Surprising results from smoke inhalation study

January 13 2012

A Loyola University Chicago Stritch School of Medicine study includes some unexpected findings about the immune systems of smoke-inhalation patients.

Contrary to expectations, patients who died from their injuries had lower inflammatory responses in their lungs than patients who survived.

"Perhaps a better understanding of this early pulmonary immune dysfunction will allow for therapies that further improve outcomes in burn care," researchers reported.

The study is published in the January/February issue of the *Journal of* Burn Care *& Research*. First author of the study is Christopher S. Davis, MD, MPH, a research resident in Loyola's Burn & Shock Trauma Institute. Corresponding author is Elizabeth J. Kovacs, PhD, director of research of the Burn & Shock Trauma Institute.

Researchers followed 60 burn patients in Loyola's Burn Center. As expected, patients with the worst combined burn and smoke-inhalation injuries required more time on the ventilator, in the intensive care unit and in the hospital. They also were more likely to die, although this finding fell just short of being statistically significant.

Also according to expectations, patients who died were older and had larger injuries than patients who survived.

But the immune system findings were unexpected. Researchers measured concentrations of 28 immune system modulators in fluid collected from the lungs of patients within 14 hours of burn and smoke-inhalation injuries.

These modulators are proteins produced by leukocytes (white blood cells) and other cells, including those that line the airway. Some of the modulators recruit leukocytes to areas of tissue damage or activate them to begin the repair process that follows tissue injury.

Based on studies conducted at Loyola and other centers, researchers had expected to find higher concentrations of modulators in patients who died, because sicker patients tend to have more active inflammatory responses. But researchers found just the opposite: patients who died had lower concentrations of these modulators in their lungs.

Why do some patients mount robust immune responses in the lungs while others do not? The reason may be due to age, genetics, differences in patients' underlying health conditions or anything that might disrupt the balance between too much and too little inflammation, Davis said.

Survival of burn patients has significantly improved since the 1950s, due to advancements such as better wound care and improved prevention and treatment of infections. But progress has somewhat stalled in the last 10 years.

The immune response to injury "remains incompletely understood and additional effort is required to further improve survival of the burn-injured patient," researchers wrote.

The study was presented at the 2011 meeting of the American Burn Association, where it won the 2011 Carl A. Moyer Resident Award for the best study submitted by a resident physician.

Other co-authors of the study are Richard L. Gamelli, MD, FACS, director of the Burn & Shock Trauma Institute; Joslyn M. Albright, MD, chief resident in the Department of Surgery; Stewart R. Carter, MD, research resident; Luis Ramirez, BA, laboratory technician; and Hajwa Kim, MA, MS. All are from Loyola except Kim, who is at the University of Illinois at Chicago.

The study was funded by grants from the National Institutes of Health, Department of Defense, International Association of Fire Fighters and the Dr. Ralph and Marian C. Falk Medical Research Trust.

Loyola's Burn Center is one of the busiest in the Midwest, treating more than 600 patients annually in the hospital, and another 3,500 patients each year in its clinic. It is one of only two centers in Illinois that have received verification by the American Burn Association.

The study is among the results of research over the last several years conducted in Loyola's Burn Center and Burn & Shock Trauma Institute, which is investigating the lung's response to burn and inhalation injuries.

Provided by Loyola University Health System