Scientists discover how flu damages lung tissue

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A protein in influenza virus that helps it multiply also damages lung epithelial cells, causing fluid buildup in the lungs, according to new research from the University of Alabama at Birmingham (UAB) and Southern Research Institute . Publishing online this week in the journal of the Federation of American Societies for Experimental Biology, the researchers say the findings give new insight into how flu attacks the lungs and provides targets for new treatments.

In severe cases of flu, fluid accumulates in the lungs, making it difficult to breathe and preventing oxygen from reaching the blood stream. The researchers report that M2, a protein in the flu virus, damages a protein responsible for clearing fluid from the lungs by increasing the amount of oxidants, or free radicals, within the cells. Oxidants are necessary for proper cell function, but can become toxic if uncontrolled.

"Under normal conditions, oxidants play an important role, as they destroy pathogens in cells. But our findings suggest that lowering the number of oxidants, or preventing their increase, would prevent damage to the lungs resulting from the M2 protein," said Sadis Matalon, Ph.D., vice chairman for research and professor of anesthesiology at UAB and principal investigator of the study.

The researchers say the recent outbreak of H1N1 influenza and the rapid spread of this strain across the world highlight both the need to better understand how the virus damages the lungs and the urgency to find new treatments. Influenza is a contagious disease leading to about 36,000

human deaths and 200,000 hospitalizations every year in the United States alone.

Matalon, along with co-investigators Ahmed Lazrak, Ph.D., and Karen E. Iles, Ph.D., from the Department of Anesthesiology at UAB, and James W. Noah, Ph.D., and Diana L. Noah, Ph.D., of Southern Research, injected frog eggs with M2 protein and the lung protein involved with fluid removal. Using molecular biology techniques, they removed part of the flu protein until they could isolate the segment responsible for the lung injury.

"We found that when the flu protein was shortened in length, it did not damage the lung protein responsible for removing fluid from the lungs," said Diana Noah. "This is important information as it will enable us to design drugs that will hopefully prevent this M2 flu protein from functioning properly, making it possible for those infected with the flu to recover faster."

Another set of experiments involved injecting intact flu proteins and their target lung proteins into frog eggs along with agents that remove oxidants. The findings of the study show that following this procedure the lung proteins were no longer damaged by the flu viruses.

The team then repeated the experiments in cells from human lungs and found the same results. "We were able to understand the basic mechanisms by which the flu damages key components of the lungs in a simple system, such as the frog eggs, and then confirm these findings in human lung cells," said Matalon.

The researchers are hesitant to say that these results indicate a simple antioxidant, such as vitamin C, can prevent or minimize flu. "The issue is too complex and we simply can't answer that yet," said James Noah. "Vaccination is our leading defense against flu and we have anti-viral

drugs that are effective in some cases, but flu viruses show a remarkable ability to mutate, rendering vaccines and drugs less effective. Having a new target for potential interventions opens up an entirely new approach to combating influenza."

Source: University of Alabama at Birmingham (news : web)