Compound may prevent sickle cell pain crises

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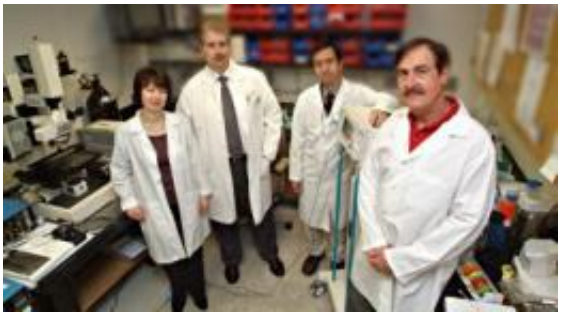

Drs. Diana R. Gutsaeva (from left), C. Alvin Head, Tohru Ikuta and Research Technician James B. Parkerson at Georgia Health Sciences University (formerly Medical College of Georgia) have shown that a new compound may help prevent the traffic jam of cells that causes a debilitating pain crisis in sickle cell disease. Credit: Phil Jones, Campus Photographer

A new compound appears to prevent the traffic jam of cells that causes debilitating pain crises and associated mortality in sickle cell disease, Georgia Health Sciences University (formerly Medical College of Georgia) researchers report.

The aptamer, developed by Archemix Corporation in Cambridge, Mass., appears to work by occupying sticky receptors lining the walls of small blood vessels where sickle-shaped red blood cells and white blood cells can pile up, according to the study published in *Blood*. The cell traffic jam occludes blood and oxygen flow, causing pain, organ damage and, eventually, death.

"Many people are focusing on developing new therapies for sickle cell disease because right now, there is only one FDA-approved choice (hydroxyurea, a chemotherapeutic agent)," said Dr. Diana R. Gutsaeva, GHSU physiologist and molecular biologist and the study's first author. "We think this aptamer has potential to be one of those new therapies."

Patients can become resistant to hydroxyurea, which was approved in1998 as the first treatment for adults with sickle cell disease.

In a mouse with sickle cell disease, administering the aptamer prior to a pain crisis-provoking stressor reduced adhesion of sickle red blood cells by 90 percent and white blood cells by 80 percent, the researchers report. The animals also had increased blood flow velocity and reduced mortality.

GHSU researchers believe the drug can now move to clinical trials where it has potential for treating an acute pain crisis – now primarily treated with narcotics – as well as avoiding one, if a tablet form becomes available. The current liquid form must been given intravenously or injected under the skin.

The Food and Drug Administration already has approved one aptamer to treat macular degeneration and others are under study for cardiovascular disease and blood disorders. GHSU also is exploring the potential of inhaled nitric oxide in treating a sickle cell pain crisis. Results of a small clinical study, led by Dr. C. Alvin Head, Chairman of the GHSU Department of Anesthesiology and published in October 2010 in the *American Journal of Hematology*, showed that inhaling nitric oxide provides better pain control than standard self-administered morphine.

The new aptamer targets P-selectin receptors, which are highly expressed in sickle cell patients. "The aptamer locks them up so they do not function," said Dr. Tohru Ikuta, GHSU molecular hematologist and a

study co-author. "There are almost no good compounds that inhibit cell adhesion and many that do are toxic." At least in their animal studies, the new compound wasn't toxic and didn't provoke an immune response, Ikuta said.

"... (T)hese results represent an exciting development offering the possibility of a much-needed, novel, targeted therapy for patients with SCD," Dr. David J. Anstee of the Bristol Institute for Transfusion Sciences, wrote in a commentary. He noted that further studies are needed to ensure the compound does not produce a harmful immune response.

Provided by Medical College of Georgia