

## Artificial pancreas – another Canadian breakthrough for diabetics

An artificial pancreas that provides far better control of blood-sugar levels in diabetes than can ever be achieved by pills or conventional methods of injecting insulin has been developed at the Hospital for Sick Children in Toronto, in collaboration with the Institute of Biomedical Engineering of the University of Toronto.

Specialists believe that it provides, for the first time, a chance to protect some diabetics from many of the disabling secondary effects of the disease, such as blindness, kidney failure and blood-circulatory problems in the extremities.

The new machine provides a continuous measure of the levels of blood-sugar, computes the dose of insulin needed to head off any tendency towards abnormally high levels and then injects the required amount of insulin.

When blood-sugar levels are low, instead, it injects dextrose directly into the bloodstream.

While the present model is about the size of an average television set, and too large to be readily portable, Dr. Michael Albisser, senior engineer in the team, says the size and weight might well be reduced by utilizing foreseeable developments in technology.

The machine, and tests conducted with it on both laboratory animals and humans, are described in two papers by members of the team in the current issue of the journal *Diabetes*. The first paper describes how diabetic dogs were successfully treated by the machine; the second records three cases in which human patients were treated, first by conventional subcutaneous injection of insulin and then automatically, using the new artificial pancreas.

### Positive results

In all cases, a consistently beneficial level of blood-sugar was achieved when the machine was used. When insulin was injected in the usual way, instead, blood-sugar levels rose and fell according to a pattern that is well known and characteristic of current methods of treatment.

Many specialists in the field believe that it is these major fluctuations in blood-sugar level that lead to microvascular complications and later dis-

abilities, even when the gross immediate symptoms of the diabetes are controlled.

Clinical tests involved three patients, a 27-year-old student, weighing 160 lbs., who had suffered from diabetes for three years; a 20-year-old unemployed male, weight 160 lbs., who had been a recognized diabetic for eight years; and a 42-year-old merchant, weight 180 lbs., who had had diabetes since the age of four.

All were given conventional subcutaneous insulin on the first day and monitored throughout the day. On the second day, they were monitored and treated by the machine, and served identical meals.

The results showed that the combined effects of administering insulin to reduce abnormal sugar levels and giving dextrose to increase the levels when low, produced an unprecedented degree of control, so that patients were never in a situation that could be considered in any way unsatisfactory or abnormal. On the other hand, all three patients showed large excursions and persistently elevated levels of blood-sugar when treated with subcutaneous insulin in the normal manner.

It was interesting to note that the artificial pancreas was able to cope, not only with sugar loads resulting from meals and snacks, but also downward trends in sugar levels caused by such minor excitements as the visit of a fiancée or friend, the taking of blood from veins or some emotional situation in a television program.

### Statement by discoverer of insulin

Commenting on the latest development, Dr. Charles Best, co-discoverer of insulin with Sir Frederick Banting in 1921, writes:

"Many experts feel that the complications of diabetes which are of such deep concern to us might be prevented if the liberation of insulin were completely physiological, i.e. normal. One is by the transplantation of islet tissue, which has great promise, but which I will not discuss here. The other is by the perfection of an artificial pancreas, and there are a number of laboratories throughout the world which are very active in this field. I believe, however, that Drs. Leibel, Albisser and Zing-

and their colleagues in Toronto are leaders in this vital research... I regard this development as extremely important and one which gives very great promise of helping diabetic patients, if the apparatus can be made more compact."

Dr. Leibel, senior physician in the team and an associate professor in the Banting and Best Department of Medical Research of the University of Toronto, notes that, although insulin was discovered more than 50 years ago, there has been no significant change in treatment since its adoption. The success of any individual treatment has usually been assessed retrospectively by urinalysis and is extremely coarse." He went on: "The clinician is handicapped because at present there is no practical way to administer insulin according to physiological demand."

## Canada aids Red Cross in Asia, Sahel

Canada has contributed more than \$500,000 for Red Cross relief programs in Asia and Africa. A grant by the Canadian International Development Agency (CIDA) of \$250,000 will assist the League of Red Cross Societies with civilian resettlement programs in Bangladesh and Pakistan. The repatriation and resettlement program grew out of the bilateral agreement signed last year at New Delhi by India and Pakistan, and was facilitated by establishment of recognition between Pakistan and Bangladesh at the recent Islamic summit meeting in Lahore, Pakistan. A contribution of \$1 million in 1973 to the United Nations High Commissioner for Refugees has since been used to help nearly 330,000 civilians return home.

Canada has also provided the League of Red Cross Societies with \$250,000 for its work in Africa's Sahelian zone, where the famine in six countries is expected to be at least as bad in 1974 as it was last year. Estimates of food aid required were revised upward in February. An additional grant of \$58,750 to help Red Cross work in the Sahel and Ethiopia was announced early in April.

Migration of nomads across national borders to refugee centres has strained the resources of countries already trying to cope with starvation among