Algae invade amphibian egg masses

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The establishment of symbiotic systems requires one organism to live in or on a host. For some North American amphibians, these symbionts are algae and they associate with their aquatic egg masses. Researchers have begun to speculate that these smaller organisms initially invade embryonic host tissues and cells and then transfer to the next generation of hosts.

In a previous study, one of the authors of the current study was part of a team that discovered single-celled algae were invading the embryonic cells of their salamander hosts. This was the first report of such an organism in a vertebrate host, and it led the researchers to question why a photosynthetic organism like algae would invade the tissues of an opaque host that will, as yellow spotted salamanders do, spend virtually all of its life underground. They hypothesized that the algae are invading the embryos as part of a system of intergenerational symbiont transfer.

However, it was still very possible, and in fact likely, based upon work done in the 1940s that the algae that invaded egg masses were present in pond water at the time that the egg masses were laid and simply migrated in, thereby becoming acquired environmentally.

The authors of an article published in the current issue of the journal *Phycologia* investigate the possibility of environmental symbiont acquisition on yellow spotted salamanders and their symbionts, a type of single-celled green algae called Oophila (egg lover) amblystomatis. The authors developed a way to collect undisturbed pond water from previously identified salamander breeding habitat, filter it, and then

extract DNA, which they then sequenced and analyzed. The authors found that the pond water did in fact contain free-living cells whose DNA sequences were identical, or nearly identical to those sequences from green algae harvested directly from egg masses. These pond-dwelling algae were present both before and after the salamanders laid their eggs. Therefore, the authors could conclude that the pond water can be considered a potential source of the algal symbionts. However, it is still not possible to conclude that those very same free-living algae actually invade egg masses.

Wood frogs often breed in the same ponds as salamanders. In an unexpected twist, the authors also learned that the algae that associate with the salamanders is, genetically, slightly different than algae that associate with the wood frogs. These results provide preliminary evidence that pond-based algae that differ genetically may only be drawn to one type of host. More rigorous studies are needed to further test this idea, and these are underway.

So, for now, the question of where symbiotic algae are derived from remains open and tantalizing.

More information: "Identification of free-living Oophila amblystomatis (Chlorophyceae) from Yellow Spotted Salamander and Wood Frog breeding habitat." *Phycologia*: 2015, Vol. 54, No. 2, pp. 183-191. doi: dx.doi.org/10.2216/14-076.1

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