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Researcher identifies novel treatment for pain in sickle cell disease

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A University of Minnesota Medical School research team led by Kalpna Gupta, Ph.D., has discovered that cannibinoids offer a novel approach to ease the chronic and acute pain caused by sickle cell disease (SCD).

Using a mouse model of SCD, Gupta and University of Minnesota colleagues studied the pain mechanisms by observing animals that exhibited both musculoskeletal pain and temperature sensitivity, symptoms similarly experienced by humans with SCD. The team compared two classifications of drugs in their ability to manage pain sensed by the animals, the traditionally prescribed classification of drugs, opioids, with a new therapeutic approach, cannabinoids, a synthetic compound based on marijuana derivatives. Currently, the only approved treatment for management of severe pain in SCD is opioids.

Using confocal miscroscopy, a precise type of laser scanning that allowed the researchers to observe the nerve pathways of the animals, Gupta and her colleagues were able to study structural changes in the neural pathways that are activated when the animal is sensing pain. When comparing the effects that each classification of drug had on the animal's level of pain, Gupta discovered that both opioids and cannibinoids equally lessened the amount of pain the animals sensed. However, researchers were able to use much smaller doses of cannibinoids to achieve the same level of pain relief. Moreover, because researchers injected the cannibinoids directly into the body in such low doses, unwanted side effects that result from higher doses of the drug reacting in the brain were minimized.

"This paper provides proof that we can use other classifications of drugs to treat pain in patients with sickle cell disease," Gupta said. "Cannibinoids offer great promise in the treatment of chronic and acute pain, and they're effective in much lower amounts than opioids—the only currently approved treatment for this disease."

Sickle cell disease is a genetic blood disorder that affects the red blood cells in the body making them become sickle-, or crescent-shaped. The crescent shape of the cells makes it difficult for them to pass through the small blood vessels in the body, forming blocks that lessen the flow of blood. The decreased blood flow often causes a variety of other serious health complications, including stroke and damage to vital organs including the lungs, spleen, kidneys, and liver.

The disease causes a constant level of chronic pain in patients, including cold and hot temperature sensitivity, and additional episodes of sharp, severe pain known as crises. Pain in SCD is described to be more intense than labor pain. The pain starts early in a patient's life, often during infancy, and increases in severity with age. There is no known cure, and the best treatment option for most patients with SCD is pain management.
To date, the only approved classification of drugs for pain management and treatment of SCD is opioids (narcotics), the category of drugs that includes morphine. Opioids have long been used to manage the pain of patients with a variety of diseases, and the ill effects of the drugs are well known.

Particularly of concern for SCD patients is that opioids often negatively affect a patient's blood vessels and kidneys, two plaguing elements of the disease itself. In addition, patients with this disease need to take very high doses of opioids to sense any pain relief. Gupta and her team discovered that this is because the receptors required for the binding and action of morphine to provide pain relief are decreased in animals with

SCD.

More information: The paper, "Pain related behaviors and neurochemical alterations in mice expressing sickle hemoglobin: modulation by cannabinoids," was featured on the cover of the July 22, 2010 issue of Blood.

Provided by University of Minnesota