Gene Defect Linked to a Common Dwarfism

Injections of growth hormone can boost the height of certain very short children, while better control of environmental factors during pregnancy can help prevent certain other forms of growth retardation (SN: 2/11/84, p. 83). But for children born with the most common form of dwarfism caused by an inheritable defect in cartilage, even an understanding of the genetic mechanisms of the disease — let alone a chemical cure — has remained stubbornly out of reach.

At the San Francisco meeting of the Society for Pediatric Research last week, Charles M. Strom of the University of Chicago reported for the first time a genetic defect he believes is responsible for the stunted growth and other symptoms of a 14-month-old girl with the cartilage disease. The finding is a first step, says Strom, in the long road toward prenatal diagnosis of a rare but usually fatal form of the disease, and toward a possible non-surgical treatment of the milder form.

Children born with this disease, known as achondroplasia, have abnormally short arms and legs and an enlarged head. The bowed legs, curving spine and narrowing of the spinal canal that often accompany the syndrome can require surgical correction. Breathing problems and paralysis, triggered by a compression of the spinal cord, pose the biggest health risks to these patients, says Reed E. Pyeritz, of Johns Hopkins University School of Medicine in Baltimore where "a few hundred" patients with achondroplasia are seen each year. Roughly one child in 26,000 has the disorder.

The genetic flaw Strom and co-worker William B. Upholt identified is in the gene that instructs the body in the production of type II collagen, one of the principle protein constituents of cartilage, a tough but flexible tissue of the body. Prevalent in the skeleton of a human embryo but gradually replaced by bone as the fetus ages, cartilage occurs any place in the adult body that requires both stiffness and elasticity, such as at the ends of bones, in walls of the voice box, and in the protruding parts of the ears and nose.

Physicians have long recognized that the disease has a genetic link, though they haven't been certain of its nature. Roughly 50 percent of the time, an adult with achondroplasia passes on the syndrome to his or her child. When both parents have achondroplasia, their offspring stand the chance of having an especially severe form of the disease that is fatal within a few days of birth. A prenatal test that could genetically detect these severe cases in the first weeks of pregnancy could prove valuable for such couples, Strom says. But, in addition to the ethical debate such a prenatal test might trigger, there are several genetic questions still to be answered before any such test could be considered, Strom and Pyeritz agree.

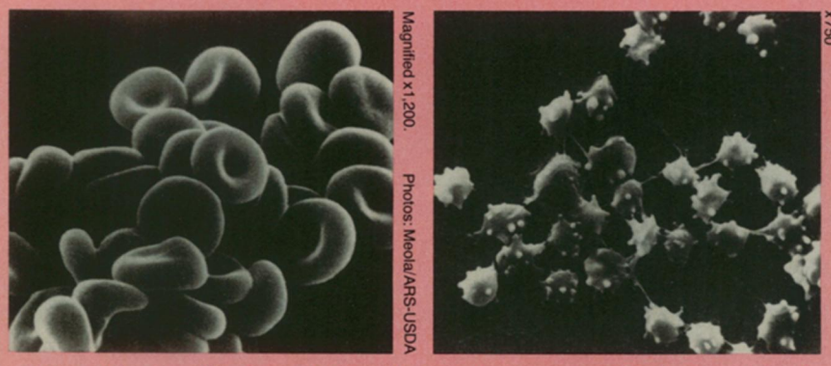
Though "it is likely that most patients with achondroplasia have some sort of defect in this gene," says Strom, the gene is large and there is no certainty that other persons with the disorder have exactly the same defect.

In the last few years, researchers have found that any number of defects in the gene that codes for type I collagen (a less prevalent protein in cartilage) can trigger the same disease of brittle bones called osteogenesis imperfecta (SN: 2/20/82, p. 124). "Similarly, it may very well be that different mutations within the type II collagen gene produce achondroplasia," Pyeritz told SCIENCE NEWS.

A prenatal test for one type of defect in the gene might not pick up a different kind of defect, Pyeritz says. Also, in order to detect a specific defect, a physician would have to be looking for it — an unlikely scenario for the vast majority of persons with achondroplasia, whose parents do not have the syndrome. Cases such as these are thought to arise through a spontaneous mutation in one or more genes.

—D. Franklin

A telltale bridging when kidneys ail



Animal blood cell findings that could open the way toward better screening for potential kidney problems have been reported by Texas researchers. A scanning electron micrograph of red blood cells from sheep illustrates the normal shape (left). Cells from sheep or swine with partial or complete kidney failure, however, distort, forming characteristic spikes that reach out and fuse with those from other affected cells (right). Research scientist Shirlee Meola of the Agricultural Research Service in College Station, Texas, has developed the cell preparation technique that first showed that the deformation is a defect in cell structure and not just a cohesion of proteins in a blood smear. Cell preparation is simple, takes only 15 to 20 minutes, and permits identification of characteristic deformations with a conventional light microscope.

This bridging might be called an artifact, Meola says, because it only takes place in cells outside the body that have had contact with air. However, it happens even when only a small portion of the kidneys are affected — before clinical symptoms have occurred. What causes the deformation is unknown, though it is reversible; bridging cells placed in normal saline resume their normal shape. Veterinary pathologist Sandra Lovering at Texas A&M University in College Station, who has worked with Meola, says "similar changes have been seen in people with certain types of renal [kidney] disease."

Virus hunter's guide

Though most water users don't give viruses a second thought, Robert Safferman, chief of virology at the Environmental Protection Agency's Environmental Monitoring and Support Laboratory in Cincinnati, believes they should. Safferman's lab just completed a step-by-step manual to help other researchers identify and quantify waterborne viruses. Its looseleaf format allows easy updating as new techniques become available.

"We know from research that one virus particle has the potential of causing infection in an individual," he says, and "there are over 100 different viruses found in water." Moreover, routine filtration given water used for drinking isn't enough: "We can always find viruses being emitted [by these water filtration plants]," he says.

Not only are there no federal laws limiting levels of viruses in water, but until now, there also has been little guidance on how to even find waterborne viruses. □