Nanoparticle treatment for burns curbs infection, reduces inflammation

September 14 2009

Treating second-degree burns with a nanoemulsion lotion sharply curbs bacterial growth and reduces inflammation that otherwise can jeopardize recovery, University of Michigan scientists have shown in initial laboratory studies.

U-M burn surgeon Mark R. Hemmila, M.D., reports today at the Interscience Conference for Antimicrobial Agents and Chemotherapy on results achieved with a nanoemulsion developed at U-M and licensed by U-M to Ann Arbor-based NanoBio Corporation.

The nanoemulsion shows promise in overcoming the limitations of current creams used in burn treatment, which aren't able to penetrate skin to kill sub-surface bacteria and don't have a strong effect on inflammation, says Hemmila, associate professor of surgery at the U-M Medical School.

In a collaborative effort between the U-M Department of Surgery and NanoBio Corporation, Hemmila led experiments at the U-M Medical School in which a nanoemulsion lotion was able to reduce bacterial growth one-thousand-fold compared to control animals receiving no treatment or a placebo. The nanoemulsion showed a similar reduction when compared to a topical antimicrobial agent commonly used in people with burns.

The nanoemulsion is made of soybean oil, alcohol, water and detergents emulsified into droplets less than 400 nanometers in diameter. It has

proved effective at killing a variety of bacteria, fungi and viruses in previous research.

The scientists used the nanoemulsion to treat partial thickness burns, better known as second degree burns, over 20 percent of the body, to test its effectiveness in the type of injuries doctors commonly see in people brought to tertiary hospital trauma and burn centers. Such burn victims typically require aggressive treatment in intensive care both to rein in infection and to try to prevent vital fluids from leaking from blood vessels into the damaged skin, a dangerous situation caused in part by excessive inflammation within the body.

The nanoemulsion appears to reduce the action of two inflammatory agents or cytokines that play a role in cell signaling during this critical post-burn period. Slowing this action may prevent initial burn damage from becoming worse, and thus reduce the severity of the burn and extent of skin grafting needed, says Hemmila.

The findings add one more possible use to a growing list of promising applications for the patented nanoemulsion technology developed by James R. Baker, Jr., M.D., director of the Michigan Nanotechnology Institute for Medicine and Biological Sciences at U-M. Baker, a member of the research team, is the Ruth Dow Doan Professor of Nanotechnology and allergy division chief at the U-M Medical School. He is founder and CEO of NanoBio Corporation.

Uses for nanoemulsions include treatments for cold sores, now in phase 3 clinical trials, and for toenail fungus and cystic fibrosis infections, as well as vaccines against influenza and bioterrorism agents.

Before the burn treatment can be tested in people, further laboratory studies are needed to examine the nanoemulsion's effects on the overall healing process.

Source: University of Michigan Health System (news : web)