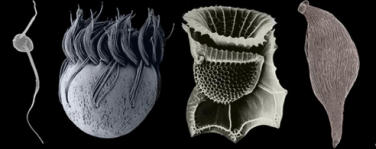


ALVEOLATES

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WHAT IS IT?

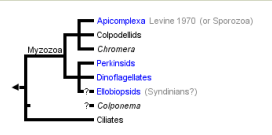
- **Alveolates**- Major superphylum of protists
- Group of single-celled eukaryotes that get their nutrition by predation, photoautotrophy, and intracellular parasitism
- Spherical basophilic organisms (6-9 μm diameter)
- Most notable shared characteristic is presence of cortical alveoli, flattened vesicles packed into linear layer supporting the membrane, typically forming a flexible pellicle



(Leander, 2008)

WHAT IS IT?

- 3 main subgroups:
 - Ciliates → predators that inhabit intestinal tracts and flesh
 - Dinoflagellates → mostly free living predators or photoautotrophs, release toxins
 - Apicomplexans → obligate parasite; invade host cells
- Several other lineages such as:
 - *Colpodella*
 - *Chromera*
 - *Colponema*
 - Ellobiopsids
 - *Oxyrrhis*
 - *Rastrimonas*
 - *Parvilucifera*
 - *Perkinsus*



(Leander, 2008)

HOW DOES IT KILL AMPHIBIANS?

- Cause infection and disease in amphibian populations
 - Infection = parasite occurs in host; occupying intestinal lumen
 - Disease = advanced infection; presence of spores in tissues; occupying intestinal mucosa, liver, skin, rectum, mesentery, adipose tissue, pancreas, spleen, kidney, and somatic musculature
- Effects on organs
 - Filters into host's internal organs in mass amounts
 - Causes organ enlargement and severe tissue alteration
 - Obliterates kidney and liver structure
 - System shut-down = DEATH
- How its introduced to environment
 - Birds
 - Insects
- How it spreads/transmission:
 - Ingestion of spores
 - Feces of infected individuals
 - Tissues from dead/dying infected tadpoles
 - Free-floating spores

(Cook, 2008)

HOW DOES IT KILL AMPHIBIANS?

- Environmental influence
 - pH of water (5.5-7.5 = mass zoospore hatching)
 - Salt = mass zoospore hatching
 - Zoospores = disease condition = DEATH
- Variety of host species
- Age of amphibian
 - Kills off tadpoles
 - Sometimes persists through metamorphosis
 - Infection in adults
- Very high rates of mortality

(Cook, 2008)

EVIDENCE OF DIE-OFFS OR DECLINES?

- (Green, 2002):
 - Severe infection to be the cause of 2 mortality events and contributor to 2 other mortality events occurring only in *Ranid* tadpoles in MN, MI, NC, and NH
 - Occurred in no onset pattern & each of the 4 events occurred in 4 separate months
 - Observations suggesting that infection causes >95% mortality rate in this population of tadpoles
 - Parasite said to be undetermined, but resembles *Dermocystidium*
- (Jones et al. 2012):
 - Analysis of rRNA sequence reveal that the organism from Green's experiment is actually most closely related to type of alveolate protozoa

WHY IS IT THE MOST IMPORTANT?

- New and emerging parasite
- All species are potential hosts, not just specific species as seen in Ranavirus
 - No limit on occurrence to a certain time period or place
 - Reported in variety of geological areas & in different seasons
 - No pattern of environmental requirements
- Overwhelms populations with little to no recovery after infection occurs
 - No way to combat it
- Completely destroys the organs causing failure
- Alveolate infections are moving/spreading geographically
 - First reported event in New Hampshire and now has reached Alaska, Georgia, Florida, Maine, Mississippi, Minnesota, North Carolina, and Virginia
- Large realm of unknown
 - Halts prevention

REFERENCES

- Cook JO (2008) Transmission and occurrence of *Dermomyces* sp. in *Rana sevens* and other ranids in the North Central Gulf of Mexico States. MS thesis, University of Southern Mississippi, Hattiesburg, MS.
- Davis, Andrew K. et al. (2007) Discovery of a Novel Alveolate Pathogen Affecting Southern Leopard Frogs in Georgia: Description of the Disease and Host Effects. *EcoHealth*, 4: 310-317.
- Green DE, Converse KA, Schrader AK (2002) Epizootiology of sixty-four amphibian mortality events in the USA, 1996–2001. *Ann NY Acad Sci* 969:323–339.
- Jones, E.B. et al. (2012) Granulomatous myositis associated with a novel alveolate pathogen in an adult southern leopard frog (*Lithobates sphenoccephalus*). *Dis Aquat Org*, 102: 163-167.
- Landsberg, J.H. et al. (2013) Co-infection by alveolate parasites and frog virus 3-like ranavirus during an amphibian larval mortality event in Florida, USA. *Dis Aquat Org*, 4: 88-99.
- Leander, Brian S. 2008. Alveolates. Alveolata. Version 16 September 2008 (under construction). <http://tolweb.org/Alveolates/> 2379/2008.09.16 in The Tree of Life Web Project, <http://tolweb.org/>
