

## **Spaceflight and simulated microgravity increases virulence of the known bacterial pathogen *S. marcescens*.**

After spaceflight, the number of immune cells is reduced in humans. In other research models, including *Drosophila*, not only is there a reduction in the number of plasmatocytes, but expression of immune-related genes is also changed after spaceflight. These observations suggest that the immune system is compromised after exposure to microgravity. It has also been reported that there is a change in virulence of some bacterial pathogens after spaceflight. We recently observed that samples of gram-negative *S. marcescens* retrieved from spaceflight is more virulent than ground controls, as determined by reduced survival and increased bacterial growth in the host. We were able to repeat this finding of increased virulence after exposure to simulated microgravity using the rotating wall vessel, a ground based analog to microgravity. With the ground and spaceflight samples, we looked at involvement of the Toll and Imd pathways in the *Drosophila* host in fighting infection by ground and spaceflight samples. We observed that Imd-pathway mutants were more susceptible to infection by the ground bacterial samples, which aligns with the known role of this pathway in fighting infections by gram-negative bacteria. When the Imd-pathway mutants were infected with the spaceflight sample, however, they exhibited the same susceptibility as seen with the ground control bacteria. Interestingly, all mutant flies show the same susceptibility to the spaceflight bacterial sample as do wild type flies. This suggests that neither humoral immunity pathway is effectively able to counter the increased pathogenicity of the space-flown *S. marcescens* bacteria.