

Beware the Vapors

Back some 60 years ago, when researchers first noted that chemical workers exposed to benzene fumes seemed unusually prone to leukemia and other serious disorders, the industry moved quickly to clear the air in the factories of the noxious vapors and gases. Now, a Chicago physician suggests that the same kind of measure should be taken in the nation's operating rooms. Dr. David L. Bruce of Northwestern University says there is evidence that stray anesthetic vapors may be causing a high rate of miscarriages among surgical nurses and female anesthetists.

Addressing the annual meeting of the American Society of Anesthesiologists in Atlanta, Bruce cited a recent study by physicians at Stanford University. The study, directed by Dr. Ellis Cohen, included a survey of 67 operating-room nurses and 92 general-duty nurses in three large northern California hospitals. It showed that nearly 30 per cent of pregnancies among the surgical nurses ended in miscarriages as compared with only 9 per cent among the nurses not involved in operating-room chores. Similarly, female anesthetists had a 38 per cent miscarriage rate, compared with 10 per cent among women doctors in non-surgical specialties. Researchers in Denmark and the Soviet Union, Bruce noted, have reported similar findings.

Bruce emphasizes that such statistics do not prove a cause-and-effect relationship between anesthetic vapors and spontaneous abortion. But he does note that the inhaled fumes are retained in the body for a considerable period. In addition, recent studies have disclosed a high incidence of birth defects in the offspring of rodents exposed to various anesthetic vapors. Precautions, says Bruce, should be taken to reduce the exposure of operating-room personnel to escaping anesthetics. At Stanford, for example, special devices have already been installed in all surgical suites to trap gases and vent them into the hospital's air exhaust system.

Genetics: A Friendly Virus

More than a hundred serious diseases are the unhappy consequence of a single defective gene among the thousands within the body's cells. One example is galactosemia, a fairly exotic inherited disorder that afflicts upwards of 50 children born in the U.S. every year. Because their cells lack the gene for the production of an enzyme required for the proper utilization of galactose, or milk sugar, the children's bodies are flooded with toxic substances that cause mental retardation and even death.

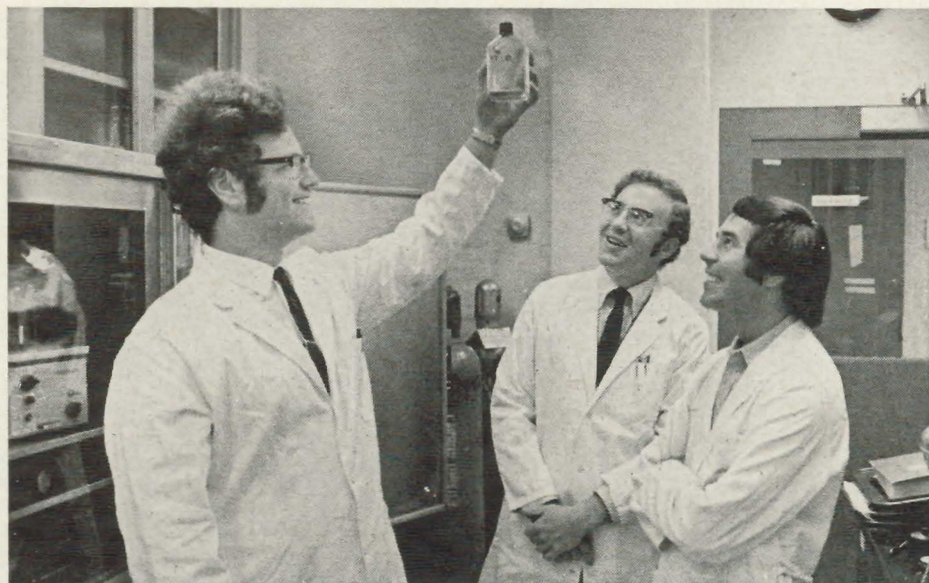
Galactosemia and some other similar genetic diseases—the widely publicized phenylketonuria (PKU) among them—

can be at least partially controlled by dietary measures. But what researchers would like to do is overcome these disorders entirely by replacing the missing genes. In Washington last week, three investigators reported making a major advance toward such genetic engineering by infecting sick human cells with a friendly virus.

The achievement was described in the current issue of *Nature* by Drs. Carl R. Merrill of the National Institute of Mental Health, Mark R. Geier of George Washington University and John C. Petricciani of the Division of Biologics Standards. The genetic engineers emphasize that their work is a long way

Washington team was one that had picked up (from the bacteria it commonly infects) the gene for the production of the enzyme necessary to metabolize galactose: GPU transferase.

Transfer: The researchers then grew skin cells from a patient with galactosemia in tissue cultures and infected them with the lambda bacteriophage. After a few days, Merrill and his co-workers found that the skin cells now contained genetic material in the form of RNA that was complementary to the DNA of the virus. The viral genetic material, in other words, had been transferred to the tissue culture cells. More to the point, they also proved that the new genetic material was functioning within the cell. When galactose was added to the skin cell cultures, the sugar was converted



Geier, Merrill and Petricciani: Curing disease with a gene from a germ

from a practical treatment for galactosemia or any other inherited disease. Nonetheless, a *Nature* editorial hails their feat as "of the greatest and most startling interest to all biologists."

To genetic engineers, the notion that viruses might offer a way to correct genetic defects is reasonable enough. Viruses are, after all, nothing more than packets of genetic material—either DNA or RNA—wrapped in a coat of protein. In causing disease, the virus insinuates its genetic material into the cell it infects and forces it to make new viruses; the cell may die in the process. But the right kind of virus, researchers have long suggested, might carry into a defective cell the gene it lacks; instead of killing the cell, the virus would cure it.

For their experiment, Merrill and his colleagues chose lambda bacteriophage, a kind of virus that normally infects certain bacteria that reside in the intestinal tract. Such viruses are among the standard models for virologic research because, among other things, they are not known to be harmful to humans. Among the lambda bacteriophages used by the

into a further breakdown product, indicating that the GPU transferase enzyme was now present.

The findings are exciting enough in terms of basic research. They show for the first time that bacterial genetic material can function within human cells, further demonstrating the universality of the genetic code spelled out by molecules of DNA and RNA. But at the same time, the experiments raise high hopes for the future of genetic therapy in the treatment of human disease. Until now, experiments with genetic engineering have largely been carried out with various animal viruses, some of which may have deleterious effects. Bacterial viruses, on the other hand, are plentiful and may prove much safer to develop as a means of repairing sick cells.

A Nobelist in Nashville

Dr. Earl W. Sutherland Jr. and his wife, Claudia, were unpacking from a fishing trip one day last week when a camera crew from Swedish National Television trooped into their Nashville home