

# Science

## Researchers Aim for Better Treatment of Diabetes

by Miriam Tucker

Experts from around the world met in Tokyo last year at the International Symposium on Childhood Diabetes to discuss the latest findings in the field of diabetes research. Dr. Allan Drash, head of the Department of Endocrinology at Children's Hospital of Pittsburgh, was one of the participants. Drash is the immediate past president of the American Diabetes Association, and one of the world's leading experts in the field of

as a result of the disorder. Elimination of these complications is the basis of the many research efforts going on around the world. Since virtually all victims of diabetes under the age of 20 are insulin-dependent, much research is directed at these young people, who stand the greatest chance of developing future complications.

### CAUSE

The first 'C' is cause, or etiology of diabetes. Research

Environmental factors are also implicated in the causation of diabetes. Certain pollutants and toxins have been shown to cause the disorder in laboratory animals. Several individuals became diabetic after attempting suicide by ingesting vacor, a type of rat poison. Some nitrosamines in food have also been implicated in beta-cell damage.

Another interesting finding is the enormous variation in expression of IDDM around the world. The highest attack rate is in Finland, where 40 cases occur for every 100,000 children each year. In Pittsburgh, the rate is 15 per 100,000, while in Japan, less than 1 case per 100,000 occurs each year. These differences can't be explained by genetic factors alone; the primary explanation must lie in the environment.

One difference in the various countries is in the mode of nutrition. Animal studies have shown that dietary manipulation has a large impact on the expression of diabetes. A study in Copenhagen found that breast-feeding may have a protective mechanism against diabetes, or that *absence* of breast-feeding may lead to increased susceptibility in individuals who already have the underlying defect. Evidence for this includes the fact that the frequency of IDDM increases the further a population is from the equator. This corresponds to the increase in industrialized areas, which, in turn, means a decrease in the tendency of mothers in a population to breast-feed. In Samoa, where there are no cows, all children are breast-fed. There are no

IDDM victims in Samoa. When Samoans move to another country, however, future generations begin to develop diabetes at a rate equivalent to the rate in that country.

### COURSE

Many studies are currently aimed at determining what happens to the diabetic over time. One current focus is the honeymoon or remission of the disease. Approximately two-thirds of newly-diagnosed diabetic children experience a slow remission about two to three months after diagnosis. They become very healthy, and their prescribed insulin doses are decreased drastically, sometimes being eliminated altogether. This phase lasts only for a few weeks, however, after which the patient usually returns to insulin therapy permanently. By studying patients during this phase, doctors hope to find clues as to why the beta cells are destroyed in the first place, and what can be done to prevent them from dying.

Another aspect of the clinical course of the disease relates to the aforementioned HLA-DR factor. It seems that the rate and frequency of the serious complications may relate in some way to HLA-DR type. The data on this issue, however, is inconclusive at this time.

### CARE

The third 'C' is care, finding the best way to manage diabetes with existing methods. The biggest problem here is lack of compliance. Many diabetics

find it difficult to stick to strict regimens of diet and exercise, and to take the responsibility for testing their blood and taking shots regularly. Advances in recent years have made care somewhat easier. One is home blood glucose monitoring, in which patients test their own blood for sugar. Another is extra long-acting insulin, which allows more flexibility in eating regimens.

A recent development which has contributed significantly to patients' awareness of how well they are controlling their own blood sugar levels, is the measurement of glycosylated hemoglobin A(1c) levels. These molecules are variants of the hemoglobin molecule, and occur in elevated levels in diabetics. It was found that the level of hemoglobin A(1c) in the blood corresponds to the average blood glucose levels over approximately a four-month period. This gives doctors and patients an idea of how good their control is in relation to that of other diabetics and how their blood sugar levels compare to normal levels.

The newly-developed purified human insulin has not proved to be much better in controlling blood sugar levels than pork or bovine insulin, the two most common types in use today. The glucose level response is about the same, and Drash has actually seen *more* problems with the human insulin, since its time course is shorter, thereby requiring more shots to achieve the same effects.

*Next week: Complications and Cure.*



American Diabetes Association

Dr. Allan Drash of the Children's Hospital of Pittsburgh.

childhood diabetes.

Drash summarizes the many different aspects of diabetes research in terms of the "five C's": cause, course, care, complications, and cure. These five headings encompass most of the current issues involving the disorder.

Diabetes mellitus results when the beta cells of the pancreas slow down or stop producing insulin, the hormone which allows the body to metabolize carbohydrates.

The milder form of the disorder, known as Type II diabetes, is thought to occur when the patient's body cells are resistant to the insulin produced by the pancreas, or when the pancreas itself produces a low amount of insulin. Found mostly in older adults, its control can usually be achieved by pills or diet alone.

In insulin-dependent diabetes mellitus (IDDM), however, the pancreas completely stops producing the hormone and the patient must rely on daily injections of insulin to stay alive. Although these injections do keep the patient alive, in no way can they be considered a cure. Diabetics often experience higher than normal levels of blood sugar. They are also subject to spells of low blood sugar known as insulin reactions, which can cause brain damage or death if not treated with sugar immediately.

Many long-term complications, such as kidney damage, atherosclerosis, eye damage, and neuropathy can also occur

is particularly aimed at determining the factors involved in beta cell damage. Although little is known for sure, it is generally believed that genetic predisposition, viral infections, and autoimmune destruction of beta cells interact with environmental factors to cause diabetes.

One interesting finding is that a certain gene involved in the immune system, the HLA-DR, is of two particular types in diabetics. Almost all IDDM patients possess either HLA-DR 3, HLA-DR 4, or both. This would obviously suggest genetic predisposition to the disorder. Furthermore, it seems that the two types of genes themselves differ in the underlying etiology and clinical course of the patient's diabetes. While HLA-DR 3 is associated with a chronic, ongoing, autoimmune process, HLA-DR 4 patients are more likely to develop diabetes by an acute infectious process. This provides evidence that genetic predisposition may interact with autoimmune, viral, or environmental factors in the destruction of beta cells.

Many specific viruses have been implicated in relation to diabetes, including the coxsackie group, mumps, rubella, influenza, and hepatitis. In 1973, during an epidemic of Reye's Syndrome which occurred across the northeastern United States, five out of twenty afflicted children who died at Children's Hospital in Pittsburgh also presented symptoms of diabetes mellitus. It was later discovered that the primary initiating virus for Reye's Syndrome was Influenza B, thus suggesting a link between this virus and diabetes.

## Highlights

Public TV—Science and Nature Programs

Channel 67, Baltimore

Fri., Feb. 1, 7:30p.m.: Wild, Wild World of Animals—The Floating Wilderness.

Sat., Feb. 2, 8:30a.m.: Oceanus—The Water Planet, Cosmic Origins; 1:30p.m.: New Tech Times; 2:00p.m.: The Nature of Things II; 3:00p.m.: Nova (R)—The Conquest of the Parasites; 4:30p.m.: Academy on Computers—What Next?; 8:00p.m.: The Undersea World of Jacques Cousteau—Sharks; 9:00p.m.: Nature(R)—Flight of the Bumblebee.

Sun., Feb. 3, 9:30a.m.: Academy on Computers(R); 10:00a.m.: The New Literacy: An Introduction to Computers—The Computing Machine, Part II, Communicating with a Computer; 7:00p.m.: The Living Planet: A Portrait of the Earth—The Building of the Earth

(Premiere!!!); 8:00p.m.: Nature—Birds of Paradox.

Mon., Feb. 4, 7:30p.m.: Wild, Wild World of Animals—What the Dolphin Knows.

Tues., Feb. 5, 7:30p.m.: Wild, Wild World of Animals—The Ingenious Insect; 8:00p.m.: Nova—In the Land of the Polar Bears; 9:00p.m.: The Living Planet: A Portrait of the Earth(R)—The Building of the Earth.

Wed., Feb. 6, 7:30p.m.: Wild, Wild World of Animals—Hawaiian Wilderness; 8:00p.m.: Discover: The World of Science.

Thurs., Feb. 7, 7:30p.m.: Wild, Wild World of Animals—Surviving the Badlands; 8:00p.m.: Wild America—Wolverine Country; 8:30p.m.: Newton's Apple.

**BIRDS OF THE GALAPAGOS ISLANDS: TRADITIONAL WATER-COLORS BY LEE MARC STEADMAN.** National

**Museum of Natural History.** Rotunda Gallery. Jan. 11-March 10.

**SPANNING NIAGARA: THE INTERNATIONAL BRIDGES, 1848-1962**

This exhibit shows the many and varied bridges built to link the United States and Canada by spanning the Niagara River at Niagara Falls. Each of the 73 lithographs, wood engravings, photographs, stereographs, stamps, and other works on paper demonstrates the ways in which engineers of the 19th and 20th centuries have addressed the grandeur and technical challenges of the site. From the earliest, erected in 1848, to the most recent, completed in 1962, the bridges also have challenged photographers and other graphic artists to depict major man-made works in the setting of one of the world's greatest natural wonders. The works in the exhibition come from U.S. and Canadian libraries and historical societies, as well as the Niagara Falls Bridge Commission. **National Museum of American History.** Jan. 11-May 14.

