

Investigating Potential Mechanisms of Clove Oil (Eugenol) in Model Systems

*Claire Kinmon*¹ • *Alec Bradley*¹ • *Danielle Cantrell*¹ • *Bhavik Patel*¹ • *Carolyn Grachen*¹ •
*Elizabeth Grau*¹ • *Kaylee Hall*¹ • *Danielle Hawthorne*¹ • *Paula Ortiz-Guerrero*¹ •
*Kaitlyn Samuels*¹ • *Chinni Suryadevara*¹ • *Gia Valdes*¹ • *Samuel Wycoff*¹ • *Kristin Weineck*¹ •
*Robin Cooper, PhD*¹

¹Biology, University of Kentucky

Clove oil is commonly used by humans as an essential oil. Eugenol is an active ingredient found in clove oil. Eugenol acts as an anesthetic, which is commonly used for teething children and as a topical anesthetic in some countries. Eugenol does not block glutamate receptors at the crayfish and insect neuromuscular junctions, however it does block neural activity in crustaceans and insects. We theorized that eugenol acts on voltage gated sodium channels in neurons. The crayfish heart is neurogenic so we expected the heart rate to decrease quickly but we were surprised to find that it beat at a normal heart rate despite administering 400ppm eugenol intravenously. The activity of the primary proprioceptive neurons ceased at 200ppm. In our experiment, we administered eugenol to crayfish both systemically and through exposure in their aquatic environment. Excessive use of clove oil has been found to cause overdose and cellular toxicity in humans. Overuse of topical eugenol may block proprioception in humans by the same mechanisms as in our model animals. This could result in a fall hazard, especially in elderly patients. Our focus is to determine the mechanism of action of eugenol in the nervous system.

Acknowledgments: Funding by BIO 446 lab