type
- ☒ Infected tadpoles that make it to adults can grow lesions that will decrease mobility which will increase the chance of predation!!!

Questions?

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