

Sex differences in brain activity alter pain therapies

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A female brain's resident immune cells are more active in regions involved in pain processing relative to males, according to a recent study by Georgia State University researchers.

The study, published in the *Journal of Neuroscience*, found that when microglia, the brain's resident immune cells, were blocked, female response to opioid [pain](#) medication improved and matched the levels of [pain relief](#) normally seen in males.

Women suffer from a higher incidence of chronic and inflammatory pain conditions such as fibromyalgia and osteoarthritis. While morphine continues to be one of the primary drugs used for the treatment of severe or [chronic pain](#), it is often less effective in females.

"Indeed, both clinical and preclinical studies report that females require almost twice as much morphine as males to produce comparable pain relief," said Hillary Doyle, graduate student in the Murphy Laboratory in the Neuroscience Institute of Georgia State. "Our research team examined a potential explanation for this phenomenon, the sex differences in brain microglia."

In healthy individuals, microglia survey the brain, looking for signs of infection or pathogens. In the absence of pain, morphine interferes with normal body function and is viewed as a pathogen, activating the brain's innate [immune cells](#) and causing the release of inflammatory chemicals such as cytokines.

To test how this sex difference affects morphine analgesia, Doyle gave male and female rats a drug that inhibits microglia activation.

"The results of the study have important implications for the treatment of pain, and suggests that microglia may be an important drug target to improve opioid pain relief in women," said Dr. Anne Murphy, co-author on the study and associate professor in the Neuroscience Institute at Georgia State.

The research team's finding that microglia are more active in brain

regions involved in pain processing may contribute to why the incidence rates for various chronic pain syndromes are significantly higher in females than males.

More information: H.H. Doyle et al. Sex Differences in Microglia Activity within the Periaqueductal Gray of the Rat: A Potential Mechanism Driving the Dimorphic Effects of Morphine, *The Journal of Neuroscience* (2017). [DOI: 10.1523/JNEUROSCI.2906-16.2017](https://doi.org/10.1523/JNEUROSCI.2906-16.2017)

Provided by Georgia State University

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