Phylogenetic affinities of the enigmatic protist \textit{Nephromyces}

Developing an integrated approach for phylogenetic analysis of a complex tripartite marine symbiosis
How can phylogenetic studies provide insights into the ecological and physiological dynamics of symbiotic interactions?

How can understanding of host-symbiont dynamics provide insights into the evolutionary history of the host and microbial taxa?

How can *Nephromyces* enhance understanding of protist phylogeny?
Molgula occidentalis
Molgula manhattensis... and company

Molgulid host

Nephromyces

bacteria

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Nephromyces

Eclectic cells in search of a relative

“a fungus with no relatives, not even close ones. . .”

Paul Buchner
A fungal lifestyle:
but is it a fungus? (or even a chytrid?)

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Nephromyces: life cycle

reproductive stages

vegetative stages

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ssu rDNA:
Nephromyces is an apicomplexan

Phylogenetic analyses, still in progress, consistently indicate that Nephromyces is a distinct clade within the Apicomplexa. Although the relationship of Nephromyces to other apicomplexans is not yet definitively resolved, in (unweighted) analyses of ssu rDNA sequences thus far, Nephromyces usually groups with non-coccidian clades.

(preliminary phylogenetic analysis: a sample maximum likelihood tree)

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Apicomplexa

• parasites & pathogens
• apical complex
• apicoplast (remnant algal chloroplast?)

Are these features also found in Nephromyces?
12 hours: *Molgula* blood

24 hours: renal sac
Fig. 1: electron-micrographs of second generation merogony and of merozoites of *Eimeria ninakohlyakimovae* in the large intestine epithelial cells of experimentally infected goat, 15 days after infection. A: division and migration of meront nuclei (arrow), scale bar = 2.1 μm; host cell nucleus (HN). B: formation and liberation (arrows) of merozoites, scale bar = 0.8 μm; residual body (RB). C: merozoite, scale bar = 0.4 μm; conoid (C), rhoptrie (R). D: merozoite, scale bar = 0.3 μm; micronemes (MI), micropore (MP), electron-dense bodies (CED).
Inside

*Nephromyces*
Symbiotic partners can be highly modified in structure and physiology compared to free-living relatives.

Molgulids and *Nephromyces* are distinctive clades: in what ways might their interdependence have affected their respective evolutionary paths, compared to sister taxa?