

Why Sequence the Shipworm Microbes?

Shipworms, also known as "termites of the sea," are worm-like saltwater clams that feed primarily on submerged wood. Like termites, shipworms depend on symbiotic bacteria in their digestive tract for enzymes, which allow them to digest wood and are of potential interest for the commercial production of ethanol from plant biomass. As part of the DOE's mission to replace fossil fuels with renewable sources for cleaner energy (such as ethanol,) sequencing the symbiont metagenome of *Bankia setacea*, the giant Pacific shipworm, will provide a valuable source of information for converting biomass into ethanol.

While the mechanisms shipworms use to digest wood remain largely unknown, anatomical considerations indicate that they differ from those observed in terrestrial cellulose consumers such as termites. The digestive systems of most terrestrial cellulose consumers contain dense and diverse populations of symbiotic microbes thought to be involved in cellulose metabolism and nitrogen fixation. Shipworms lack such highly developed and conspicuous microbial populations in their digestive systems. Instead they harbor dense populations of intracellular endosymbiotic bacteria in specialized cells (bacteriocytes) within a specialized organ (the Gland of Deshayes) in their gills. The shipworm symbiont community is far simpler and is phylogenetically distinct from those found in termites and ruminants. The mechanisms of lignocellulose degradation that shipworms employ are unique, placing shipworms and their symbionts among the most promising potential sources of novel enzymes for lignocellulose degradation and ethanol production.

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Page Last Updated 7/10/2008



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