Fluid Derived From Aloe Plant Prolongs Life After Hemorrhagic Shock In Animal Study

PITTSBURGH, July 26, 2014: A novel resuscitation fluid derived from aloe vera that was developed by researchers at the University of Pittsburgh's McGowan Institute for Regenerative Medicine has the potential to save the lives of patients with massive blood loss, according to results of an animal study published in the August edition of the medical journal Shock. The findings could have a significant impact on the treatment of hemorrhagic shock caused by both civilian and military trauma.

In a rodent model of hemorrhagic shock, animals that were given a very small amount of the fluid, an aloe vera-derived drag reducing polymer (DRP), had significantly longer survival time and increased systemic whole body oxygen consumption, even in the absence of resuscitation with blood or other fluids, compared to animals that did not receive DRP.

"We hope this fluid will offer a viable solution to a significant problem, both on and off the battlefield. Typically, hemorrhagic shock is treated by controlling ongoing bleeding and restoring blood volume by infusing a lactate solution and packed red blood cells. Soldiers wounded in combat often lose significant amounts of blood, and there is no practical way to replace the necessary amount of blood fast enough on the front lines. When this happens, there is inadequate perfusion of the organs which quickly leads to a cascade of life-threatening events," said senior author Mitchell P. Fink, M.D., professor and chair, department of critical care medicine and Watson Professor of Surgery at the University of Pittsburgh School of Medicine.

"Medics would need only to carry a small amount of this solution, which could feasibly be administered before the soldier is evacuated to a medical unit or facility," he added.

The central ingredient of Pitt's resuscitation fluid comes from the slick substance inside the leaves of the aloe vera plant. A so-called mucilage, it is rich in polysaccharides and has a high molecular mass and specific "visco-elastic" properties that allow it to reduce resistance to turbulent flow when added to a fluid at minute concentrations.

"As a drag reducing polymer, it may provide better diffusion of oxygen molecules from red blood cells to tissues because of its ability to better mix in the plasma surrounding red blood cells," explained Marina Kameneva, Ph.D., research associate professor of surgery and bioengineering, University of Pittsburgh, and director of the Artificial Blood Program at the McGowan Institute, who developed the fluid and has been researching its potential for the past several years.

In the current study, lead by Carlos A. Macias, M.D., a visiting research associate in the department of critical care medicine at the University of Pittsburgh's School of Medicine, five of 10 rats that were injected with a small amount of a normal saline solution survived four hours after hemorrhagic shock. Of the animals treated with a same amount of saline and the aloe-derived DRP, eight of 10 survived. The animals treated with DRP also fared better in another experiment involving more severe blood loss; five of 15 survived the two-hour observation period, compared to one of 14 treated with saline solution alone. Seven animals receiving no treatment all died within 35 minutes.

According to the Department of Health and Human Services, trauma is the leading cause of death for those under the age of 40. In the United States, traumatic injuries result in approximately 150,000 deaths per year; complications resulting from the loss of large amounts of blood account for almost half these deaths.

In addition to Drs. Fink, Kameneva and Macias, authors of the study are Jyrki J. Tenhunen, M.D., Ph.D., visiting research associate in the department of critical care medicine at the University of Pittsburgh's School of Medicine; and Juan-Carlos Puyana, M.D., associate professor of critical care medicine and surgery at Pitt and critical care director of the trauma/surgery intensive care units at the University of Pittsburgh Medical Center.

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