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# THE EFFECTS OF GERMLINE SEQUESTRATION ON MULTICELLULARITY

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There have been many transitions in the history of evolution. For example, the transition of prokaryotes to eukaryotes, asexual to sexual populations, primate to human societies and so forth. We are specifically interested in the transition from unicellular to multicellular organisms. This transition is particularly interesting because multicellularity requires an immense amount of cellular cooperation. Our previous research focused on how relatively simple mechanisms such as growth and dispersal affected the evolution of multicellularity. In this study, we want to investigate the importance of germline sequestration (differentiation). A germline is the cellular lineage of an organism. Germ cells, distinct from other cells, pass their genetic material to following generations. The segregation of germline cells occurs early in development. Previous research suggests the presence of germline cells play a role in the transition to multicellularity. The goal of our experiment is to manipulate the germline cells and observe how they influence the evolution of multicellularity. We will create multicellular pseudo-organisms using *Dictyostelium discoideum*. *D. discoideum* is a eukaryote that transitions from a unicellular amoeba to a multicellular slug in order to form a fruiting body when starved. A fruiting body consists of an upright stalk (composed of dead cells) with a mass of surviving cells at the apex. A key characteristic of multicellularity is cooperation. We will add a mixture of non-fruiting cheaters to a mixture of wild-types. These non-fruiting cheaters are unable to form a stalk, thus preferentially reach the apex. We will manipulate the timing and location of our collection of germline cells. These cells will be passed from generation to generation and we will observe the effect on multicellularity. We theorize that the presence of cheaters, which are non-cooperative, should break down the multicellular system, but some types of germline sequestration may prevent this from occurring.