Immune response may tie stress to colds

People who feel unable to deal with life's stresses display an exaggerated immune reaction that may intensify their sneezing, coughing, and other physical symptoms once they've contracted a common virus, a new study suggests.

However, the researchers have not yet confirmed whether this particular immune response—a sharp rise in the production of a chemical messenger known as interleukin-6 (IL-6)—magnifies coldlike respiratory symptoms or occurs in response to them.

"This is the first linkage of psychological stress to both an immune system change and a verified disease outcome," says psychologist Sheldon Cohen of Carnegie Mellon University in Pittsburgh, who directed the investigation. "We've shown that these three factors are interrelated, but we can't say for sure that increases in IL-6 concentration precede cold symptoms."

Cohen and his colleagues previously found that high levels of mental stress increase the risk of becoming infected by respiratory viruses and developing cold symptoms (SN: 8/31/91, p. 132).

In the latest research, published in the March/April PSYCHOSOMATIC MEDICINE, 55 adults who were recruited through newspaper advertisements first completed a short questionnaire. It focused on the extent to which the volunteers had felt able to cope with psychological demands and maintain manageable stress levels in the past month.

Participants then spent 8 consecutive days quarantined in separate rooms of a Pittsburgh hotel. On the first day, they underwent physical examinations and were tested for viral infections.

The next day, each volunteer received nasal drops containing an infectious dose of an influenza A virus. The researchers verified that all the volunteers developed infections from the virus during their hotel stays.

At the end of each day, participants rated the severity of their cold symptoms. These consisted of sneezing, nasal congestion and discharge, sore throat, cough, headache, chilliness, and feeling uneasy and uncomfortable.

Mucus production was assessed by collecting and weighing used tissues that had been sealed into plastic bags. IL-6 levels were measured daily in samples of nasal secretions.

Those individuals reporting pronounced stress in their lives produced the most mucus, displayed the largest surges in IL-6 production, and cited the most-severe symptoms of respiratory infection during the course of the study, the researchers say. During the early stages of infection, increases in IL-6 concentration closely corresponded to the intensification of cold symptoms and mucus production, they add.

When a virus impinges on cells' ability to function, IL-6 release attracts immune cells to that site. In the case of a respiratory infection, IL-6 production ignites a process that results in cold symptoms.

Psychological stress may loosen physiological controls on IL-6 release, Cohen proposes, leading to its overproduction in the face of viral infection. It's also possible that the increase in IL-6 for stressed people reflects a larger and much more complex immune process triggered during the course of viral infections, he says.

"This is a provocative new finding, but it's hard to know if the findings truly pick up on a biological mechanism linking stress to cold-virus activity," remarks psychologist Janice K. Kiecolt-Glaser of Ohio State University in Columbus.

IL-6 may react with great sensitivity to psychological stress without serving as a physiological bridge to cold symptoms, she contends.

In a follow-up investigation, Cohen's group plans to stimulate IL-6 release in immune cells grown in the laboratory. The researchers will then see if the individuals who provided the cells generating the highest concentrations of IL-6 also experience the greatest stress and respond to virus with severe cold symptoms.

Drugs that block IL-6 and could help reveal its impact, if any, on cold symptoms are not yet available. —*B. Bower*

Device eliminates wait for DNA results

Crime investigators want forensic tests to be fast and accurate. Unfortunately, such tests are often slow and prone to error. Whenever a person intervenes in the procedure, opportunities for mistakes increase.

Now, researchers have designed a machine that performs a standard DNA test on blood samples from start to finish—without human intervention. Nanyan Zhang, Hongdong Tan, and Edward S. Yeung at the Department of Energy's Ames (Iowa) Laboratory and Iowa State University in Ames describe their prototypical device in the March 15 ANALYTICAL CHEMISTRY. It can work on blood samples as small as 1 microliter.

Traditional DNA analysis can match bloodstains found at a crime scene, but getting results from a lab usually takes 4 to 6 weeks. The new system "would give you enough information to rule in or rule out certain people in about 2 1/2 hours," says Yeung.

Existing technology also permits automation of certain steps of the process, says Yeung, but a person still must transfer samples between the steps. That increases the chance of contamination and other mishaps.

Yeung

A prototypical system performs automatic DNA analysis on blood. To control the fluid flow, the device shuts the tubes by freezing them with liquid nitrogen, then opens the tubes by thawing them with a blow dryer.

The prototype carries out a sequence of several operations automatically on tiny blood samples. Each sample travels through a long, thin capillary tube. In the first section, a brew of chemicals breaks open the blood cells. The chemicals amplify the minuscule amount of DNA to a measurable quantity via a process called the polymerase chain reaction, or PCR (SN: 10/23/93, p. 262).

The second section of the tube separates the amplified DNA fragments. The pieces of DNA are then identified by beaming a laser at them and detecting their fluorescence.

In order to use PCR on whole blood, rather than on isolated DNA, Yeung and his coworkers had to modify the standard procedure.

"Blood is one of the worst materials because it contains a lot of proteins, and proteins affect the enzymatic reactions in PCR," he explains. The Ames group, therefore, chose enzymes that work in the presence of various blood proteins.

The researchers' prototype analyzes and compares 8 DNA samples simultaneously, although it could easily handle 100 without major changes in design, Yeung says.

Many companies are developing miniature chemistry labs on microchips so that forensic- and environmental-test devices can be portable (SN: 8/15/98, p. 104). Unlike these other miniaturized instruments, the Iowa system "does a lot of samples in parallel. That's what's unique about it," says Steven A. Soper of Louisiana State University in Baton Rouge. In a clinical setting, the Iowa device could screen many blood samples for disease-causing genes, reducing delays and cost, adds Soper.

Though not as small as a lab-on-a-chip, the Ames group's prototype could fit in the back of a van, says Yeung. Taken to a crime scene, the machine could examine evidence on the spot. —*C. Wu*