# Brain differences could explain why males and females experience pain relief differently

April 18 2006

A study conducted by investigators at Georgia State University and the Atlanta-based Center for Behavioral Neuroscience (CBN) reports that anatomical and functional differences in the brain may explain sex differences in the experience of pain and in the effects of certain drugs on pain.

The finding, reported in the April 13 issue of the *Journal of Comparative Neurology*, is the first report of specific differences in the parts of the brain responsible for the transmission of pain sensations in the body. The study used rat brains, but a host of clinical evidence suggests that similar differences occur in humans – in other words, this finding could eventually lead to the development of differential treatments for pain in men versus women.

A team led by Dr. Anne Murphy of the Georgia State Department of Biology and the CBN showed that male and female rodents are anatomically different in the area of the brain called the periaqueductal gray (PAG). This region of the brain relays information regarding pain to another brain region, the rostral ventral medulla (RVM). This PAG-RVM circuit is the main pain circuit in the brain, and is responsible for the sensation of pain. Both narcotics and analgesics work by acting on these brain regions. Interestingly, while thousands of studies have been conducted examining the role of the PAG and the RVM in pain and analgesia, these studies were conducted exclusively in males.

The study by Murphy is the very first to examine if these brain regions

are organized anatomically in a similar manner in females. In addition to sex differences in how the PAG is organized anatomically, the team went on to show that persistent pain activates this pathway differently in males and females. Specifically, the scientists showed that inflammatory pain activated the PAG-RVM circuit to a greater degree in males than in females. Morphine – an opioid drug or narcotic - reduced the response of this circuit to pain to in males, but not females.

These results provide the first potential anatomical and functional explanation for sex differences in the experience of pain and responses to the drug morphine in the treatment of pain.

Morphine is currently the drug of choice for treating several types of post-operative pain, and it is becoming increasingly clear that morphine alleviates pain to a greater degree in males in comparison to females. The results of the study by Murphy and Loyd provide important details about how morphine might be used differently in females and males to achieve maximum pain relief.

Pain is one of the most common reasons that people consult physicians. Thus, the management of pain has become one of the highest priorities in health care. Chronic pain from inflammatory conditions such as arthritis and fibromyalgia are the most prevalent and pervasive forms of chronic pain.

Clinical evidence suggests that women are much more likely to experience chronic forms of pain than are men and that women report feeling more pain than men following various medical procedures.

Recent recommendations from the American Academy of Pain Medicine and the American Pain Society indicate that opioid drugs or "narcotics", such as morphine, are essential in the management of chronic pain. However, there is well-established clinical and nonclinical

evidence that males and females do not respond the same to the effects of morphine. Specifically, females tend to require higher doses of morphine than males for pain relief following various medical procedures.

Source: Georgia State University