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Inducing Reversions Between Asexual and Sexual Reproductive Strategies in Daphnia

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I. Our Study

We are testing the effects of numerous treatments (both chemical and non-chemical) on crustaceans, with the goal of controlling the male to female ratio and the method of reproduction they use (sexual or asexual).

Understanding how this process works and how to control it would be invaluable not only to the scientific community, but also to farmers (as asexual organisms reproduce much faster!).

We believe that the different modes of reproduction evolved together early on in eukaryotic evolution; thus the capacity for asexual and sexual reproduction is retained in the genetics of all eukaryotes.

So far, we have found that the control for reproductive strategy is largely dependent on population size and the amount of available food.

II. What Are Daphnia?

Daphnia (water fleas) are a genus of small crustaceans that are present in almost all major freshwater environments. They are used in studies because they reproduce quickly and are very sensitive to environmental changes.

Daphnia are facultatively parthenogenic, meaning that they can adjust their reproductive pathway to best fit the environment.

III. Supporting Research

Past studies from Dr. Carman and Dr. Gao of USU have shown sexual pathways can be changed with chemicals found in the TOR pathway.

In these studies, sexually reproducing plants were induced to reproduce asexually and vice versa.

Upon treatment, there is a dramatic change in the reproductive strategy.

IV. Importance of Study

Apomictic plants and parthenogenic animals reproduce much faster and in much greater numbers than sexually reproducing ones.

If there is a desired trait a plant or animal has, apomixis locks it in place.

The majority of crop plants reproduce sexually, meaning that we can’t use hybrid varieties’ seed. If apomixis was permanently fixed, so would hybrid vigor.

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