

**Centennial Honors College
Thomas E. Helm Undergraduate Research Day 2024**

ABSTRACT

Major: Exercise Science

Poster

Faculty Mentor(s): Timothy Piper

Pain Tolerance and Sensitivity in Redheads

Alexis Betker

Red hair makes up about 1-2% of the world's population. Of this 1-2%, there are about 2-6% of redheads in the United States. Redheads carry the melanocortin-1 receptor (MC1R) gene that controls the production of melanin, leading to red hair. This gene produces high amounts of the pigment pheomelanin which results in characteristics of freckles, fair skin, and darker eye color.

Redheads possess more of the hormone MC4R which results in a higher pain sensitivity, meaning that they can sense pain at lower levels of exposure than a typical person.

They also possess higher levels of the hormone, OPRM1, which leads to the opioid inhibitor imbalance and a higher pain threshold. The imbalance of these two hormones, OPRM1 being the predominant hormone, leads to the need for more anesthesia during medical procedures.

Research has shown that the pain threshold in redheads, due to MC1R, exhibit a higher pain tolerance than non-redheads. While this study was performed on mice the MC1R gene functions in similar fashion in humans. The effects that the MC1R gene has on the pain threshold in redheads may be useful to those in the medical field so that they may provide better pain control during treatment, procedures, and recovery.

Future research should investigate the pain tolerance differences between redheads and non-redheads. The rating of pain on a 1-10 scale through the application of electrical stimulation by the application of surface EMG induced muscle discomfort.