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### Why is the Flu More Potent in Winter?

#### Background on Flu Statistics and Older Theories

The two members of the *Orthomyxoviridae* family, known as the flu (influenza A and B), are the reason for the hospitalization of over 200,000 people each year and eventually are implicated in causing the deaths of 36,000, striking both infants and old folks without mercy.

Until recently, scientists all recited the same cause as to why more people got sick with the flu in the winter rather than in the summer. It was due to the fact that humans spend long hours indoors, breathing and generally contaminating each other with the flu virus. (By the way, touching common objects only transmits colds, not the flu.)

How about the fact that winter was cold and put more thermal stress (see *Types of Stress*) on the body? Some scientists presented the argument that the winter cold suppressed people's immune systems and the lack of sunshine diminished the body's receiving extra vitamin D.

But there were holes in everyone's theories. If being in crowded places caused transmission, why didn't people transmit the flu virus in the hot summer, when they were crammed into factories, offices, and sweating next to each other in buses, train stations, airplane terminals? On the other hand, if little kids coughing and sneezing on each other were the source of contamination, why weren't there outbreaks in September and October?

#### New Breakthrough

Well, thanks to medical researchers at the microbiology department at Mount Sinai School of Medicine in New York, who have published their findings in the medical journal *PLoS Pathogens*, citing that by varying both air temperatures and humidity in the cages of guinea pigs, it was found that the flu transmitted best at 41 degrees. (The Italian word *influenza* originally was coined as *influenza di freddo* (influence of the cold!))

Furthermore, transmissions proved to steadily decline with higher temperatures and, at 86 degrees, the virus perished and did not transmit at all. In addition, the humidity factor was found to be at its highest transmission rate when only at the low humidity of 20% (and to cease transmission at 80%).

#### Further Discovery

After celebrating the findings at Mount Sinai School of Medicine when they were published, other researchers at US National Institutes of Health published their own research in the scientific journal *Nature Chemical Biology*. This new research made a quantum leap further into our understanding by discovering that in colder temperatures, viruses form a tough, rubbery coating of fatty substance that hardens to the consistency of a gel, which protects them in cold air. This tough coating is composed of lipids, similar to those found in fats, oils and cholesterol.

#### How It Works

This fatty coating (called hemagglutinin) provides a protective shield so that the virus can pass from person to person without perishing. When the virus is inhaled, its protective coating melts into a buttery consistency in the respiratory tract, enabling the virus to enter a host cell. Since viruses cannot reproduce on their own, they take over a healthy cell and inject their genetic material into the cell, effectively converting the cell into a viral factory that will infect other cells. This why flu loves the winter likes skiers love the snow. It's time to party!

However as the temperature rises to 60 degrees, the virus' coating melts into a soupy consistency, losing its power to protect. Therefore temperatures in the spring and summer are too warm to

allow the tough coating to remain in its gel state, causing the viruses to weaken and perish.

Now if scientists can only discover how viruses operate in the tropics – hmm.

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**Sources: Influenza Virus Transmission Is Dependent on Relative Humidity and Temperature** *PLoS Pathogens* 3(10): e151 doi:10.1371 October 19, 2007 **Influenza Seasonality: Underlying Causes and Modeling Theories** *Journal of Virology* 2007 June; 81(11): 5429–5436 **Influenza-Associated Hospitalizations in the United States** *Journal of the American Medical Association* 2004 Sep 15;292(11):1333-40