Biology

Lisa Davis reports from Washington, D.C., at the annual meeting of the American Society for Microbiology

Common denominator for common cold

The rhinovirus, responsible for up to half of all common colds, is such a quick-change artist that no vaccine is likely to be able to prime the body against all the variants of the virus. So scientists at Merck Sharp & Dohme Research Laboratories in West Point, Pa., have taken a different tack: They have developed a monoclonal antibody that, like a fat person stuck in the doorway, denies the virus access to cells.

There are at least 115 variants, or serotypes, of the virus. "What we set out to do was to find a common denominator to these serotypes," says research head Richard J. Colonno. "And what we found was that 90 percent of the serotypes would attack the cell through a single cellular receptor."

The researchers treated a culture of human nasal cells with a monoclonal antibody specific to that receptor protein. Of 88 serotypes tested, 78 were unable to bind with the treated cells. (The remaining serotypes competed for a second receptor.) When the researchers allowed the virus to bind to cells before adding antibody to the culture, they found that "the antibody will literally knock the virus off the cells and replace it," Colonno says.

In the first clinical trial of the receptor blockade, conducted by Frederick G. Hayden and Jack Gwaltney at the University of Virginia in Charlottesville, 26 volunteers used nose drops containing either antibody or placebo; three hours later, all sprayed a specific rhinovirus serotype into their noses. They continued periodic treatment with antibody or placebo for 39 hours. Though nearly identical numbers in each group developed colds (11 of the antibody group, 12 of the placebo group), cold symptoms were delayed by up to two days in the antibody group, and were only about 60 percent as severe. The researchers observed no side effects from the antibody.

The fact that the antibody had any effect at all shows the promise of the approach, says Colonno, since "we know virtually nothing about the number of receptors that need to be blocked by the antibody, or their turnover rate."

The work changes the odds for rhinovirus researchers: There may be 115 serotypes, but their common receptors mean researchers can now deal with just a few receptor types. The researchers hope the work will lead to a nasal spray with prophylactic and therapeutic effects against colds.

Don't share the air

Scientific studies in the past have pointed to skin contact as the prime mode of transmission of the common cold. But in research by Elliot Dick at the University of Wisconsin in Madison, marathon poker games between healthy players and sniffling, sneezing ones gave an indication that *airborne* particles play a significant role in passing the infection.

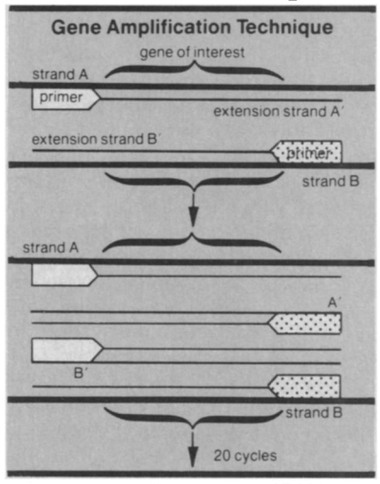
In one experiment, half of the healthy players wore large, sun-reflector-style collars to keep them from passing germs picked up from cards or pencils to their eyes, noses or mouths. Five out of six of these players caught colds, says Dick. Results from two other experiments, in which the healthy players wore restraining arm braces (to prevent them from touching their faces) were much less clear: Four caught cold in the third poker session, but only one got sick in the second.

A final session, immediately following the third, tested infection when there could be no aerosol transmission. In a different room, 12 healthy players used the contaminated cards, chips and pencils from the previous game. Once each hour, freshly contaminated materials were brought in. None of these players caught colds. "The combination of the relatively equal attack rate between the aerosol and [hand-to-hand] transmission," Dick says, "and the complete lack of transmission in . . . a potentially massive contamination with cards suggests to us that the aerosol route may be very important."

Biotechnology

Julie Ann Miller reports from Washington, D.C., at the American Society for Microbiology Conference on Biotechnology

Ample samples of specific genes



A new process for copying any selected part of a human chromosome can make a million copies in about two hours, according to a group of California researchers. Unlike the techniques previously in use, the procedure does not insert the human DNA into a microorganism. Instead, it uses enzymes in the laboratory simply to copy and recopy a designated stretch of DNA. The procedure is expected to be useful wherever small amounts of DNA must be analyzed, for example in diagnostic medicine, forensic science and laboratory research. "If there is not enough DNA, you can just make more of it," says Henry Erlich of the Cetus Corp. of Emeryville, Calif.

Cetus scientists have used the method to take as little as 33 nanograms of human DNA and produce enough of the beta-globin gene to detect carriers of thalassemia (a form of anemia) and to do some prenatal diagnoses. They are also using the procedure to study the proteins responsible for transplant rejection.

The strategy takes advantage of the natural process by which DNA replicates. An enzyme called a polymerase travels along a single strand of DNA, adding the correct components to make a new double strand. The starting point for the polymerase activity is a short DNA segment, called a primer. The primer must be bound to the strand serving as the template.

In the new method, the scientists dissociate DNA into its single strands. Next they mark the gene to be copied by adding two short stretches of laboratory-synthesized, single-stranded DNA that bind, one on each side of the gene, to provide two primers for the polymerase. Then the polymerase is added and allowed to synthesize a new DNA segment that includes the gene of interest. The resultant double-stranded stretch of DNA is dissociated, completing a "cycle" of the procedure. Because each of these single strands – both the original full-length strands and the new fragments – can bind one of the two primers and serve as a template for further DNA synthesis, when the cycle is repeated the DNA pieces accumulate exponentially.

Genes (and proteins) in the bank

Improvements are being made in the computer programs used to compare the sequences of the components that make up proteins and DNA, decreasing both the time and computer memory required to search for similarities, reports William R. Pearson of the University of Virginia in Charlottesville. He and his colleagues have devised new methods to compare proteins or genes analyzed by different laboratories and entered into computerized data banks. For example, he says, with an IBM PC microcomputer, DNA sequences totaling 4 million nucleotides can now be searched for a given sequence in less than an hour. And a protein data bank containing 700,000 amino acids can be searched in less than 10 minutes. "Computer analysis of DNA and protein sequences has become increasingly important as our ability to clone and sequence genes has outstripped our ability to identify their functions," he says.