Hot Button: Non-Invasive Approach for Studying Emotion States in Mice

Backer Peral, David (School: La Canada High School)

Aggression, fear, and mating are innate behaviors in most vertebrate animal species, including humans. Research to understand the brain circuits that control these emotions is important to develop treatments for various neurological disorders. The ability to genetically modify mice and then elicit emotions in a controlled manner has allowed researchers to advance in this field. My research focuses on a non-invasive methodology to evaluate and quantify emotion states in mice using a thermography camera to measure body temperature, which I then correlate with the emotion states. First, I assembled the equipment and developed the necessary software for data acquisition and synchronizing the thermography camera with the rest of the lab instrumentation. Then, I collected data, analyzed it using custom tools, and conducted control experiments to test the validity of this approach. My research provides statistical evidence that activation of aggression neurons leads to an increase in the mice's head temperature, as captured by the thermography camera, thus demonstrating the effectiveness of the non-invasive apparatus I developed. When using a similar approach to study fear neurons, the results were unexpected. There was a temperature increase, even greater than that with aggression neuron activation, but no temperature increase with natural fear stimulation. This opens up some intriguing questions about these brain circuits that require further investigation. My current research utilizes these tools I developed to study other brain regions, such as those involved in mating. Finally, I designed a miniature head-mounted camera for recording the facial expressions of mice within an unrestricted environment as an additional metric of a mouse's emotion state.

Awards Won: