The Effect of X-Rays on Drosophila Melanogaster Behavior and Fly-Grooming

The purpose of this study is to perform an X-ray dosage experiment on Drosophila Melanogaster and determine its effect on the behavior.

Herman Muller in 1927 discovered that the number of genetic mutations in fruit flies increased after they were exposed to X-rays. Since then, many conducted experiments on fruit flies to observe the relationship between mutations and X-rays. In these studies, relatively high doses of ionizing radiation is used. We want to instead observe whether there is an impact on fruit flies' grooming behavior in a much lower dosage of X-rays (~0.2 Gy).

There are five types of rhodopsins expressed in the eye of Drosophila Melanogaster and their peaks of absorption range from 345–508 nm. Each photoreceptor cell expresses only one type of rhodopsin and these rhodopsins present a range of preferred light sensitivity from UV to green, which is different from the spectrum of visible light in humans (400–700 nm). Most X-rays have a wavelength in the range of 10 picometers to 10 nanometers and X-ray wavelengths are shorter than the wavelengths in UV rays and typically longer than those in gamma rays. Grooming in Drosophila Melanogaster is an intrinsic behavior that involves the coordination of many motor programs. When grooming, fruit flies clean their bodies of dust, microbes, and other pathogens that could hinder their normal functions, including vision and flight. Flies perform grooming behavior in well-defined sessions that mainly transpire in stereotyped patterns.

In this experiment, Drosophila Melanogaster flies are placed into a fly chamber and irradiated with different doses of X-rays. After, the grooming behavior and velocities of the flies will be analyzed to determine if there is an effect of X-rays on their grooming behavior. We expect to find a certain X-ray dosage range in which the increase in grooming behavior for the fruit flies is maximal and other ranges where the grooming behavior is negatively impacted. We are also looking at the change in velocities by analyzing the fly's trajectories.

SHORTENED ABSTRACT FOR NCUR:

The purpose of this study is to perform an X-ray dosage experiment on Drosophila Melanogaster and determine its effect on the behavior. Herman Muller in 1927 discovered that genetic mutations in fruit flies increased after they were exposed to X-rays. Since then, many conducted experiments on fruit flies to observe the relationship between mutations and X-rays. In these studies, relatively high doses of ionizing radiation are used; we will observe whether

there is an impact on fruit flies' grooming behavior in a much lower dosage of X-rays (~0.2 Gy). There are five types of rhodopsins expressed in the eye of Drosophila Melanogaster and their peaks of absorption range from 345–508 nm. Each photoreceptor cell expresses only one type of rhodopsin and these rhodopsins present a range of preferred light sensitivity from UV to green, which differs from the spectrum of visible light in humans (400–700 nm). Most X-rays have a wavelength from 10 picometers to 10 nanometers; X-ray wavelengths are shorter than wavelengths in UV rays and typically longer than those in gamma rays. Grooming in Drosophila Melanogaster is an intrinsic behavior that involves the coordination of many motor programs; fruit flies clean their bodies of dust, microbes, and other pathogens that hinder their normal functions, including vision and flight. Flies perform grooming behavior in well-defined sessions that mainly transpire in stereotyped patterns. In this experiment, Drosophila Melanogaster flies are placed into a fly chamber and irradiated with different doses of X-rays. After, the grooming behavior and velocities of the flies will be analyzed to determine if there is an effect of X-rays on their grooming behavior. We expect to find a certain X-ray dosage range in which the increase in grooming behavior for the fruit flies is maximal and other ranges where the grooming behavior is negatively impacted. We are also looking at the change in velocities by analyzing the fly’s trajectories.

In Drosophila, grooming is a stereotyped, coordinated movement of the forelegs and hindlegs, prompted by a mechanical/microbial stimulus, and requires functional DA neurotransmission. In this experiment, Drosophila Melanogaster flies are placed into a chamber and irradiated with X-rays doses. We will then analyze the effect of X-rays on grooming.