

Manipulation of the Microbiome in the gut of the fruit fly to Alleviate Cadmium Bioaccumulation

Cadmium (Cd) poisoning contributes to severe bodily detriments characterized by kidney failure, osteomalacia, and osteoporosis, otherwise known as Itai-Itai disease. The ingestion of cadmium contaminated foods primarily causes these conditions. There are no treatments to remove cadmium once absorbed, resulting in bioaccumulation. In this study, we are developing a method to manipulate the community of microorganisms (microbiome) living within the gastrointestinal (GI) tract of the fruit fly (*Drosophila melanogaster*), intending to use microorganisms to reduce the availability of ingested cadmium.

The biodiversity of microorganisms within the GI tract is responsible for metabolizing substances that the body cannot perform. Introducing a microbe that can metabolize cadmium into an insoluble form in the gut microbiome might be key to reducing cadmium absorption. To confirm the microbe's effectiveness, the microbe itself must reach the GI tract and successfully colonize it.

A germ-free (axenic) population of flies bearing no microbial presence within their bodies was developed and maintained as our model. Repopulation using *Escherichia coli* was unsuccessful, suggesting that non-native bacteria may have a low success rate. We procured a culture of native bacteria from wild-type fly GI tracts to repopulate the axenic model. This attempt was successful, affirming that repopulation of an axenic GI tract is feasible. These results suggest that modifying the native bacteria to metabolize cadmium may be a valuable way for future experiments.