WORLD HEALTH

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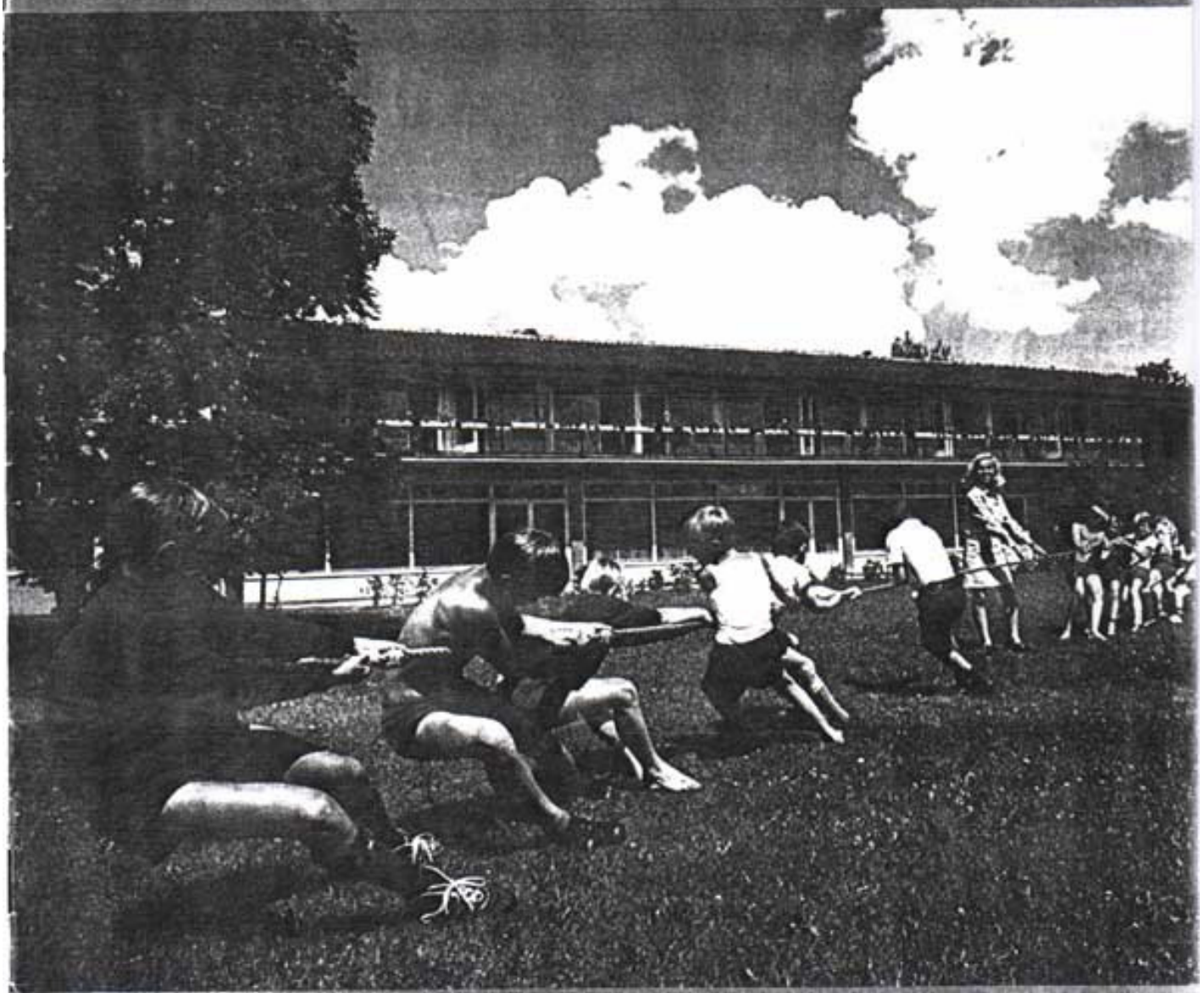

a full life despite diabetes

"A full life despite diabetes." The slogan for World Health Day, 7 April 1971, is illustrated on the cover of this issue: the picture was taken in a summer camp for diabetic children (see page 35).

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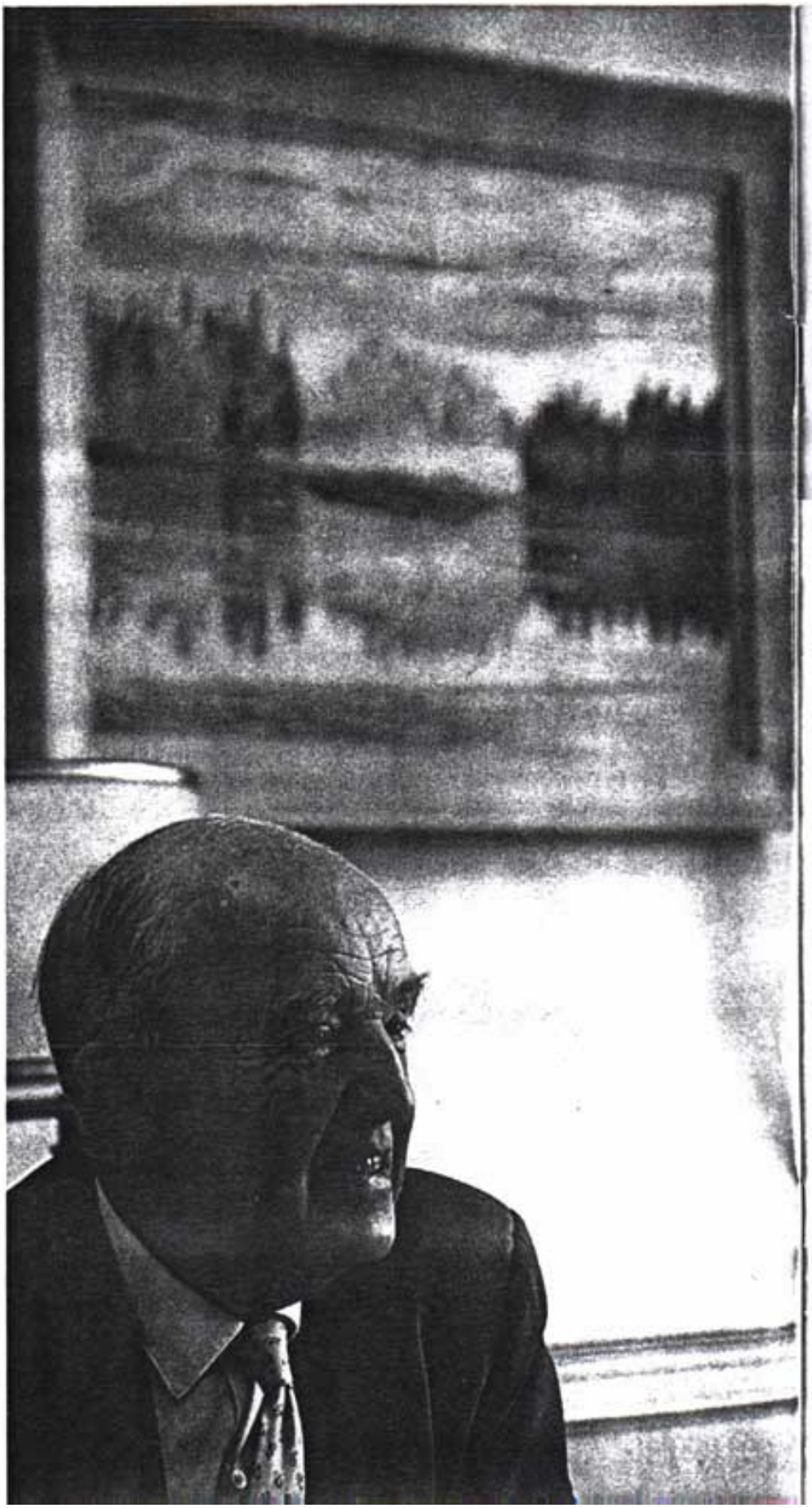


diabetes

50 years after insulin

by Dr M. G. Candau

Director-General of the World Health Organization

At the beginning of this century, diabetes mellitus was a formidable disease. Its diagnosis in a young child was a notice of premature death. Its discovery in a man or woman in the prime of life meant a complete change in the way of living, and a greatly reduced expectation of life.

And then, fifty years ago in the later months of 1921, the persistent interest of a young Canadian surgeon, Frederick Grant Banting, in research on diabetes was finally rewarded. Together with his younger collaborator, Charles Herbert Best, they isolated insulin and in January 1922 used it successfully in the treatment of patients. One of the greatest and most dramatic discoveries of modern medicine, it completely transformed the outlook for the majority of sufferers from diabetes.

What Banting and Best had discovered in a Toronto laboratory appeared for a time to be the decisive "cure" for the disease. But it was soon recognized that there were cases of diabetes which do not respond to insulin, so research was intensified into the types of the disease, its mechanisms, and into insulin itself.

In recent decades this research has yielded a number of important discoveries. Long-acting insulin has reduced to one a day the number of injections required by patients. Anti-diabetic drugs which can be taken by mouth have been developed. More evidence has been gained of the natural and basic methods of control by diet and exercise.

Despite these discoveries, diabetes appears to be on the increase and there are many undetected cases, particularly amongst men and women above the age of forty who are overweight. This knowledge has led many public health authorities to try to detect such cases by organizing community screening surveys, using blood or urine tests.

Once the disease has been diagnosed, the appropriate form of treatment is prescribed. It is now possible for the diabetic patient to live a normal working life, to bear children, to play games and, in brief, to enjoy life to the full.

Obviously, certain precautions must be taken. The most important is that the treatment and dietary regime prescribed by the doctor are carefully followed. Diabetic patients must also subject themselves to a periodical medical "check-up". This is particularly true during and after such an illness as influenza, or during pregnancy when the body's metabolism i changing. For people about to be married genetic counselling is advisable whe either partner has a family history o diabetes.

Diabetes is still a serious disease an neglect of the prescribed treatment ca lead to dangerous complications—coma blindness, kidney and nervous disease skin infections and, above all, degenerativ changes in the heart and blood vessel

The more people know about the diseas the better they will be able to fight i Information and education at all level can therefore help to promote both earl detection and proper care. Physicians an other members of the health team—in cluding nurses, dieticians, health edu cators, medical social workers and pha macists—all have a part to play in th educational process.

"Informed opinion and active co-opera tion on the part of the public are of th utmost importance in the improvement the health of the people." These word from the preamble of the Constitution the World Health Organization are part cularly pertinent with regard to diabete a disease of public health importance all parts of the world.

◁ *Dr Charles Best, one of the discoverers of insulin, at home.*

the discoverers

an interview with Dr C. H. Best *

to whom so many owe so much

World Health: How did you set out to track down that mysterious substance now known as insulin?

Dr Best: My work, that is Fred Banting's and mine, began in May 1921... It was all initiated by an idea which Banting had that if we tied up the pancreatic ducts, the enzyme-producing cells would degenerate and thus permit the extraction of a hypothetical active principle. This idea had been worked on previously; happily we didn't know about it at the time and so the work was started. It was a combination of surgery and chemistry, and we had our disappointments, but looking back on it, we were fortunate in soon being able to get some positive results.

W. H.: How old were you then?

Dr Best: Twenty-two.

W. H.: Do you feel now that it was somewhat of an adventure?

Dr Best: It was the most exciting period of my life, scientifically, of course.

W. H.: Can you recollect the actual genesis of the discovery? How the idea crossed your mind?

Dr Best: Well, the idea of starting it was really Fred Banting's. He was preparing a lecture on diabetes, and he came across a passage in a clinical article where although a patient had gall-stones blocking the pancreatic duct he had not become diabetic. So that put the idea in Fred's mind. But he was a surgeon, and so needed somebody else with experience in biochemistry and physiology to help him. I had just graduated with a degree in those two subjects, and I was interested in diabetes. So that was the way the whole thing started.

W. H.: Can you set in order of importance the difficulties which you had to overcome?

Dr Best: Well, I think that previous people who had tried, and some came very near to discovering insulin, were faced with two main difficulties. First, the lack of experience in surgery, and that Banting certainly had; and then the fact that until almost 1921 no micro-methods for determining blood sugar, ketone bodies and other constituents of the blood had been worked out. We were immensely aided by the fact that the chemists had provided us with extremely good tools. Finally, I think a lot of people were also inhibited by previous failures and you had to be young and uninhibited, I think, to overlook those things and still go ahead with the hope, almost with the expectation of being successful.

W. H.: So it was a combination of conviction and know-how?

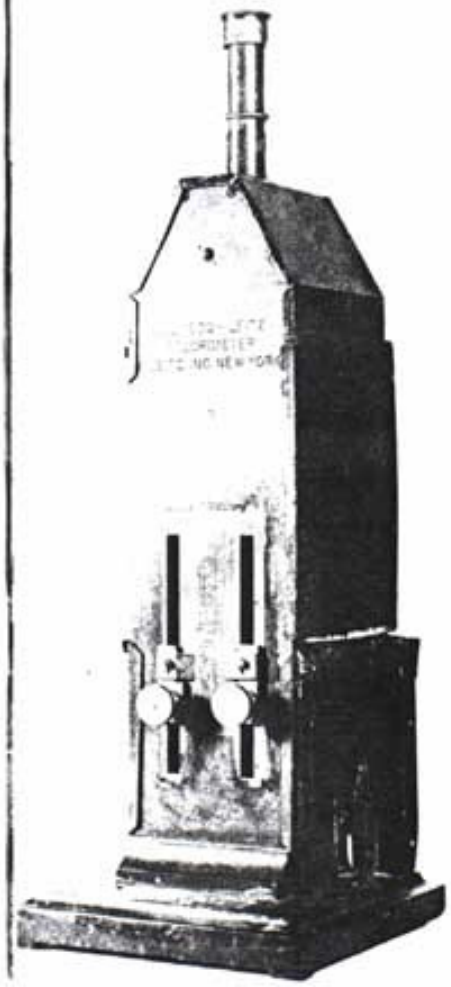
Dr Best: Yes, I think so.

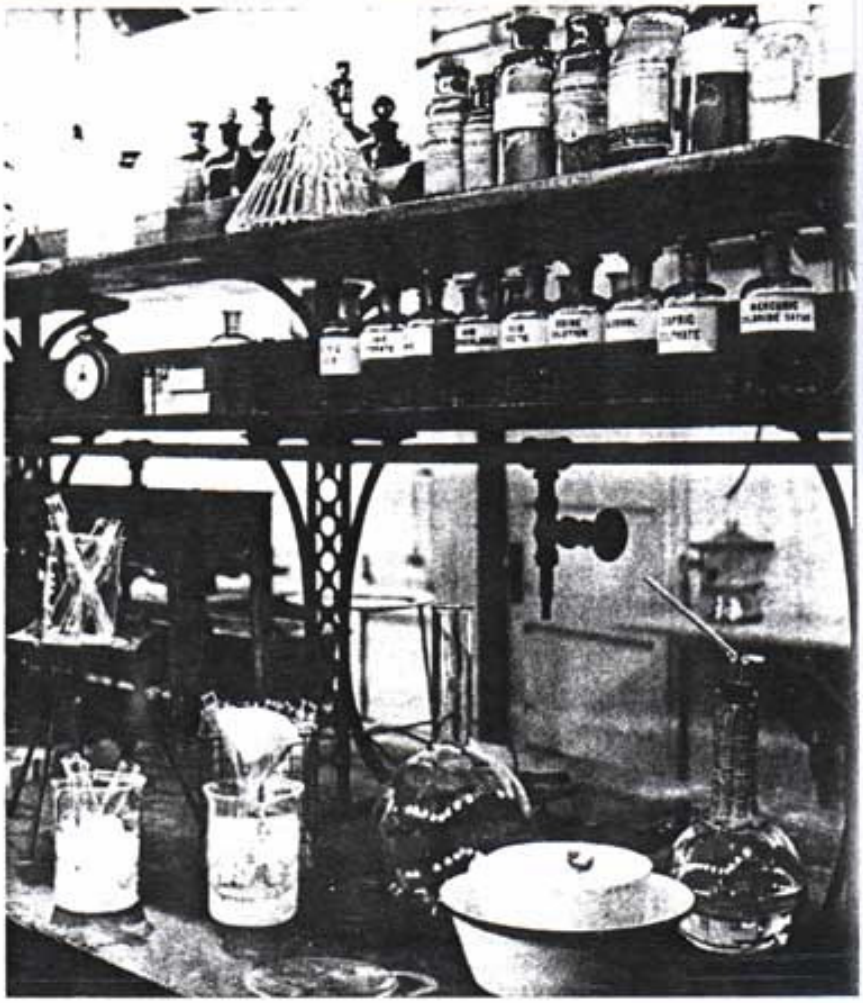
W. H.: How do you view the diabetes situation today?

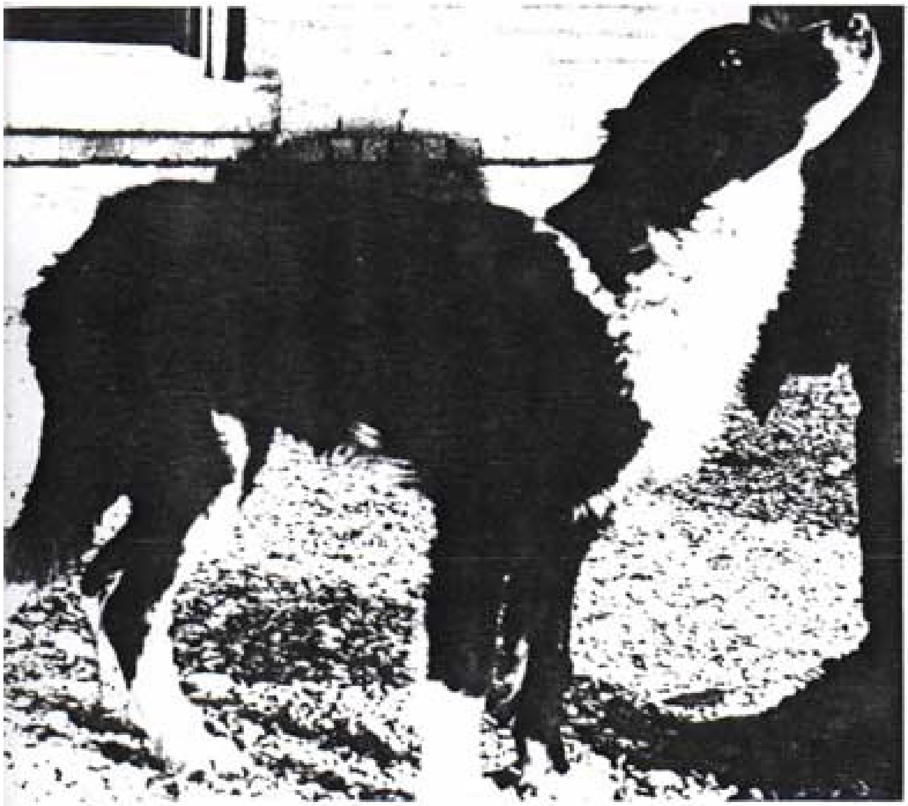
Dr Best: Well, there have been tremendous advances. There have been hundreds of thousands of papers on insulin, and its chemistry has been worked out. It is also being made synthetically. We know a lot more about how it acts. Yet the problems which still have to be solved are perhaps much more difficult now. Of course, the

* Professor and Head of the Banting & Best Department of Medical Research, University of Toronto, Canada, since 1941.

Dr Best (left) and Dr Banting in 1920/22, the period when they were at work trying to develop an effective technique for making insulin. The laboratory in which they worked is now an exhibit in the Museum of Technology and Sciences in Toronto, Canada. One of the instruments they used was the colorimeter below, also in the Museum. This instrument allows components of various fluids to be analyzed by colour, for example, sugar in the urine.

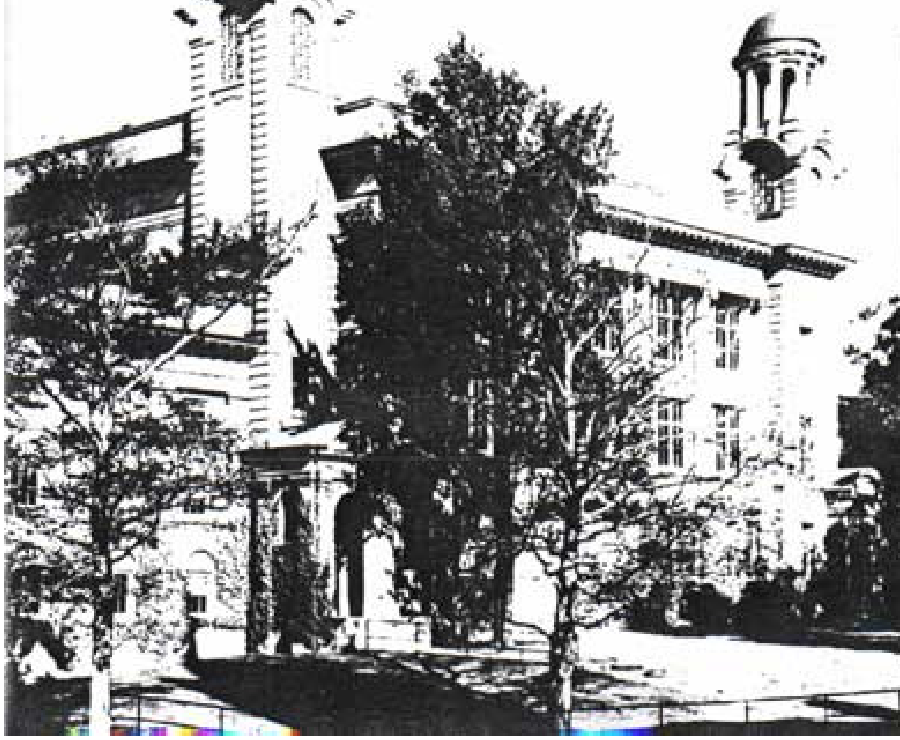






Dog 410:
July 30th.
Blood Sugar - .20
10-15 - injected 4 cc. of extract (Ringers solution cold) of degenerated pancreas from dog - 391 -
11-15 - Blood sugar - .12
Injected 5 cc. of extract -
12-15 - Blood Sugar .11
Dog drinking
Injected 5 cc. of extract
2-15. Blood Sugar - .14
Vol urine 10 cc (5 cc per hr)
Ben. qual. neg.
- Injected intravenously 5 cc extract
- 20 gms sugar in 200 cc water injected into stomach

Marjorie played an important part in the discovery. She was the first depancreatized animal to be kept alive by insulin.
Above is a photograph of a page from the actual notebook kept by Banting and Best during their pioneering work on insulin. It gives the details of Marjorie's treatment and how she reacted to it. The experiments were carried out in the medical building of the University of Toronto (lower left).
Leonard, a fourteen-year-old boy, was the first human being to be kept alive thanks to the discovery of insulin (below).



Still at work, Dr Best is here seen discussing with Dr Gerald Wrenshall current work in 1970 at the Banting and Best Department of Medical Research, Toronto.

tools we can employ are wonderfully sophisticated, so there are all sorts of opportunities to get ahead.

W. H.: Is a major breakthrough in view?

Dr Best: I think the great breakthrough would be when we are finally able to know exactly how insulin acts. On the clinical side there remains a major gap. In spite of knowing a great many things about diabetes, no one yet knows the real cause of the disease. If the mechanism of the action of insulin could be completely elucidated and if we could find the exact cause of diabetes that would represent two major breakthroughs.

W. H.: Is the Charles H. Best Institute working along those lines?

Dr Best: There is a lot of work going on here now under the direction of Dr Fritz who is a biochemist; for example, research on the molecular biochemistry of carbohydrate metabolism. It is a very difficult subject, but one which might yield great dividends. Then, the other department, physiology under Dr Haste, does a lot more of the conventional work on the physiology and biochemistry of diabetes. This gives some idea of our work, I think.

W. H.: What would be your message on the occasion of World Health Day?

Dr Best: It's a very great pleasure for me to say something about the World Health Day that is to be observed in 1971. It is a very important date for those of us who are particularly concerned about insulin, because it is the half-century mark since our discovery.

I have had the honour of serving in the World Health Organization and on the International Health Division of the Rockefeller Foundation. My own special interest has been in diabetes and in the general aspects of nutrition. I have always been particularly interested in nutrition, muscular exercise and the avoidance of obesity, as well as in the protein and vitamin deficiencies that one finds in so many countries of the world; I am sure that these things will be emphasized by people who are spending their full time in nutritional sciences. But I would prefer not to speak about any one subject for this celebration, but rather to emphasize that it highlights all aspects connected with diabetes.

In the field of diabetes, so much more could be done in the early detection of this disorder and, surely, if it can be detected early enough, the chances of stopping it will be much greater.

There are improved methods of detection, but I am sure that they will become more and more sensitive as time goes on and that we can all look forward to some great breakthrough in the methods of detection of this disease which affects as many as three to four per cent of the population in most countries where surveys have been made.

In conclusion, all I can say is that I hope the observance of this day will do a great deal of good throughout the world and that it will mark the beginning of a new era in which world health will be placed on a much higher level and given a much higher priority than it actually has now. ■

where we stand today

by Dr Rachmiel Levine*

We owe the wise Sir William Osler his remark concerning the favourable influence of a chronic disease on longevity. If one has a chronic but manageable disorder, one is most likely to lead a more hygienic, a more thoughtful existence, and thus live longer than the apparently more healthy individual. Certainly thousands of diabetics throughout the world testify to the truth of this aphorism. They are forced to learn principles of good nutrition and of hygiene. Minor infections are taken care of, sensible physical exercise is practised. The disease provides the motivation for the consistent practice of preventive medicine.

In recent years in many countries, the national diabetes associations and the International Diabetes Federation have promoted large-scale diabetes detection drives. These campaigns have led to early diagnosis of diabetes, and, what is even more significant, to the incidental detection of other preventable and manageable health problems.

What do we know about diabetes? What aspects still remain hidden? What does the present pace of scientific research promise us in the near future? These and other related questions will now be briefly examined.

In the normal organism all carbohydrate foods (starches and sugars) are converted to glucose in the intestinal tract and in the liver. About 60% of the protein food we eat is also ultimately convertible to glucose. This normal sugar goes by way of the blood stream to all tissues where it is used to produce the energy needed for good function. The traffic of the sugar is regulated in a most accurate fashion by means of several hormones. The result is that between meals the blood sugar level lies between 80 and 100 milligrams for every 100 millilitres of blood. During the active absorption of a meal the blood sugar rises, but usually does not exceed 160 mg. Many of the hormones (adrenaline, glucagon, the pituitary factors, etc.) generally tend to raise the blood sugar. Only insulin lowers the sugar by promoting its rapid entry into most cells.

The cells which secrete insulin are the beta cells of the so-called islets of Langerhans in the pancreas. Normally, when the blood sugar goes up for any reason, it stimulates the beta cells to secrete a small amount of insulin which then regulates the blood sugar by lowering its level again.

If the beta cells are disturbed, so that they cannot quickly secrete a normal amount of insulin, it is evident that the blood sugar will rise. If it rises above 180 or 200 mg, the kidney will excrete the extra sugar. Essentially, these are the phenomena of diabetes.

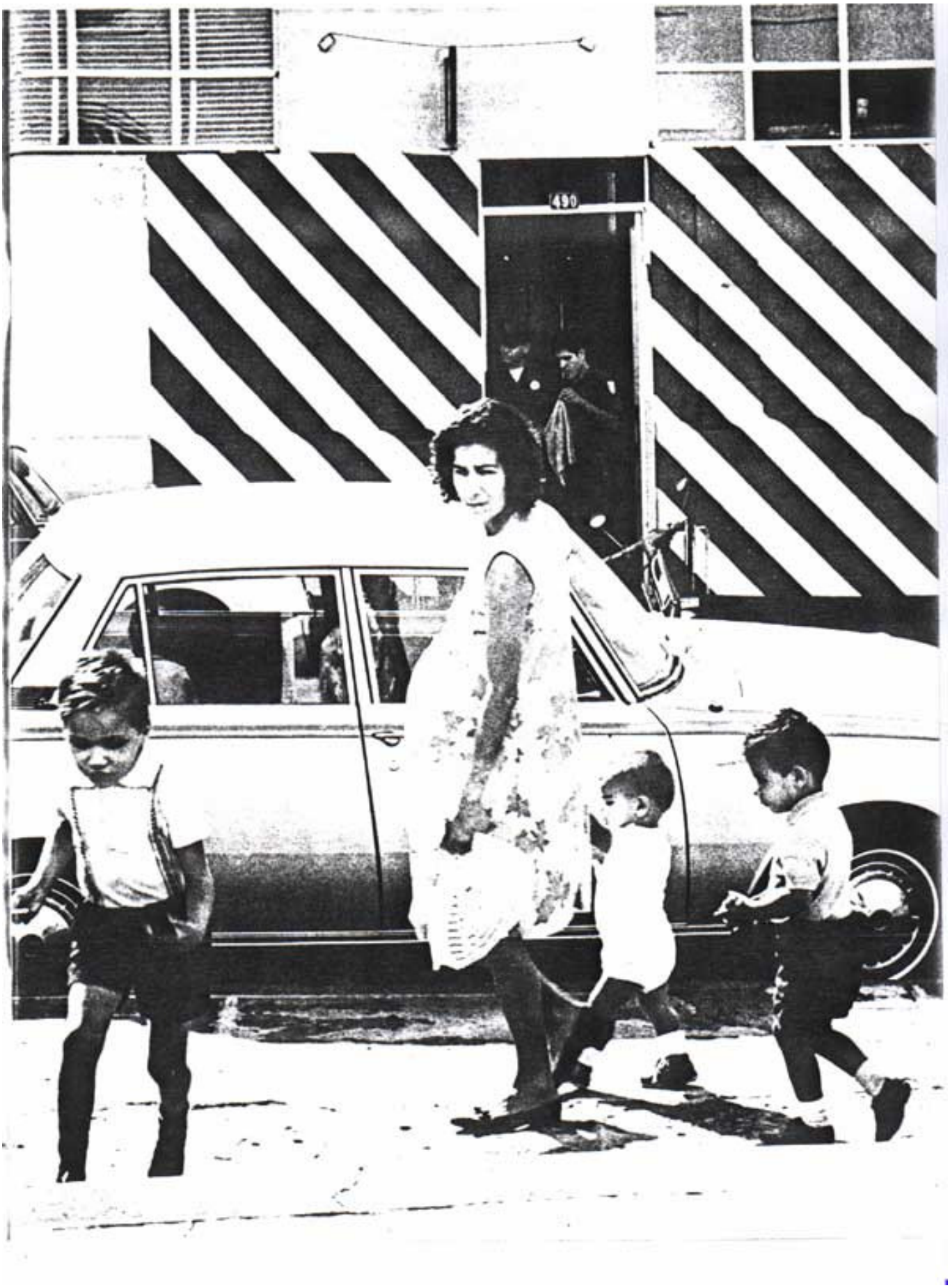
We do not as yet understand precisely why the diabetic beta cell behaves as it does. This area is at present under intense investigation but we *do* know many conditions which

Too much sugar in the wrong places...

Sugar going where it should...

Because pregnancy is associated with hormonal changes it may lead to the discovery of a diabetic tendency.

* Executive Medical Director, City of Hope Medical Center, Duarte, California. Honorary President, International Diabetes Federation.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either aggravate or ameliorate this faulty regulation of insulin secretion.

It stands to reason that one would want to decrease the degree of demand upon the insulin-secreting cell. Thus it is rational to decrease the amount of easily absorbable sugars in the diet and to decrease the size of meals. Four to six small meals per day are to be preferred to two to three heavy meals. Carbohydrate in the form of starches (rice, potatoes) is preferable to free sugar or high-sugar fruits.

Obesity tends to over-stimulate the pancreas and it also leads to factors which oppose the beneficial action of insulin. In most mild diabetics (80 per cent of whom are overweight) a diet which leads to weight reduction will keep the diabetic state under control.

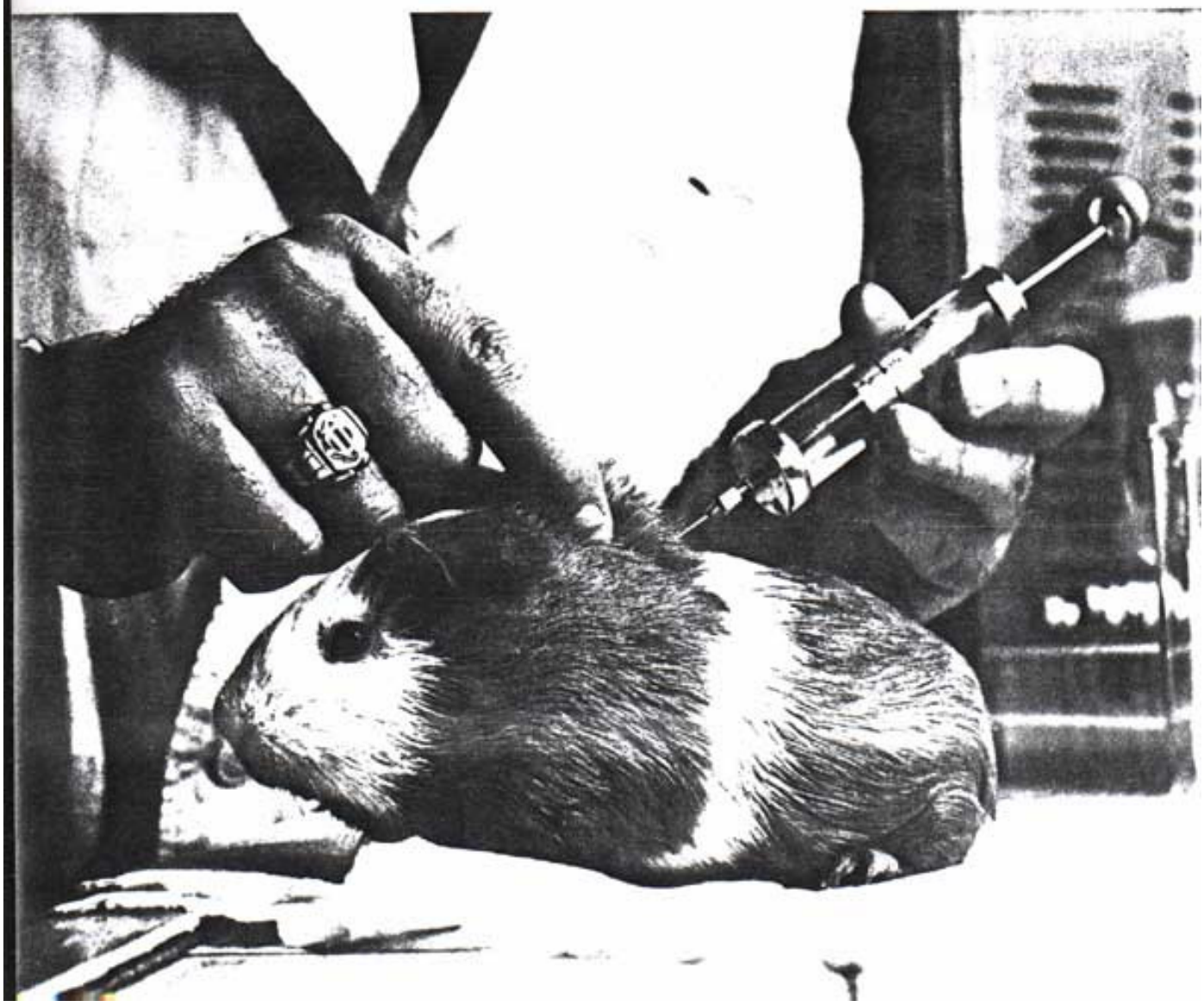
It has been known for many years that the tendency to develop diabetes is familial and genetic, but that factors in the environment which we can control are important in making the disorder come to the surface. We have already discussed overweight as one of these factors. Thus, in countries where food is scarce, the incidence of overt diabetes is low. When the standard of living rises and nutrition improves, the number of overt diabetics increases.

Pregnancy and its attendant hormonal changes may lead to the discovery of a hidden diabetic tendency. The knowledge that cases of diabetes have been detected in close relatives is useful, since it alerts the expectant mother and her physician to take preventive measures.

Generalized infections with some of the bacteria and viruses may tend to make the diabetic state become overt. Prevention and the early care of infection will usually stave off the appearance of diabetes.

Questions to be answered

The most important area of our ignorance in relation to diabetes is the relation of the disorder to various disturbances of the heart and of blood vessels throughout the body. We must uncover the causes of the more rapid and more extensive arteriosclerosis of the diabetic population, and we must be able to understand the causes of the blood vessel changes in the eyes and kidneys of



some diabetics before we can devise effective prevention and treatment. Such investigations will (if successful) have a decisive influence on human arteriosclerosis in general and help us to cope with other phenomena of aging.

There are hopeful indications that many of these problems can be resolved by a combination of studies of human diabetes and of the diabetes which has been found to occur spontaneously in many species of animals. Colonies of such diabetic animal species are being maintained and studied in several laboratories, and much helpful information has already been obtained. Such work needs to be enlarged in scope and effectiveness on a world-wide scale.

Fifty years have elapsed since discovery of insulin. Much has been accomplished. Approximately 80 per cent of diabetes cases are of the mild, adult-onset type and characterized generally by overweight. With good dietary care and reduction in body weight, aided when necessary by the so-called oral agents (sulfonylureas and biguanides) these persons can and do achieve almost the normal expectancy of life.

In the more severe group (the so-called juvenile-onset type) insulin is the mainstay of therapy. A young child with diabetes can now look forward to normal growth, development, schooling, marriage, and a useful and satisfactory life.

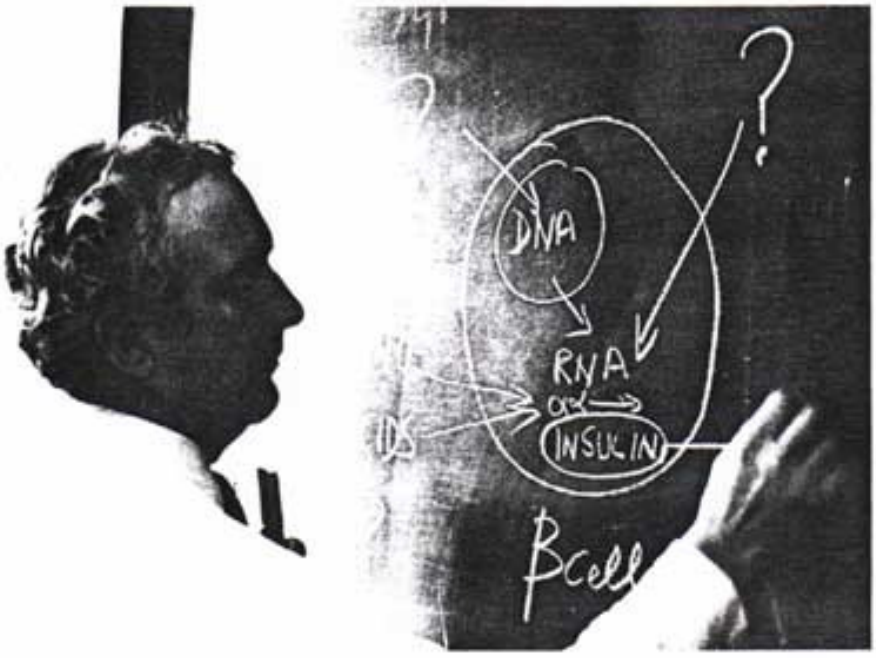
In both groups, a better understanding of the blood vessel changes will enable us to guide the diabetic to a life indistinguishable from the normal.

Throughout the world, even in the so-called advanced nations, insufficient attention is as yet being given to the support of investigation in diabetes. It is a formidable public health problem. The increase of diabetes in countries with good nutrition is between 1 and 2 per cent of the population, and it has been estimated that the genetic trait exists in 10 to 20 per cent of the world's population.

We need to know the answers to a few fundamental questions such as the root causes of obesity, the hormonal control of cell metabolism, and the chemical life story of the small and large blood vessels, in order to completely normalize the life of some 20 to 30 million diabetics. With some effort this can and will be done in the foreseeable future. ■

Jacqueline is now ten and a half years old and has been treated at a clinic for diabetics since 1968. As a result of the training she received there, she has learned the basic principles of diet and how to inject herself with insulin. Perhaps the fact that her mother is a nurse was a help.

◁ *Colonies of diabetic animals are being maintained and studied in several laboratories. The disease has been found to occur spontaneously in many species of animals.*



Professor Butterfield at the blackboard during a lecture on diabetes research.

the sugar sickness

by W. J. H. Butterfield *

By 1921 it had already been known for many years that somewhere in the human pancreas was a substance which could correct the abnormality of high blood sugar associated with the disease diabetes mellitus.

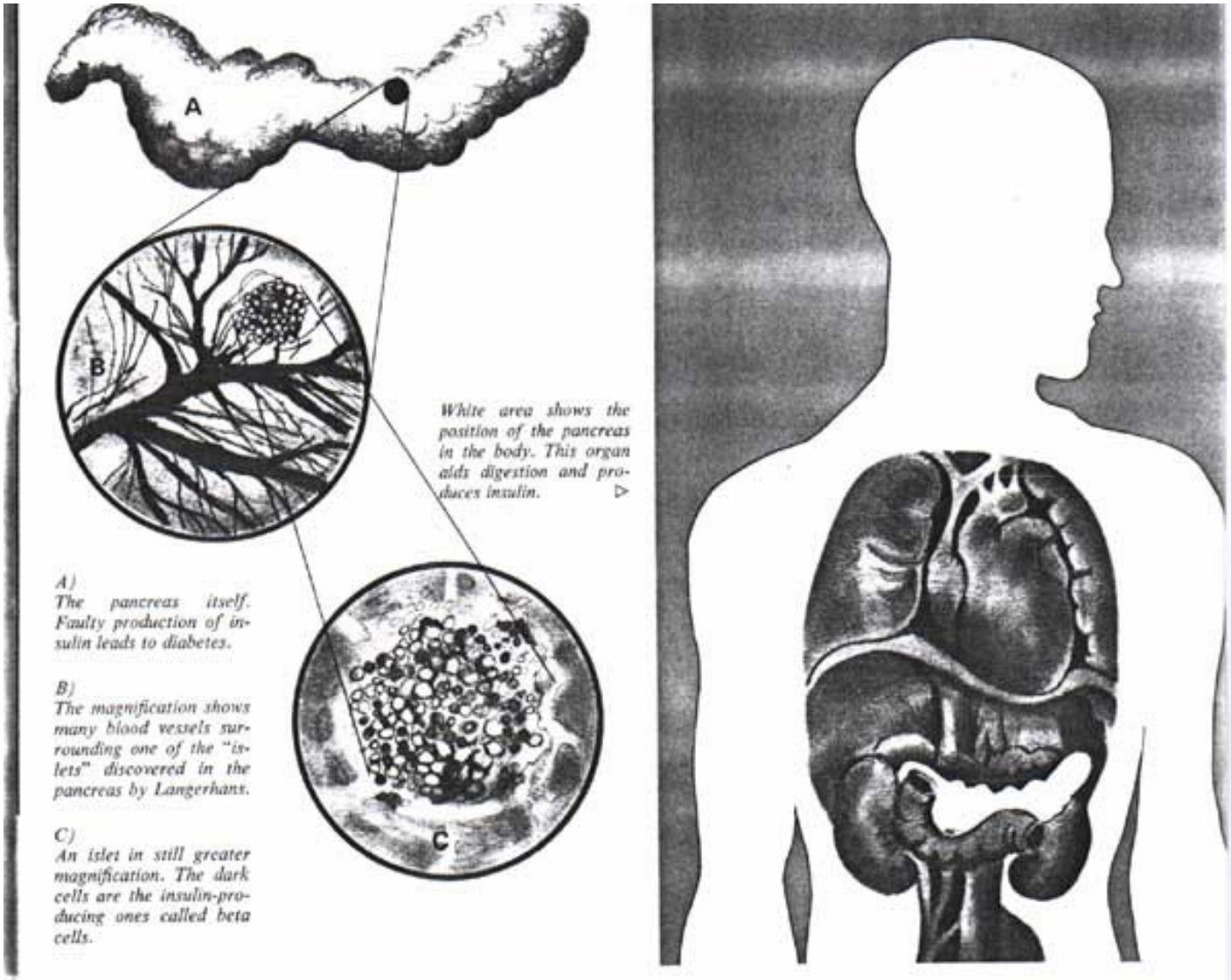
J. von Mering and O. Minkowski had previously shown that when the pancreas was removed a diabetic state resulted and that a transplant of the pancreas gave temporary relief from this condition. G. Zuelzer, E. L. Scott, J. Murlin, J. Kleiner and particularly N. Paulesco in Bucharest had all succeeded in making simple chemical extracts which were effective in animals and a few patients. In their elegant experiments, Frederick Banting and Charles Best in Toronto were able to show that the hormone everyone was hunting for came from specialized cells in the pancreas known as the islets of Langerhans. Using a surgical technique they were able to get rid of the rest of the gland which produced dangerous irritating digestive ferments; they extracted the substance, insulin, and showed that it lowered the blood sugar level successfully without side effects in patients. This demonstrated the possibility of saving diabetic lives and accelerated the chemical isolation of the hormones from animal pancreases on an industrial scale.

In 1922-3, through the work of a Canadian biochemist, J. B. Collip, and later an American pharmaceutical firm, it was finally possible to make safe insulin available commercially for the treatment of diabetics all over the world. Thanks to all of these men working independently and in teams, diabetics could lead normal lives for the first time in man's history.

Until insulin was discovered, severe diabetes mellitus was an irremediable disease. In ancient times, diabetes was recognized as a wasting condition, associated with passing copious amounts of urine. In fact, the word diabetes means "syphoning off". The first step towards understanding the chemical abnormality associated with it came when a British physician, T. Willis, showed that the urine of diabetics was sweet because it contained sugar. Mellitus means "honey-like". Chemical estimations of blood constituents, which were possible by the late nineteenth century, demonstrated that diabetes mellitus was accompanied by high levels of sugar in the blood.

After an overnight fast, a normal person's blood sugar level is about 0.1 per cent, i.e 100 mg per 100 ml of blood. If this level exceeds about 180 mg per 100 ml of blood, sugar leaks into the urine where it can be detected chemically. Insulin is needed by the tissues to utilize the sugar or glucose. If

* Professor at Guy's Hospital & Medical School, London.



White area shows the position of the pancreas in the body. This organ aids digestion and produces insulin. ▷

A)
The pancreas itself. Faulty production of insulin leads to diabetes.

B)
The magnification shows many blood vessels surrounding one of the "islets" discovered in the pancreas by Langerhans.

C)
An islet in still greater magnification. The dark cells are the insulin-producing ones called beta cells.

there is insufficient insulin, glucose continues to build up in the blood and spills into the urine. In severe diabetes, the blood sugar level may exceed 1,000 mg per 100 ml of blood.

The brain needs sugar

Why does the sugar level build up in the blood despite the fact that large quantities of glucose are spilling into the urine? The process is still not completely understood. Claude Bernard, the nineteenth-century French physiologist, discovered that if an animal's brain was damaged near the vital centres for the pulse and breathing, the blood sugar level increased. Since sugar is essential for the proper functioning of the human brain, it seems likely that the brain has a regulatory centre, a "homeostat", to ensure that the blood sugar level remains adequate for its requirements.

The mechanism whereby the brain stimulates production of sugar probably involves nervous impulses to the liver, the body's main source of glucose. Theoretically, if the brain is starved of glucose it signals the liver to manufacture and release more sugar into the blood in an attempt to preserve its supply of this vital chemical.

In severe diabetes, inadequate insulin action causes inadequate glucose utilization, spilling of sugar into the urine, and excessive sugar production by the liver. As an analogy to the interaction of these different factors, consider a wash-basin, filled to the overflow drain with water. The height of the water represents the level of sugar in the blood. The water going out of the overflow represents sugar being used in the tissues. In the model, the overflow needs a detergent (insulin) to keep it clear. Without adequate insulin action, the overflow drain becomes choked. If a tap drips into the basin (like the addition of newly formed sugar to the blood by the liver), or if a jug of water is poured in (like a meal), the water level rises and eventually causes the water to flood over the side of the basin (like sugar spilling from the blood into the urine). When the brain is starved of glucose, it possibly signals the liver to form more sugar (like turning on the tap more strongly).

Until recently, diabetes was diagnosed by testing the urine for the presence of sugar. But, because people begin to leak sugar at different levels, this method is not reliable. In special tests performed at Bedford, England, in 1962, we found that many young people had low leak levels with normal blood sugar

levels, whereas many elderly people did not leak sugar even when their blood sugar levels reached 300 mg per cent or more, which is serious. In other words, the wash-basin in our analogy can be shallower in youth and tends to get deeper with age. Consequently, in elderly people, the blood sugar may be elevated for many years without detection.

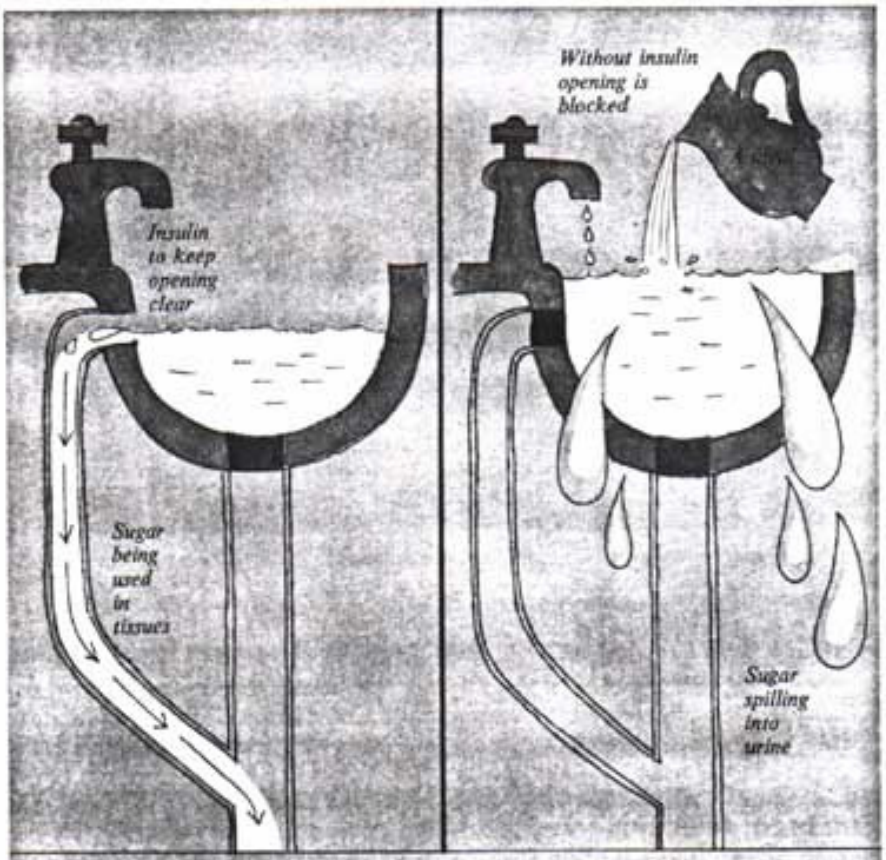
The alternative to testing the urine is measuring blood sugar levels. But at what blood sugar level is diabetes diagnosed? We are not sure. WHO has been instrumental in highlighting the diversity of diagnostic levels used in different parts of the world and emphasizing the need for standardization of tests.* The best procedure for diagnosis is to challenge the body's ability to release insulin and dispose of glucose by giving a standard portion of food by mouth and then measuring the blood sugar level as it rises and falls afterwards.

The symptoms

How are the chemical defects of diabetes manifested? Symptoms range from easily recognized severe signs to mild, insidious ones occurring in people with high renal leak levels. Gross elevation of the blood sugar leads to sugar-laden urine, and the sugar takes water with it. Large quantities of urine are passed, and the patient complains of great thirst. If diabetes is not alleviated by insulin therapy, the body, unable to use sugar, will use fats whose breakdown leads to the accumulation of acid products in the blood; consequently, the patient breathes with fast, gasping, respiration like an athlete with excess lactic acid in his blood. If the condition is still not corrected, consciousness clouds, fluid loss into the urine continues and the blood volume is reduced; shock and death ensue. Severe cases of diabetes may start with such symptoms. Unfortunately, this state also may be precipitated by infections in diabetic patients who are receiving insulin injections.

Patients with milder cases may have few symptoms. Some people recognize none at all; others acknowledge that they feel tired and listless. Sometimes, the chemical disturbance is so mild that advanced complications develop as the first symptoms: difficulties with vision; sclerosis of the arteries manifested in the heart, the feet, or the brain; infections of the urinary tract; or boils in the skin.

Many clinical conditions are associated with diabetes. E. Joslin, a Boston diabetes specialist, pointed out that the condition tends to run in families and is sometimes associated with diseases of the endocrine, pituitary and adrenal glands and of the liver. About 30 per cent of patients with the sort of pituitary gland tumours that cause giantism or enlargement of the jaw, hands and feet have diabetes. Conversely, some tumours of the pituitary and adrenal glands may cause diabetes. Since the recognition in the nineteenth century that no new cases of diabetes occur during periods of famine, but that diabetes increases during times of plentiful food supplies, an association has been established between obesity and diabetes. Just as there are many causes of fast pulse, high blood pressure, heart failure or pneumonia, there are many causes of high blood sugar. Actually only about 5 per cent of diagnosed diabetic patients have other endocrine diseases causing high blood sugar levels. Conversely, about 80 per cent of the diabetics in most industrialized countries are overweight. Furthermore, loss of weight leads to restoration of normal blood sugar values in most overweight diabetic patients. Since obesity is potentially preventable or reversible, the health challenge is to prevent it.



The level of sugar in the blood has been compared to that of water in a wash-basin. In the wash-basin, here filled to the overflow drain, the water going out of the overflow represents sugar being used in the tissues. The overflow needs a "detergent" to keep it clear. This is, in the comparison, what insulin does. Without adequate insulin action, the overflow drain becomes choked. If a tap drips into the basin (like the addition of newly formed sugar to the blood by the liver), or if a jug of water is poured in (like a meal), the water level rises and causes the water to flood over the side of the basin (like sugar spilling from the blood into the urine). When the brain is starved of sugar it may signal the liver to form more sugar; this is like turning on the tap more strongly.

* WHO Technical Report Series No 310.

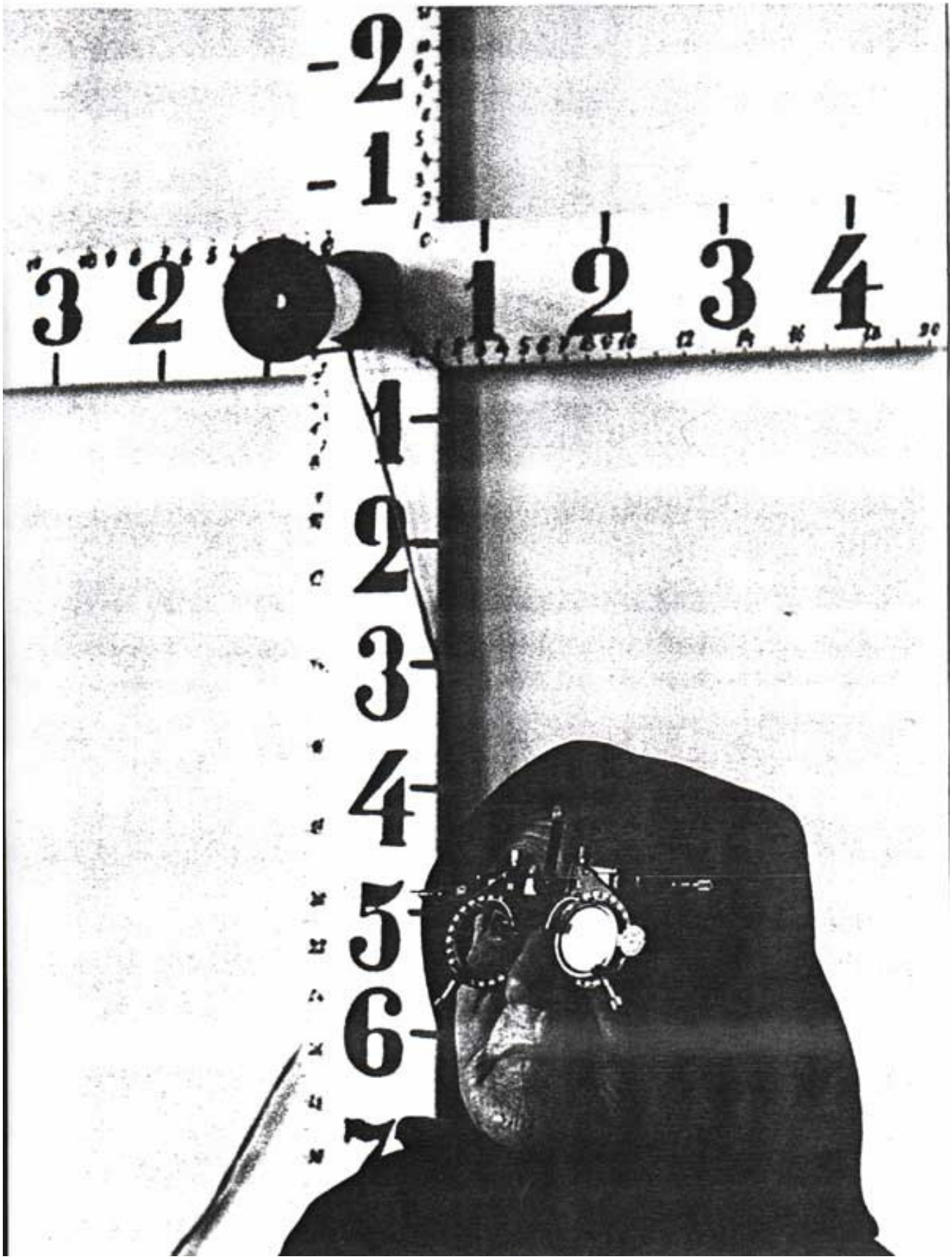
To understand the interaction between diabetes and obesity or other clinical conditions, we must consider chemistry. The chemical analyses of N.P.W. Sanger showed that insulin itself consists of 51 amino acids joined in two chains. Amino acids, the "building bricks" of which proteins are constructed, are strung together like beads. Insulin is formed from its precursor called pro-insulin, a single long strand of 83 amino acids. This strand begins by coiling over itself; the middle part is removed by a chemical reaction leaving the two overlapping sections joined together. The result is insulin. It is worth noting that the sequence of amino acids of pro-insulin and of insulin molecules in human beings differs somewhat from that of other species.

Insulin synthesis in the beta-cells of the islets of Langerhans in the pancreas depends on the right succession of amino acids being strung together in an order determined by the cell nucleus. The energy for insulin synthesis comes in part from glucose consumed by those cells.

Once synthesized, insulin molecules, forming granules inside membranes in the beta-cells, are released into the blood when the blood sugar level increases. Because of the many chemical steps in insulin production, there are many points at which a fault in the production, or the delivery system may result in inadequate insulin action on the tissues, i.e. diabetes. The weakness in the system may be insufficient DNA (deoxyribonucleic acid) in the beta-cell nuclei to transmit messages from nucleus to cell, or a shortage of amino acid "building bricks". Infections may wreck the beta-cells or there may be a disturbance of their circulation. A defect in the energy metabolism or releasing mechanisms might result in a defect in the transport or delivery systems. Alternatively the cells of tissues may be rendered insensitive to insulin. It is not surprising therefore that there are so many causes of weak insulin production-delivery systems and consequently of diabetes.

Obesity has a strong association with diabetes. Not all obese people become diabetic, but if one inherits a weakness in one's beta-cell system, obesity unmasks the defect and high blood sugar results. Obese diabetic patients have plenty of insulin in their blood but the tissues do not respond to it. This may be due mainly to fat-laden cells being "resistant" to insulin, and perhaps partly to a blockage of the usual filtration of insulin from

This machine measures the blood flow in order to see how effective it is in delivering sugar to the tissues of the forearm. Sugar is the body's fuel and a constant, orderly supply is necessary. While the test is going on, the information is being automatically recorded on another machine which presents it in the form of a graph. In the bottom picture, the graph printed by the machine is being analyzed.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◁ *As diabetics grow older they frequently develop eye trouble. Like all diabetics in her community, this old lady is having her eyesight tested (Hungary).*

The nurse asks the computer about the patient's mobility and is told that this patient is able to get out of bed while it is being made. A closed-circuit TV screen close to the patient's bedside can immediately give much vital information necessary for dealing with patients. The information is stored in a central computer. Computerization is replacing hand-written charts, which are hard to use and time consuming. ▷

the blood to the tissues. Either way, when glucose cannot gain access to muscles the body has to dispose of it in less insulin-responsive tissues, thus putting heavy demands on the beta-cells for insulin. If the cells are "weak", they fail to meet the demand. Obese diabetic patients can restore a normal insulin-glucose economy to the body by losing weight, since weight reduction increases glucose uptake by the muscles. Once the lean muscles start receiving insulin again, glucose disposal is re-established and the blood sugar level falls. Exercise also opens the circulation in the muscles and so helps counteract the tendency towards diabetes.

World-wide population surveys for diabetes have only been done during the last decade since techniques for chemical estimations on a mass scale have just become available. Before this era, diabetes was explained largely in terms of hormone disturbances in the pituitary and adrenal glands. But we know now that other factors are involved. The surveys indicate that there is little or no diabetes in un-mechanized, developing societies, while diabetes is increasing in mechanized, urbanized communities where people tend to exercise too little and to be overweight. Analysis suggests that three main factors influence the increase in the number of cases of diabetes: 1. increasing life expectancy, 2. obesity, and 3. lack of exercise.

As a person ages, the body cells lose the full code of DNA in the nucleus for complete protein production, resulting in grey, thinning hair and wrinkled skin. The production of insulin, which is a protein like hair and skin, also slows down with age and so the ability to dispose of glucose diminishes. Moreover, there are the effects of obesity and lack of exercise on the development of diabetes which have already been discussed.

Difficult comparisons

The surveys indicate that in urban societies 20 to 60 people per 1,000, or 2 to 6 per cent, have diabetes *. The exact prevalence depends on the strictness of diagnostic criteria. In 1965, the WHO Expert Committee played an important part in recommending the standardization of diagnostic criteria. But comparisons between countries are still speculative. The important point is the recent trend towards diagnosing diabetes on the level of sugar in the blood rather than the presence of sugar in the urine. Accurate diagnosis is vital to the patient and essential for accurate epidemiological studies.

Now that the level of blood sugar can be controlled with insulin and other substances, the prevention of complications resulting from diabetes represents an increasingly important clinical challenge. Diabetes seems to predispose patients to diseases of the blood vessels. Older people, with high leak levels into the urine, may have insidious high blood sugar levels. In obese persons with high levels of insulin in the blood, the lining of the blood vessels may be bathed in excess sugar and insulin and other hormones. These conditions predispose a patient to the formation of fat deposits and atherosclerosis, especially if the artery is damaged, for example by high blood pressure.

Studies indicate that diabetes is associated with an increase of heart attacks as well as of stroke, especially in people suffering from high blood pressure. There are also cases of gangrene of the feet. Other complications include cataracts and changes in the blood vessels in the retina of the eye, which can cause local haemorrhages in severe cases and eventual reduction or loss of vision. Infections or serious vascular disease of the kidneys may cause protein to leak into the urine. The nerves, both sensory and motor, may be affected and fail to convey impulses properly. Sugar in the sweat may cause skin boils or other infections. Unfortunately, the discovery of insulin and the subsequent development of other forms of therapy have not prevented these dangerous, crippling, and potentially

* See results of surveys in the U.S., England, Norway and Malta quoted in WHO Technical Report Series No 310.

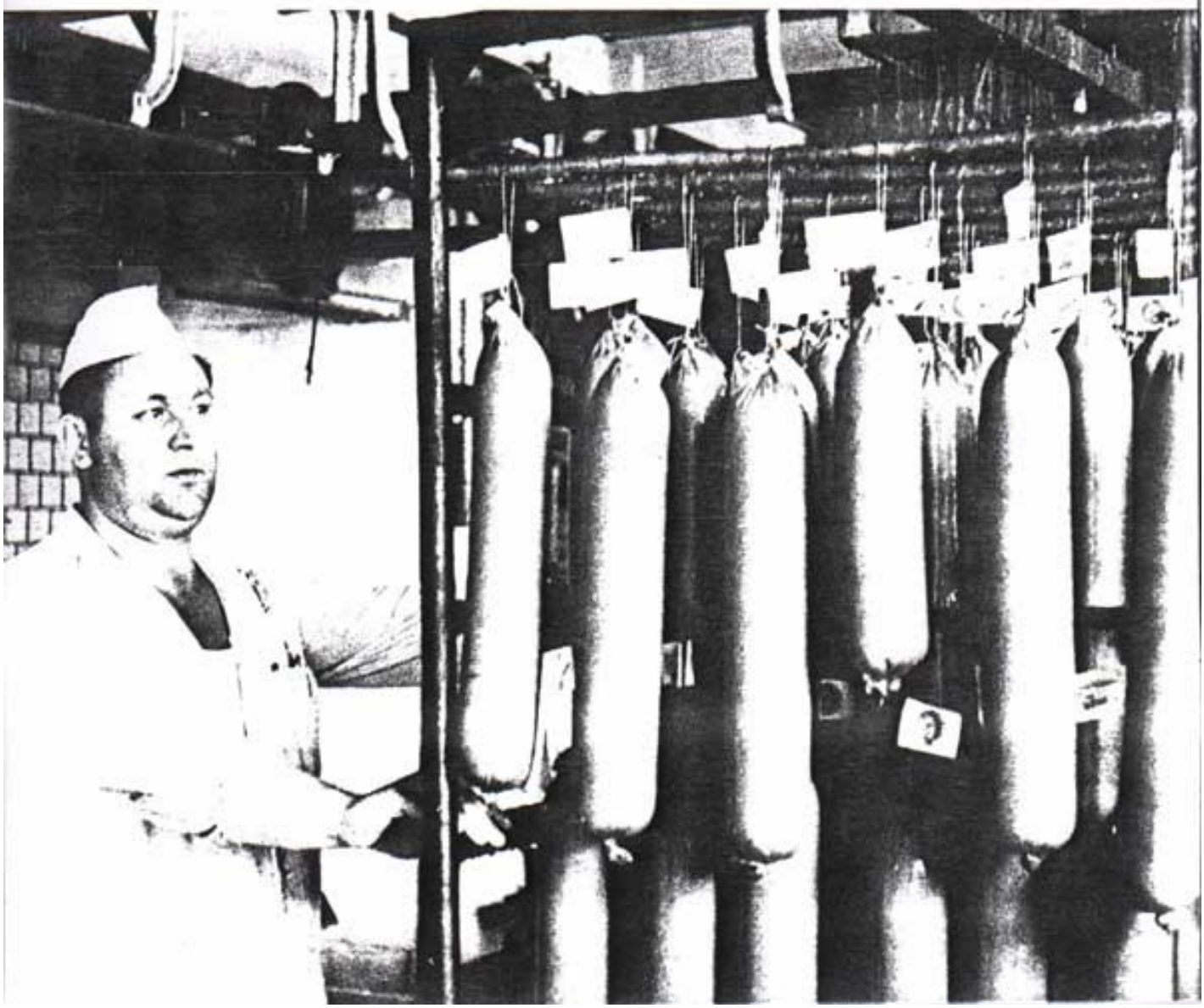
lethal complications which can affect patients with mild just as much as with severe cases of diabetes.

How has the medical profession tried to combat diabetes and its complications? First, biochemical abnormalities have to be controlled. Originally, only insulin was available. As it is a protein, insulin would be digested and inactivated if taken by mouth; so it must be injected. The diet should be standardized to ensure that the injection is adequate for the amount of sugar taken. In addition, exercise must be carefully regulated.

It is worth noting that a patient who injects ox insulin over a long period of time may develop antibodies to this form of insulin. When switching to pig insulin he may get an unexpectedly strong effect known as an insulin reaction. The same may happen whenever a patient switches from one form of insulin to another.

About 15 years ago, oral treatment for diabetic patients was developed. In Montpellier, France, during World War II, patients who were treated for typhoid fever with sulphanilamides died with low blood sugar levels. Auguste Loubatières later showed that this was because these drugs stimulate the beta-cells of the pancreas to release and perhaps synthesize insulin. In 1955, new drugs, called sulphonylureas, were given orally to increase the blood insulin level in patients who developed diabetes as adults and had the potential to secrete insulin. Other compounds, the biguanides, are also used for obese adult-onset patients. The drugs seem to enhance the action of insulin, lowering both the blood sugar and insulin levels.

Control of blood sugar levels is possible for most diabetic patients, but the prevention of complications is still uncertain. Controlling the blood sugar level lessens the tendency towards cataracts, but the exact relationship between the control of diabetes and the other complications is not understood. So patients are treated symptomatically; vascular surgical procedures offer relief from gangrene, new compounds alter kidney disease, photocoagulation of the retinae may help patients with eye complications, and so on. Experts everywhere realize that full-scale research on



diabetic complications is of the highest priority now.

Present evidence indicates that a few people inevitably will have diabetes, but the majority of susceptible persons could impede its development if the environmental factors which trigger diabetes were prevented. High-risk persons must first be identified and warned to take appropriate precautions.

Prevention often possible

The highest risk is for individuals whose blood relatives are diabetic, indicating a hereditary weakness in the beta-cells of the pancreas. Women who bear overweight babies, more than 4.5 kilos, are also highly likely to become diabetic. Finally, a much higher proportion of overweight people are diabetic than normal or underweight people.

Treatments which require the ingestion of steroids (cortisone derivatives) or certain diuretics, which increase urine output, used in heart conditions and to lower the blood pressure in hypertension, may precipitate diabetes in people with the tendency. Prolonged bed rest sometimes brings on the disease.

The proper preventive measures would be to avoid obesity, reduce food consumption as old age proceeds, take more physical exercise, be careful not to overeat during periods of enforced inactivity, and avoid drugs which may precipitate the condition.

Despite great advances, such as the discovery of insulin and the development of oral treatment, and the increased knowledge about the many biochemical intricacies of the disease, diabetes cannot be cured. We can only control it. The next 50 years will involve much clinical and biochemical research and health education to prevent diabetes. More than 2,000 years ago, Plato said, "elaborate food produces disease" and "simplicity in physical education produces health of the body". His words should be heeded today. More attention must be given to the objective with which WHO is particularly familiar: the preservation of health by the prevention of disease. ■

◁ Obesity is an aggravating factor in diabetes. This worker is a diabetic. It has been discovered that many of his overweight co-workers are diabetic as well.

This English child living in Switzerland has a ▷ diabetic condition. As a result, both he and his parents pay close attention to diet, but he manages to lead a full and interesting life quite similar to that of his school-mates.

africans
have diabetes too...

by Professor Marc Sankalé *

In 1907, the 75th annual meeting of the British Medical Association, held at Exeter, came to the conclusion that the rarity of diabetes among coloured people was established. Even in 1944, after a long career in the Congo, A. Dubois wrote: "Diabetes is rare among Africans. I don't recall having ever diagnosed a case." The general view was that this immunity was in some way related to climate and genetics.

Nevertheless, since 1933, several researchers, E. P. Joslin, L. I. Dublin and H. H. Marks, have observed that the disease was equally prevalent among white and black populations in the United States.

In Africa itself, the relative success of the battles against the major endemic diseases enabled health services to give more attention to the non-communicable and less frequently encountered illnesses. It was noticed that, like everyone else, the African falls victim to asthma, duodenal ulcers, epilepsy...and diabetes. Thus, although only two cases of diabetes were reported in Kenya between 1916 and 1920, a total of 197 were recorded between 1946 and 1950, and 58 cases in the year 1957 alone. The rate of admission of diabetics for treatment at Mulago Hospital in Uganda was 25 per 1,000 patients in 1958. At Ibadan, in 1961, the corresponding rate was 30 per 1,000, and at Dakar it was running at 27 per 1,000 in 1969.

Corn-fed Venus

The frequency of diabetes, as these figures show, is comparable to levels in other continents which is, in fact, not surprising. It is true that the disease is associated with dietary excess, and at first sight this should therefore make its incidence rare in less developed countries. But diabetes is also linked with the starchy diet which is common in developing countries, particularly in rural areas. The daily fare consists very often only of rice, millet and tuberous plants like manioc, because fats, meat and fish are expensive and hard to obtain. But social customs, particularly in the towns, also have a relationship to over-eating.

Eating as much as possible whenever the opportunity arises is a common habit. The well-rounded female silhouette is much admired, and success, like happiness, is associated with obesity and indolence, which in some communities are highly regarded. No matter how limited the family's resources may be, food is always the first consideration and not only in times of famine and drought (whose worst effects are in any case limited to certain areas); the fact is, the African loves to eat.

In the absence of any kind of systematic detection campaign, precise statistics are not available, but a careful enquiry conducted by R. Baylet and his collaborators in 1968 showed a glycosuria (presence of an abnormal amount of glucose in the urine) rate of 1.7 per cent among persons examined in Dakar and also that the incidence of diabetes was lower in the interior than in the capital of Senegal. By comparison, the incidence of diabetes among a group of salaried workers

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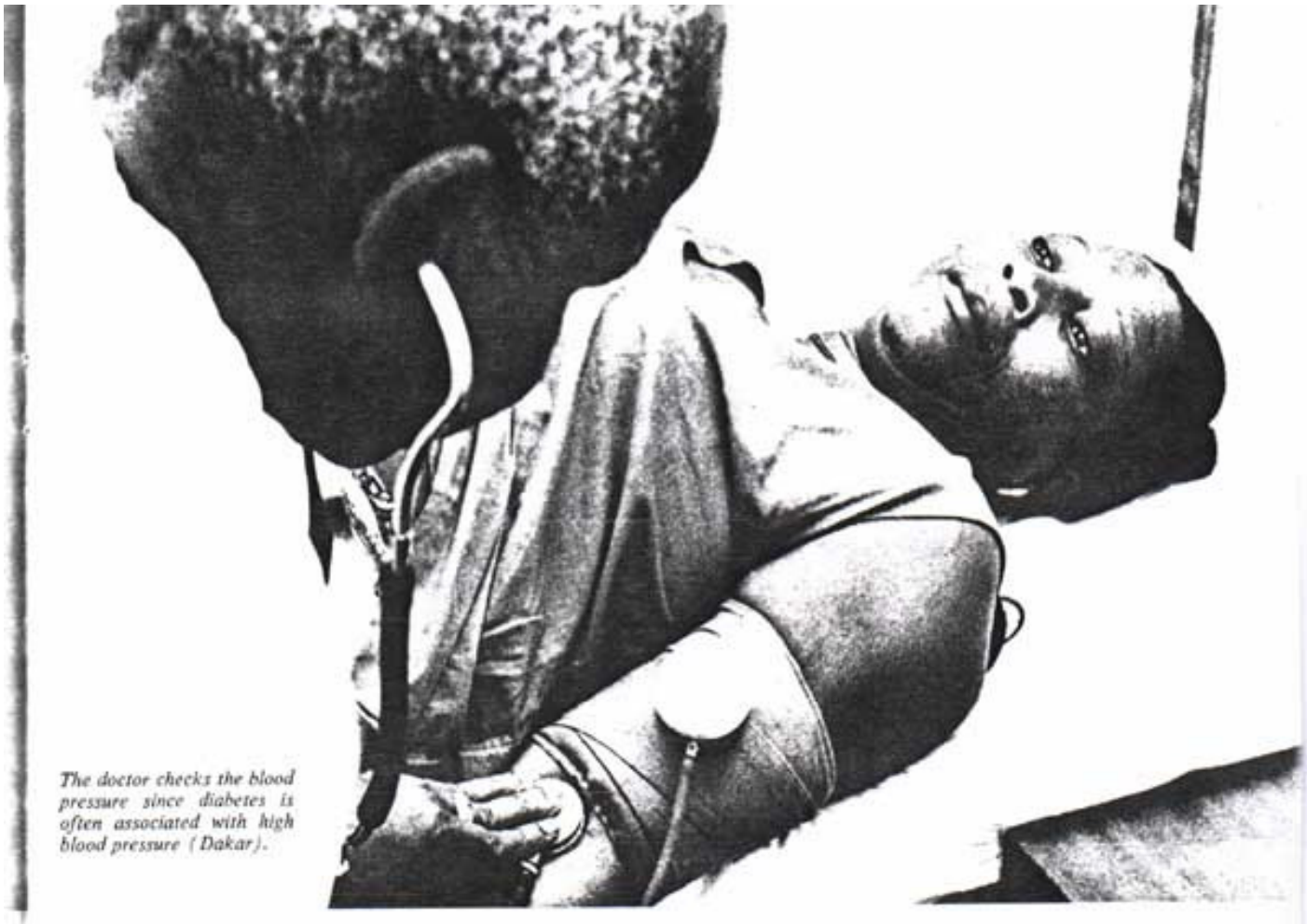


The doctor checks the blood pressure since diabetes is often associated with high blood pressure (Dakar).

(and therefore mainly adults) registered in occupational health records was between 1.5 and 2 per cent for the same year, according to Godlewski. There is every reason to think that, because of the lack of detection, only about one-tenth of the diabetes cases in Dakar are identified.

Diabetes is clearly therefore a social disease, a basic public health problem, which will come to the fore among medical preoccupations in Africa as urbanization spreads.

Serious forms of diabetes affect both sexes, but those which justify hospitalization are more frequent among women. The urban woman of Senegal is inclined to become overweight for reasons of sex appeal as well as greediness. She has a predisposition to diabetes, just like healthy landowners, political bosses and religious leaders, who are among the other traditional big eaters.

The hereditary factor evidently plays a part, and this is perhaps best illustrated in St. Louis, the former capital, where the first European settled three centuries ago and where diabetes is more frequent than elsewhere in Senegal.

African diabetes is sometimes difficult to explain. It is fairly frequent in Nigeria as a secondary complication of pancreatitis, with or without the formation of calculi, but this kind of diabetes is quite rare elsewhere. There seems no direct link with endemic diseases, such as schistosomiasis, and in almost every case the origin of the pancreatic anomaly remains one of the mysteries of the continent.

Even though the clinical picture of the disease is the same everywhere, certain peculiarities are worth mentioning in regard to the African version. It is a disease which occurs rarely among children, but attacks the young adult, and is frequently associated with complications due to late diagnosis and above all due to the difficulties of treatment in the socio-economic context.

There is no doubt about the rarity of diabetes among children in Senegal: those under 14 years represent only 1.5 to 2 per cent of all cases, while those under 20 represent 3.7 per cent of cases in Dakar, compared to 12.2 per cent in the United States and 20 per

Patients obtain a daily supply of medicine from the dispensary (Dakar).

The doctor is careful to see that his patient understands the instructions about diet and takes insulin regularly (Dakar).

cent in France (see table). It was among adolescents that Kinnear in Kenya also found a high rate of infantile and juvenile forms of diabetes: 23.7 per cent of all cases were in the age-group below 20.

Percentage distribution of diabetes cases by age groups.

All cases = 100 per cent.

Age group	*Senegal* (personal research)	*United States* (Joslin)	*France* (Deuil)
1 to 20 years	3.7%	12.2%	20%
20 to 40	22.2	23.4	10
Over 40	74.1	64.4	70
	100	100	100

Couscous, with millet as the basic ingredient, is a popular dish in Senegal and is recommended for diabetics, since for an equal amount of carbohydrate millet produces less blood sugar than rice or manioc.

Of cases in Dakar, 22.2 per cent are in the 20-40 age group, and 74.1 per cent in the age group over 40. It is evident that the 20-40 period is not a "gap". On the other hand, in certain developed countries, including France, observers note two age groupings: childhood and adolescence on the one hand, with dependence on insulin, and another, much more well-defined phase starting at the age of 50 or thereabouts in which most cases are not insulin-dependent. Between those two periods, there is a so-called "empty" period. A number of authors have recently drawn attention to the frequency of diabetes in the young adult, however, and it is clearly not rare in Africa. It may be that this is because of the starchy diet. Two patients out of three in this grouping, incidentally, are not insulin-dependent.

Generally speaking, the disease seems to develop much earlier in the African than among whites. In Dakar, it occurs more often among patients between fifty and sixty, while in the United States the peak is among men and women above sixty.

As often as not, it is the complications of diabetes which, having been allowed to develop through ignorance, bring the existence of the disease to the attention of health services. This seems to confirm the theory advanced by Joslin that the complications are directly related to the absence or inadequacy of treatment. Diabetic coma, which is the most dangerous, leads to the admission, depending on the country, of from 10 to 30 per cent of hospitalized diabetics, and is responsible for half the deaths caused by diabetes. There are many circulatory difficulties: apoplexy, arteritis of the lower limbs and, more rarely, coronary disease. Renal, ocular, and neurological complications also develop. Impotence can occur, and creates special problems in polygamous Muslim societies.

Diabetes also occurs in conjunction with certain communicable diseases, but the low incidence of tuberculosis among diabetes cases is striking: 3 per cent of all diabetes outpatients in Dakar and 2.5 per cent in Uganda compared with 8.4 per cent of all known diabetes cases in the United States, for example. Gangrene is by no means rare. Cases brought in are usually in an advanced stage and may entail amputation of the affected limb.

The main difficulty in the treatment of the diabetic African is related to his environment: in most situations it is impossible for the patient to follow an appropriate diet, or to receive uninterrupted treatment.

A diet for diabetics consists essentially of a restriction of carbohydrate and lipid, and an increase in protein intake. But this is not easy given the staple Senegalese fare, which is made up as follows:

In rural areas—2,380 to 3,000 calories of which 68 to 81 per cent are accounted for by carbohydrates, 10 to 17 per cent by lipids and 0.5 to 15.5 per cent by proteins.

In the Dakar area—3,000 calories made up of 61 per cent carbohydrates, 29 per cent lipids and 10 per cent proteins.

The end of the month...

For the diabetic to follow a correct diet means therefore to eat "like a European": have different meals from the rest of the family, spend more money on food, and perhaps dip into savings. Most patients are not able to follow the doctor's advice regarding diet, even if based on local products. Even if they do not follow a strict diet, they should eat at regular times, and maintain a certain equilibrium in the quantities they eat. This kind of "semi-free" diet implies a daily intake of regular quantities of carbohydrates, which means that there is no need to alter dosages in medication. Another problem is that in food purchases volume and price are considered more important than weight. A housewife will ask for, say, two measures, or 100 francs' worth of *couscous*, but will take no account of weight, and this makes the observance of a diet very difficult. Surveys carried out in African homes during cooking times suggest that only about 25 per cent of patients follow a strict diet. The rest depart widely from it, and usually overeat: we find that the tendency among diabetics on a "semi-free" diet is to eat about twice as much carbohydrate as they should, and they usually have a total calorie intake of about double the amount recommended.

With J. Cros, we have been able to show that the utilization of carbohydrates in the body varies for different foods. Thus, for an equal content of carbohydrate, millet causes a lower increase in blood sugar than rice or manioc, and is therefore to be recommended for diabetic patients.

In most cases, blood sugar increases in the blood and urine as the end of the month approaches. This is not because the disease

has become unstable. The real explanation is that money is running short, and it is no longer possible to ensure that the patient gets different food from the rest of the family. He eats from the common dish, and must wait for the next wage-packet to return to his diet. Lack of resources is thus the major obstacle to dietary treatment of the African diabetic.

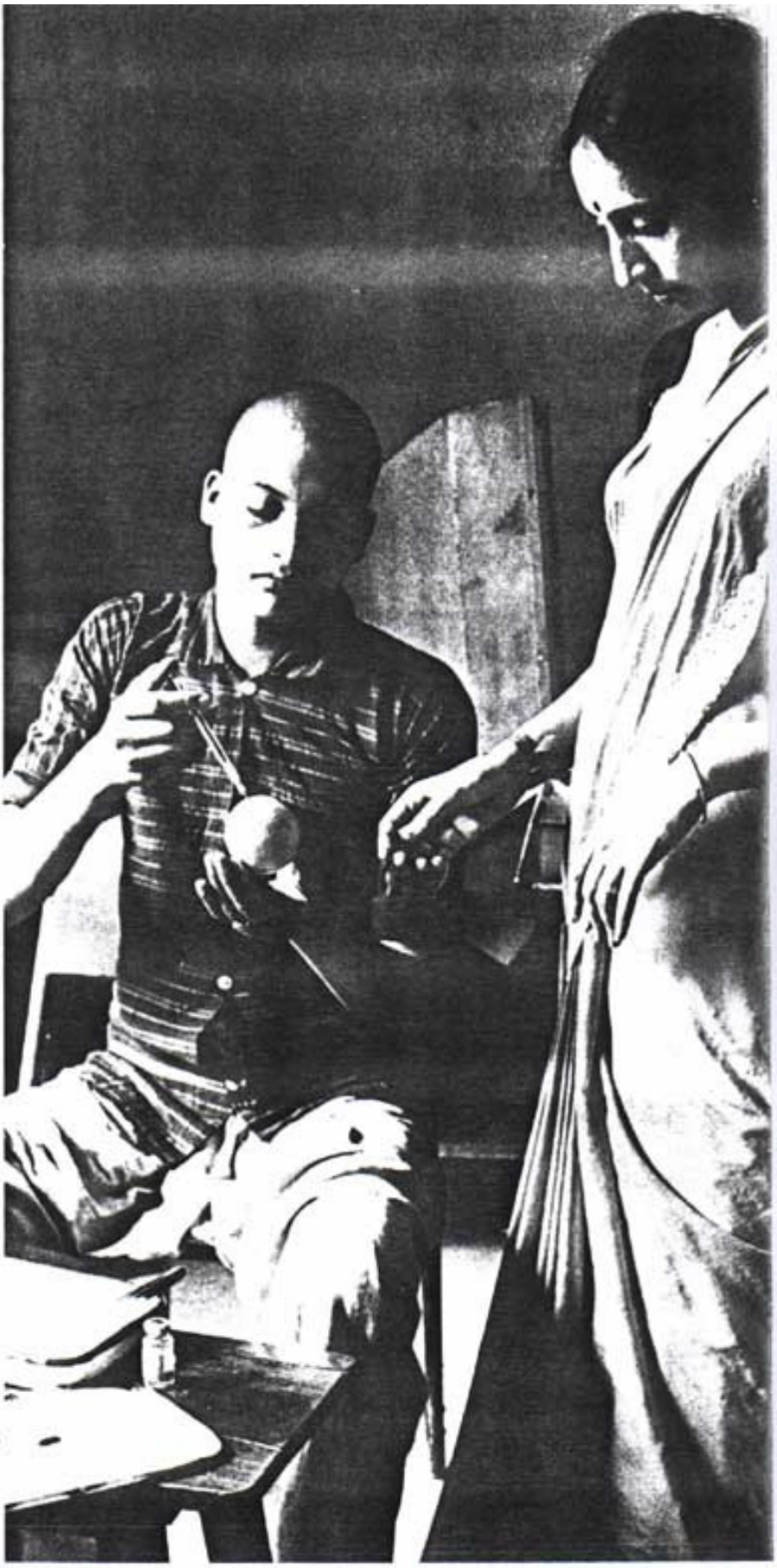
Eating habits and food taboos come next on the list of difficulties. This underlines the importance of health education in any national campaign against diabetes.

Drugs and their administration do not offer any points of special interest. About 15 to 20 per cent of patients receive insulin, usually of long-acting type. Some young diabetics learn to inject themselves, but the majority must visit the dispensary every morning.

Oral drugs are therefore particularly welcome, but they are expensive and must be taken by the diabetic uninterruptedly throughout his life. In Africa, it often happens that the patient can pay for the drug for a few weeks or months perhaps with the help of all the family. Beyond that, unless some kind of subsidy becomes available, treatment may stop. With the help of the municipal authorities, a philanthropic society established a céntre in Dakar for the treatment of diabetics, which has had encouraging results and now copes with several hundred patients. Thanks to the work of this organization, assistance has been provided for diabetics. Those who have been assisted are for the most part people of slender means, who even after retirement age should help to support their families instead of adding to the financial difficulties.

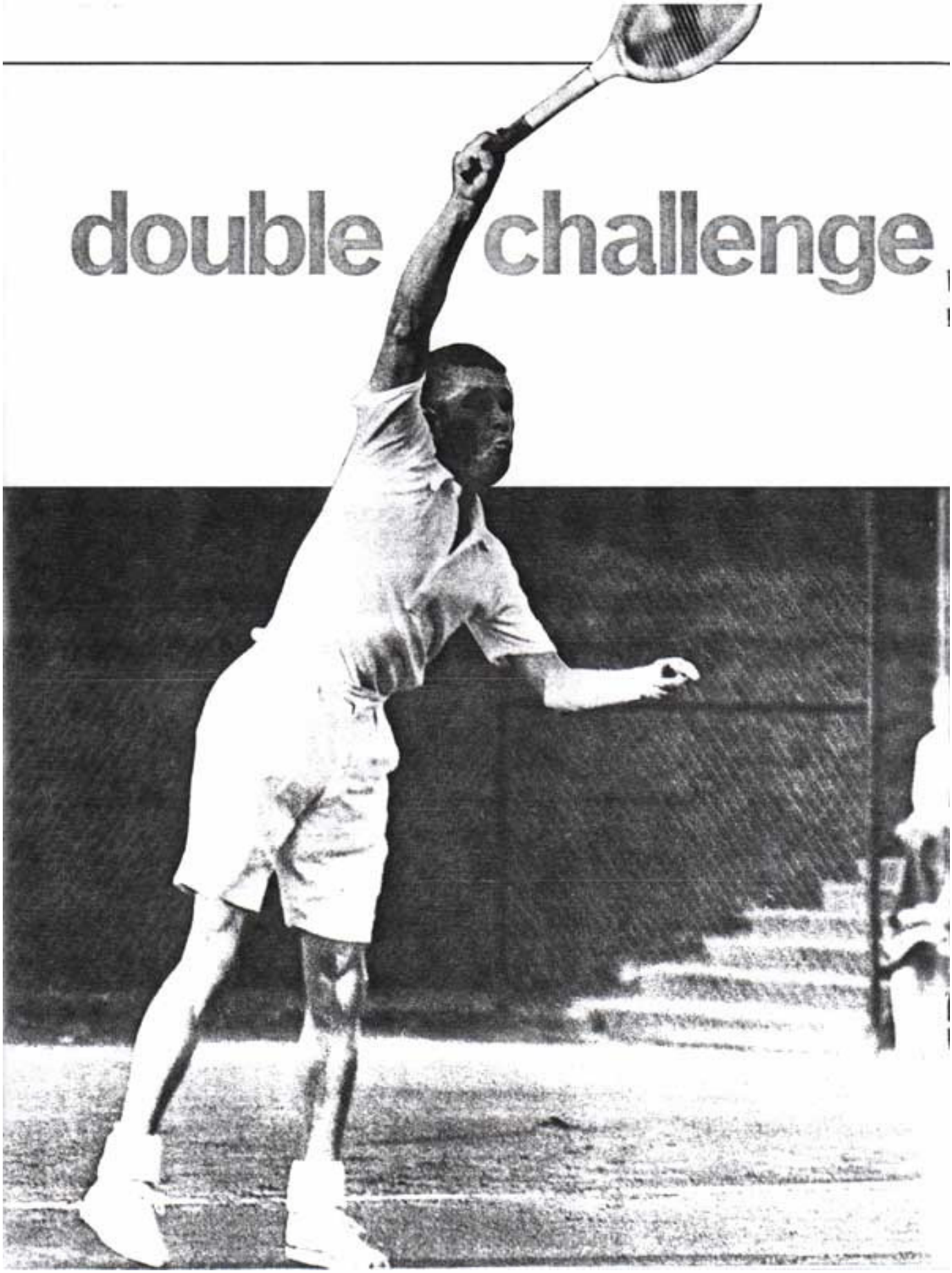
The essential role of education in any programme against diabetes, whether individual or general, follows the same pattern everywhere, and in Senegal we have created a support organization for diabetics—"Association Sénégalaise de Soutien aux Diabétiques". Its officials arrange information sessions, and co-ordinate activities undertaken by the patients themselves.

It must be emphasized that we adhere to the system of limited detection, which in the circumstances is the only practical solution. We do not have the resources to undertake large-scale treatment, so we do not launch major information campaigns nor are we planning national detection campaigns. At present, our efforts are concentrated in Dakar, a policy which is justified by the fact that today the city shows the highest prevalence. In the not too distant future it will be possible to organize campaigns against diabetes on a scale comparable with the developed countries throughout the whole of Africa, among both urban and rural populations. ■



A young diabetic learns how to give himself injections by first practising on an orange (India).

double challenge



for a champion

by William F. Talbert

Former captain of the US Davis Cup team

In 1946, I made my first trip to Australia as a playing member of the United States Davis Cup team, seeking to return to my country the big silver trophy emblematic of world supremacy in tennis. I was 28 years old and in first-class physical condition, except for one thing. I had been a diabetic since the age of 10 and my little black kit, containing hypodermic needle and insulin injections, had been as essential to my tennis career as my battery of rackets.

This was a side of my life that I had never publicized, through a reticence familiar to most diabetics. I did not want to be considered "different" from my fellow-players or tendered sympathy or special consideration because of my physical disability. Consequently only relatively few people in the tennis world were aware of my diabetic condition and the sports public at home knew nothing about it.

But in Australia tennis is a major sport and the highly competitive press treats racket-swingers the way American newspapers do home-run hitters and glamour-boy quarterbacks. Our arrival in Australia marked the resumption of international competition after a hiatus of six years caused by World War Two. The probing Aussie reporters at our first press conference wanted to know why I had not served in the war, as had the rest of our team and theirs. My standard answer, "medical reasons", which had satisfied American newspapers, was not enough for the inquisitive Australian interviewers.

Under persistent questioning, I finally admitted I had been deferred from service, classified 4-F, because of diabetes. That unloosed a flood of further questions. Next day, the newspapers featured my responses, one headline reading: "Talbert conducts his career in tennis with a hypodermic needle as well as a racket. The American Cup star is a diabetic playing the game under doctor's supervision since the age of fourteen."

The stories made me uncomfortable but I was not prepared for the aftermath. Every diabetic in Australia now knew I was one of them and they all seemed to want some kind of advice. A local group dedicated to the training and care of diabetics wrote to me, as did hundreds of other individuals and organizations, saying I was in a position to be of "inspiration and inestimable help to fellow sufferers" and asking me to play a tennis exhibition for diabetic children.

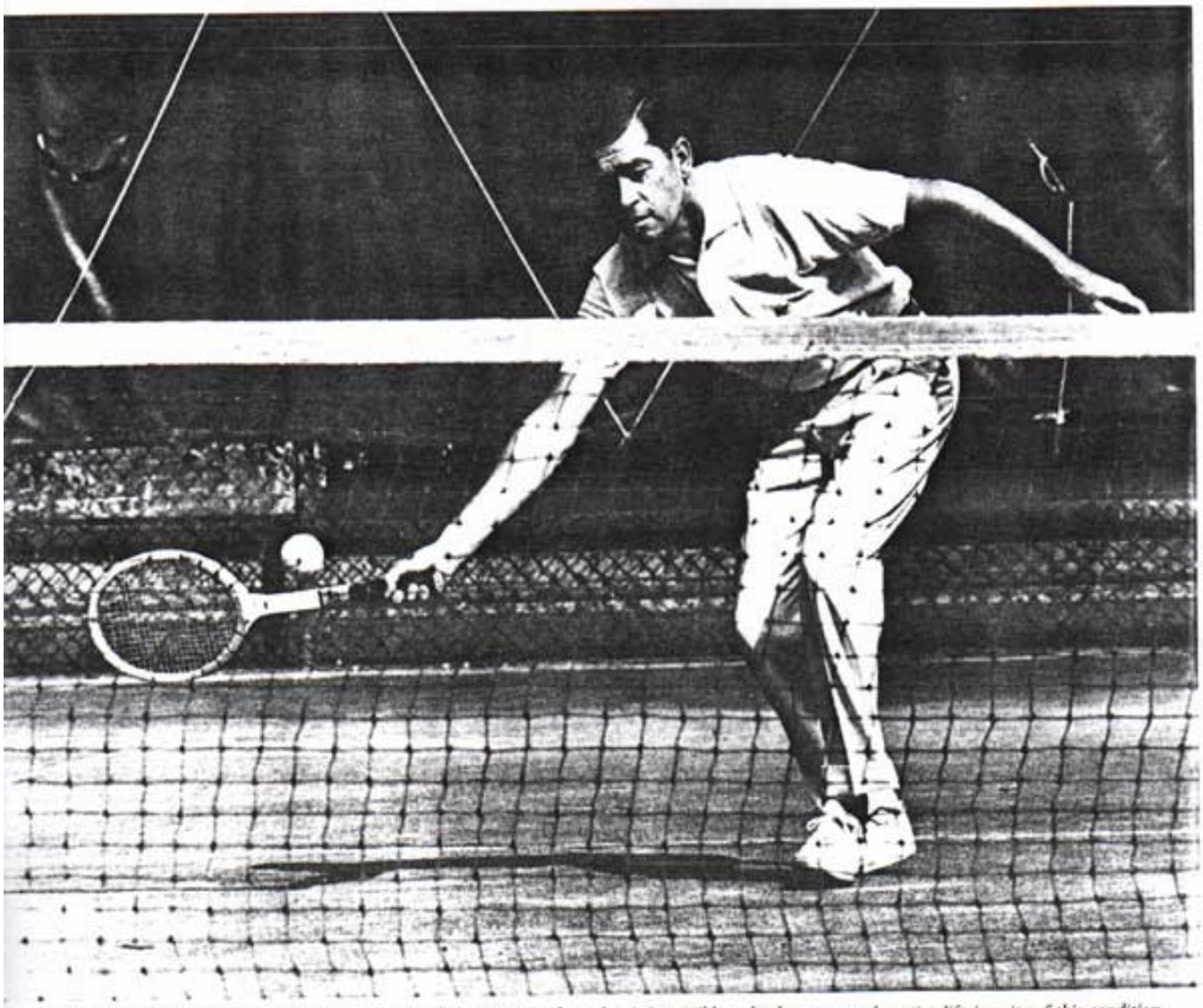
I didn't like the term "fellow sufferers". I didn't consider myself a sufferer of anything. My idea was to lick diabetes and avoid all reference to the disability. I had always given diabetic organizations a wide berth back home. But as a member of the official U.S. Cup Team I held a responsibility a little larger than that of an individual player. I agreed to play the exhibition with my teammate, Gardnar Mulloy.

It was an exhilarating experience for me. I felt an immediate identification with those Australian youngsters and I was a hero to them. They cheered wildly every time I scored a point against Mulloy. Afterwards, Mulloy said to me, "you ought to bring this crowd along with you next time you play a tournament—an outsider doesn't stand a chance around here." During my stay in Australia I played several more exhibitions for similar groups of diabetic youngsters and attempted to answer a flood of telephone calls and letters from parents and children, wanting a sympathetic ear or a few words of reassurance from someone who had been through the mill.

Time magazine picked up the story from the Australian newspapers, reporting "diabetes was making U.S. tennis player Billy Talbert a special sort of hero in Australia, and admiring fans showered him with letters, flocking to watch him practise."

Consequently, when I got back home to the States, mail from American diabetics

◁ *Talbert developed a special service with a short windup which gave him power but used less energy.*



Still active today, Talbert likes to demonstrate to diabetics everywhere that it is possible to lead an extremely active life in spite of this condition.

and their families started to come in. Many of the letters were heart-warming, some heart-breaking.

The problems faced by diabetics are often far more serious than any encountered in taking up an active sport. One girl wrote to me about her fiancé:

"Stuart has been a diabetic for a number of years and always taken care of the problem. However, a few months ago he had an insulin reaction at his office. His employer thought he was drunk and fired him. I persuaded him to go back and explain the truth of the matter. His employer apologized but said that in view of the 'risks' he could not re-hire him. Stuart has applied for a number of other jobs but insists on mentioning his diabetes. As a result, he has not been able to land anything, although he is a conscientious and competent man in his field."

This kind of discrimination was far more widespread than I had believed. It was one of the reasons that I became an active member of the groups in this country, such as the American Diabetes Association, which conduct effective educational campaigns amongst employers to prevent unfair practices against diabetics.

However, I also found that often the root of a diabetic's individual problem is his own attitude rather than his health. Some like to feel sorry for themselves and use diabetes as an excuse for not putting out maximum effort in seeking and holding a job.

There are worse things that can happen to you than diabetes, as one fellow "club member" pointed out to me. He was a middle-aged man who wrote that he had a chance to become a mail carrier and wondered about the exercise that went with such a job. I pointed out that exercise had been no great problem to me once my doctor and I had worked out the right formula of insulin and diet. He phoned me six months afterwards to say that he had taken the job, was walking five days a week and had only one complaint.

"What's that—insulin reactions?"

"No," was the reply, "flat feet. Try and fix that with a lump of sugar!"

In my case, years of trial and not a few errors have enabled me to work out a sensible regime of insulin and dieting consistent with an intensely active physical

life. I have come to believe that one or the other must be the master—I or it, the person or the diabetes. Having diabetes is much like bringing up a child. It must learn to live with you, not you with it. Other diabetics learned this long before I did. They were leading busy and creative lives in other fields. H. G. Wells in literature, Puccini in music, Cézanne in painting, Clemenceau in international affairs, Fiorello La Guardia, the late Mayor of New York City, were all diabetics.

Now many more diabetics are learning they can be active athletes and live with their disability. I get letters from proud parents of champion swimmers, football players and tennis players. At age sixteen Hamilton Richardson, a top junior tennis player, discovered he had diabetes. He was dubious about continuing his tournament career but was encouraged by my example and went on to become the top-ranking amateur in the country, a star of Davis Cup teams, and a Rhodes Scholar.

If it had not been for diabetes, I certainly would have tried for a career as a baseball player. Growing up in Cincinatti, the hometown Red players were my boyhood heroes. I learned to read in order to master the box scores in the local newspaper. I eagerly delved into my geography books to find the locations of the major league cities. My dad, a former semi-professional pitcher, encouraged my love for the game, which remains with me. When we discovered my diabetes, at age ten, I said to Dad, "even if I can't play baseball any more, maybe some day I can write about it." The remark brought tears to his eyes.

For the next four years the most active game I engaged in was playing marbles with Dad. In those days—only a few years after the discovery of insulin treatment—doctors frowned on any form of exercise for diabetics. Luckily for me, my physician had "liberal" ideas about diabetes treatment. With the encouragement of my athletics-minded father, who bought me a racket, I went out onto the courts of a neighbourhood park for my first lesson.

The satisfaction I got was enormous, after four years of enforced idleness. Compared with the narrow surface of a baseball bat, the fat hitting area of a tennis racket was a great pleasure. In baseball I was lucky if I connected once out of three or four cuts at the ball. With this unfamiliar weapon, I found I was hitting the ball—although not controlling it much—nine times out of ten. I was hooked on tennis from that first day.

I was fortunate in possessing a good eye for the ball, from my baseball training, and had natural timing and co-ordination. My progress in tennis was extremely rapid. I learned early that I had to conserve energy, particularly in long matches. I therefore developed an economical style of play which became my trademark. I cut the big backswing out of my serve, producing a stroke that made purists wince since it eliminated the traditional elaborate windup that cannonball servers use. I knew I could never be a slugger like Jack Kramer or Don Budge, so I concentrated on developing a game based on controlled speed, utilizing a variety of strokes and exploiting all the angles.

I learned in the course of my early years on the tournament circuit, in the grass-court summers of the East and the slower clay-court season in my native Middle West, something of the metabolism of the athlete. I learned to take a candy bar, sugar or a sweet drink, onto the courts with me. Then if the match developed from a routine two or three set affair into a marathon of five sets, and the unexpected activity burned up the sugar in my system, I could ingest an emergency sugar ration to carry me through the match without a harmful reaction.

Even with every precaution, I had a few close calls on the courts.

At Southampton one summer I reached the finals against Pancho Gonzales, then the amateur champion. I took the first set from the fiery Californian but lost the next two. In the fourth set my game collapsed completely as I double-faulted, sprayed shots wildly out of court and stumbled about. My old doubles partner, Gar Mulloy, rushed out on the court after I had lost three games in succession to Pancho.

"Drink this, Willie," Gar commanded. He put a glass of sugared water into my hand and I downed it greedily. It was the answer. Gar had realized that I was losing control of my functions and going into insulin reaction through rapid burning of sugar. In a reversal of form that baffled Pancho and the gallery, I took twelve of the next fourteen games to win the match and the Southampton trophy.

In the locker room afterwards, Gonzales asked: "What was in that glass, Talbert? I'd like to buy a gallon of it for myself." ■

Three famous diabetics

G. Clemenceau (1841-1929)—statesman

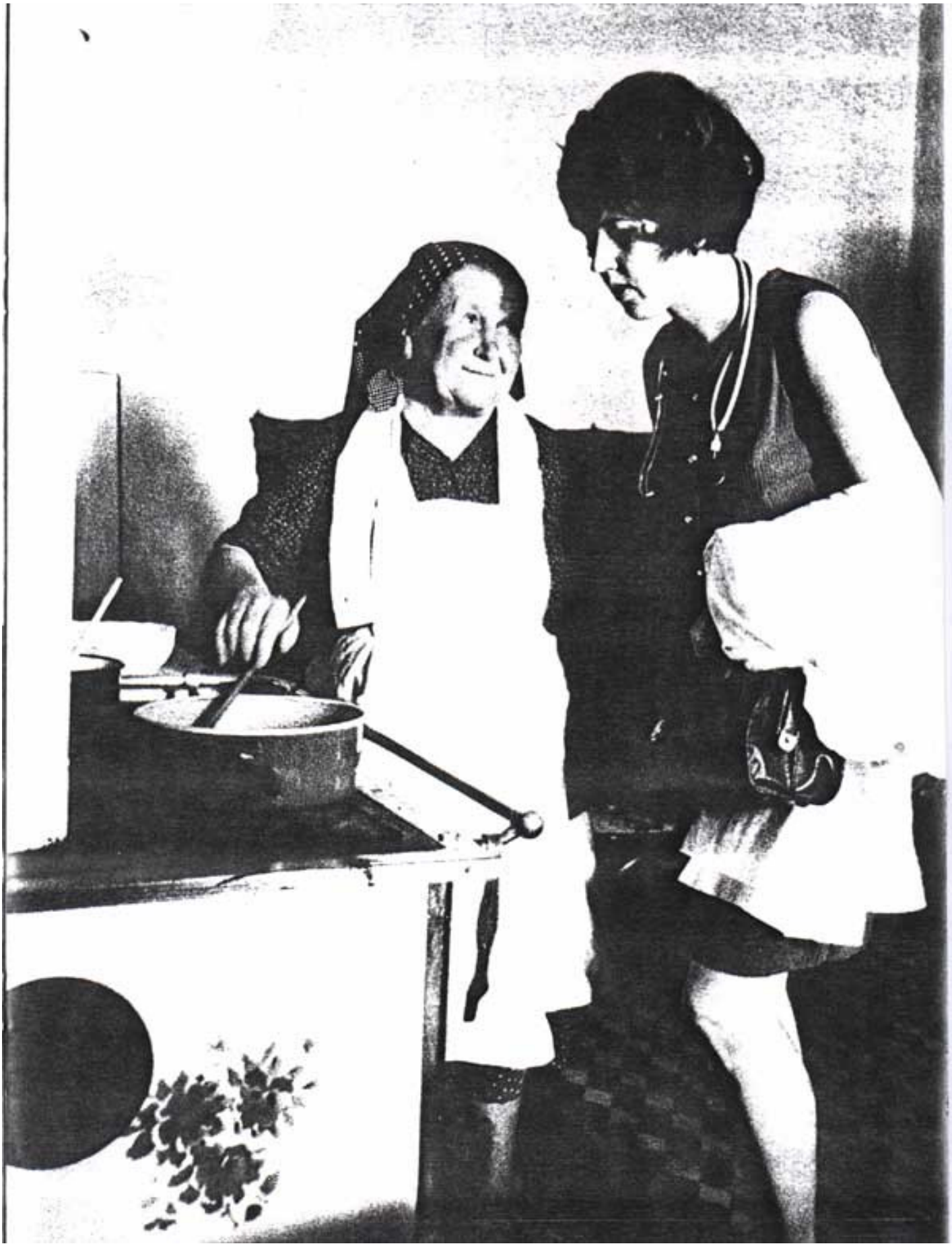
H. G. Wells (1866-1946)—author

Paul Cézanne (1839-1906)—painter

two countries on the look-out

◁ *An entire region in Hungary, Somogy, with a population of 395,000, has been studied for the last ten years by Dr I. Angeli in order to determine the incidence of diabetes and to identify, if possible, the factors that favour its development. The study has already brought out that those who work in the food industry are especially at risk. In this meat plant, for example, there is a high incidence of diabetes. Regular screening of all the workers has accordingly become standard procedure. Here, women workers at the plant are learning to do a urinalysis.*

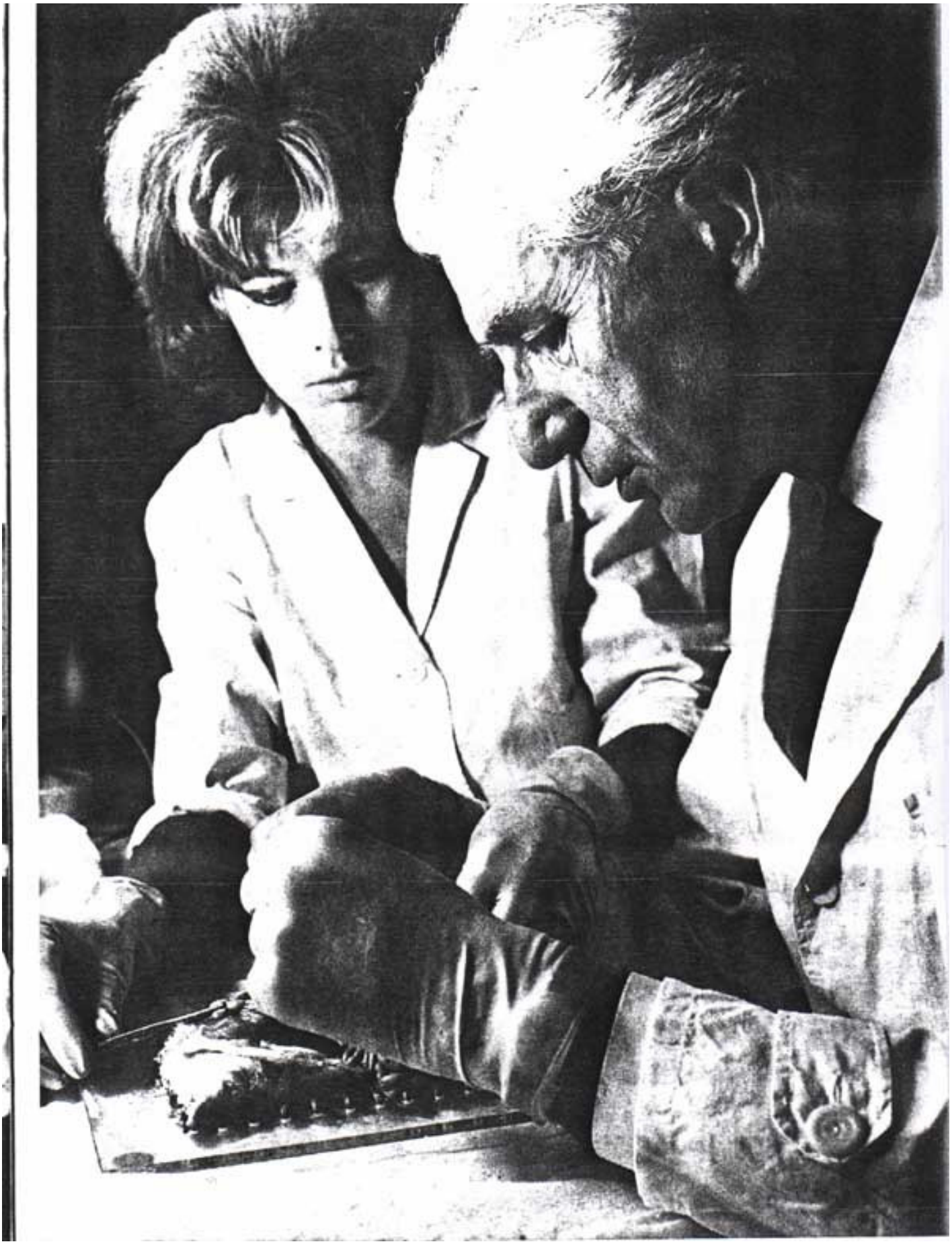
A young physician in Hungary makes her ▷ *rounds and pays particular attention to families where a case of diabetes exists. She is explaining to the mother of such a family how to prepare a balanced diet suited to the special requirements of diabetics.*



◁ *As part of his research, Dr Angeli personally checks the condition of many workers in this predominantly rural area (Hungary).*

Professor Alexander Popof in his laboratory ▷ *in Sofia, Bulgaria, with his assistant Mrs A. Aladjova. Their team is engaged in research into animal diabetes and the precise action of insulin in muscle tissue.*

Weight check and urinalysis in a Bulgarian clinic. Obesity is often the first warning sign of diabetes. ▽



summer / camp

in Maryland

by Abraham A. Silver, M. D. *

Teenager and diabetic—what sort of way can he best spend his summer? In approximately five per cent of all diabetics the onset of their disease occurs before fifteen years of age. Since it is common knowledge that diabetes presents challenging diagnostic and therapeutic problems and that it must be dealt with in childhood, a way has to be found to teach young people how to understand and deal with it.

Since the average pediatrician or general practitioner has very few of these patients in his practice, it is therefore particularly important to bring young diabetics together in a pleasant setting where they can be taught essential facts about their disease and how to manage it. A summer camp for swimming and sports is uniquely suited to attain the best therapeutic effect while allowing the children to enjoy a happy summer vacation. Camp Glyndon in Maryland, operated by the Baltimore Chapter of the Maryland Diabetes Association (USA), strives to meet these goals.

The principal object of therapy is the attainment of a normal life in every aspect: physical, psychological and social. The criteria for adequate control of diabetes are the absence of symptoms such as the passage of a large volume of urine in a given period and excessive thirst, as well as normal levels of glucose in the blood and the absence of acetone in the urine.

No "free" diets

All diets at Camp Glyndon are measured. We do not accept the concept of a "free" diet. Nevertheless, the child is permitted to eat the same meals as his family and is offered a diet with adequate calories to maintain normal growth and development, as well as proteins, fats and carbohydrates in adequate amounts.

Three regular meals with mid-morning, mid-afternoon and bed-time snacks are prescribed. Measurement of food is encouraged.

Almost without exception, every child attending Camp Glyndon needs at least one daily injection of insulin. Over the years we have had one or two young diabetics who were controlled with oral agents for a short period of time but we discourage the attending physician from insisting on oral agents when these agents are not in fact controlling the disease. Some of the children need more than one type of insulin at each injection. The measuring of insulin and the self-administration of insulin is a must for all children at our camp and it is rare indeed that a child is not taking his own "shot" after the fifth day in camp.

The degree of emotional adjustment to the disease has a direct positive correlation with adequacy of control, and is dependent upon the personality of the child and the parent-child relationship. Assistance is given to the child so that the disease does not become the focus of neurotic interaction with his parents after the child returns home.

Participation in all outdoor activities is urged at Camp Glyndon, so the three daily snacks in addition to the three regular meals are important. On rainy days, the large dining room area is used for diverse activities including a form of gymnastics known as tumbling and dancing. We think that this is a very important part of learning to live with diabetes, since the blood

* Medical Director of Camp Glyndon

sugar level drops abruptly during exercise. The average child quickly learns the symptoms of hypoglycemia and how to deal with them; crackers or fruit are excellent meals when the symptoms arise.

Camp activities

Camp Glyndon is operated for children between the ages of five and fifteen years. The criteria for admission are first, the child must be diabetic, and second, the child must need the training available at Camp Glyndon and not just be seeking the fun associated with coming to camp. Camp Glyndon is indeed a fun camp because our children engage in all of the activities that are seen in other summer camps run for healthy children not in need of medical instruction. There are no fees at Glyndon so that the child from the poor as from the rich family may enjoy and participate in all camp activities.

We have three camping sessions. One for three weeks beginning June 21 and extending beyond the first week in July for children between the ages of twelve and fifteen years. The second period runs from July 12 until the first week in August for children between the ages of nine and twelve years, and the last period begins August 2 for two weeks for children between the ages of five and nine years. Children in the first group who show promise as future counselors may stay for the entire summer including the second three-week and the last two-week periods. Some of the older children in the nine through twelve group who show similar promise are invited to stay on for the last two weeks.

Our crop of five to nine year olds is usually rather small and we keep them only for a two-week period because we feel that this is about all they can take away from home on their first camping experience.

Our full camping staff of counsellors, nurses and physicians is helped by the older children remaining from the first and second groups, and this usually gives us at least a one-to-one coverage for the little children; we find this most satisfactory.

Activities in camp include swimming, which is probably the most popular, baseball, basketball, volleyball and horse riding. Children enjoy hikes and nature study, and in general have a good time in camp.

Our arts and crafts section is an important part of the camp. Here the children are taught to make useful trinkets to take home with them and perhaps bring as presents to their brothers and sisters.

Testing urine for sugar is a serious business for the young campers. They use a small test kit which requires only five drops of urine, ten drops of water and a reagent tablet. Each child determines his own sugar level according to the colour change that takes place. If the sugar level goes up he reports it to the medical staff. These tests are done four times a day.

The children are taught to test their urine four times daily using the Clinitest method for glucose and using the Acetest method for ketones (compounds containing the carbonyl group, like acetone). They are taught to test their urine to make sure that it contains a little glucose most of the time. It is made clear to them that it is not wise for the child diabetic to be glucose free at all times. This is emphasized at the bed-time testing. In fact, no child is allowed to go to sleep if, after his bed-time snack, his testing is still negative for glucose, in which case he receives an additional snack. The child should understand the importance of not being sugar free at all times in order to prevent reaction caused by a low blood sugar level by day or night.

Every learning experience at Camp Glyndon can be enjoyable. Whenever a child has learned to measure and take his own insulin, each one of his bunk companions receives a special gift.

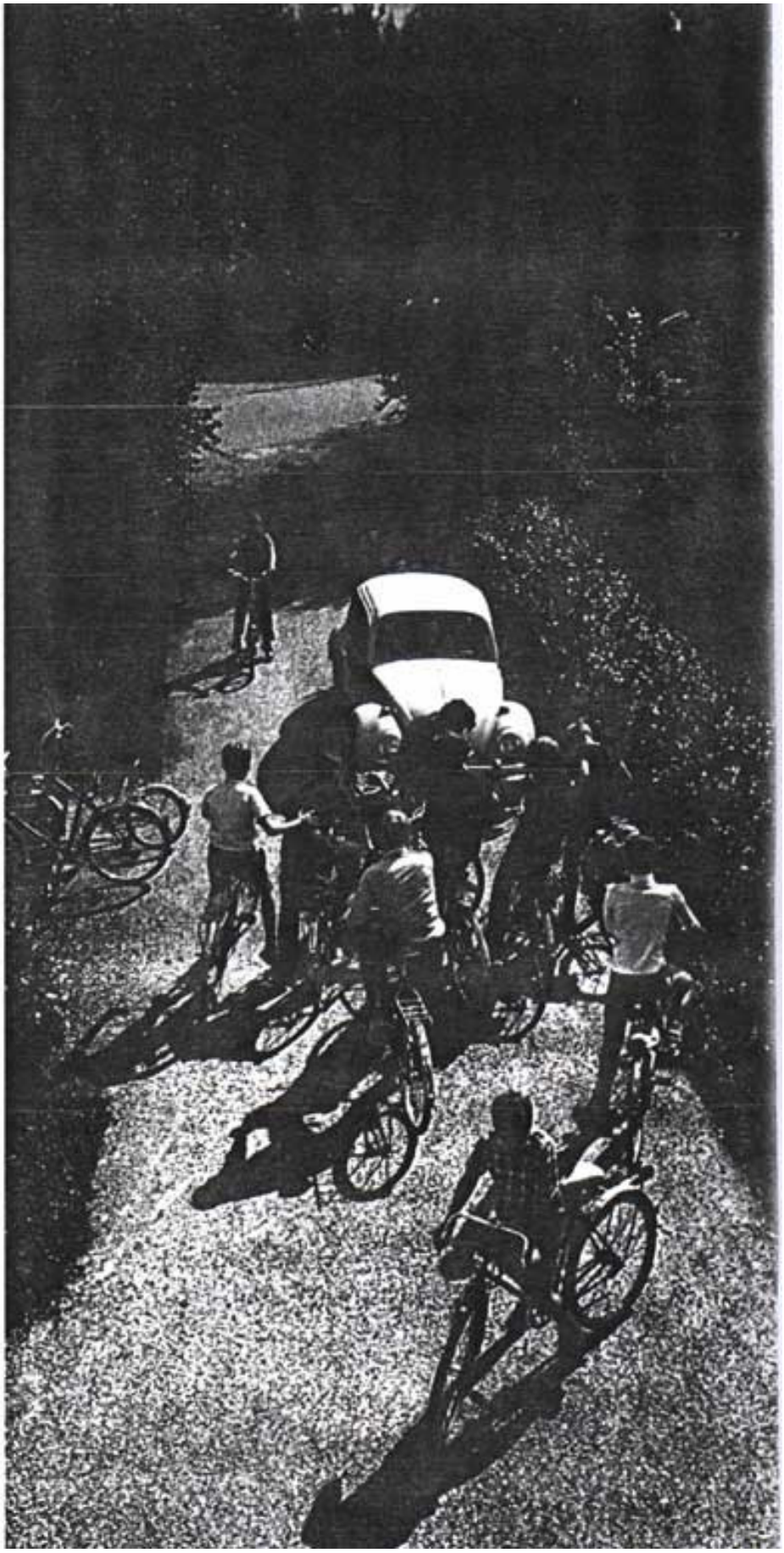
Dietician on hand

Our dietician is present at all meals and always has a few words of explanation about the food served. Camp Glyndon menus contain many of the foods that the child will get at home or in a restaurant, with a thorough explanation of how to measure them and fit them into the diet. Such "difficult" foods as spaghetti and meat sauce, beef stew and chow-mein are often included in camp menus.

The camp is fortunate in receiving assistance from County, State and City Health Departments personnel and from the Maryland Dairy Council who participate in daily instruction during health conferences; this is what we call "teaching at Glyndon". Classes are held every afternoon from Monday to Friday. We are likewise fortunate in having many local clubs come to our camp by invitation to entertain the children each night after supper.

Camp Glyndon was started in Maryland about 12 years ago and today we have many alumni of our camp working in all fields of activity, re-visiting us as pharmacists, school teachers, engineers, registered nurses, medical school students, lawyers, carpenters, plumbers and electricians, all healthy, self-sufficient and happy people. ■

In Germany also there are camps for diabetic children, for example the Hinrichssegen Home in Bavaria shown on the cover. First started as a holiday camp for diabetics, it soon became a permanent institution for three different kinds of problem patients—those from big families where a special diet is difficult to manage, those who are unusually backward at school, and those in whom the disease is liable to rapid fluctuations and requires constant medical supervision. The boys, whose ages go from 8 to 18, remain at the home for several years. They quickly gain weight, height and vitality.
Cycling is popular not only for going to school in neighbouring communities but also for summer outings. Fun has a place in therapy.



showing the way

by Dr G. Kurow *

I was twelve years of age when a cut chin of mine which refused to heal filled my parents with alarm. In a lad of that age, this was something frighteningly unnatural. They had already noticed other things. I seemed to be wasting away, I was always hungry, always thirsty. The family doctor was summoned.

His diagnosis was unhesitating. I had diabetes.

Years later, my parents told me that the doctor had at the same time seriously urged them to have another child if possible. That was in 1933, twelve years after the discovery of insulin, when a young diabetic was not expected to survive for more than ten years. The news came as such a shock that my parents resolved to enlist every means known to science to prolong the life of a young diabetic.

The year which followed seemed to bear out the doctor's worst fears. I stopped growing and had to stay away from school. My diet (the usual one in those days, very rich in fats, poor in carbohydrates and deficient in protein) gave me no resistance. I had only to catch the slightest cold for the sugar and acetone content of the urine to rise to the point where I had to be put into hospital.

When my sugar metabolism, if not my general condition, began to improve, I had the good fortune to be examined by a doctor from Berlin who had just done a course under Dr Joslin in the United States. He quickly put me on a regimen which was quite new at that time. I was no longer warned to conserve all my strength, to avoid all physical or mental effort. Instead, a rich protein diet was prescribed, the nature of the disease was carefully explained to me down to the minutest detail, I was shown how to test urine and to keep a daily record of the result and of my daily food intake. This was the treatment pioneered at the beginning of the century by the German diabetes specialist, Sandmeyer.

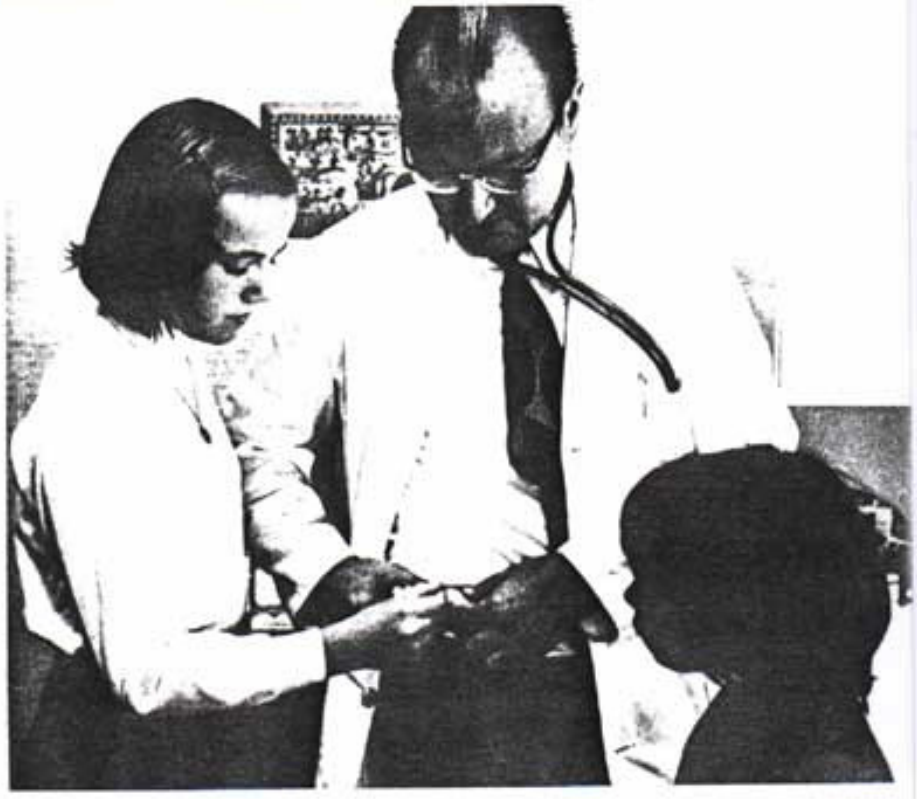
A wonderful feeling

We did not have to wait long to see the effect of these changes. I began to grow again and to put on weight. I recaptured some interest in my schoolwork. Mental apathy disappeared, physical energy flowed back. It was a wonderful feeling. Gone was the sense of isolation, the knowledge that I was the "invalid" in the circle of healthy young men where I wanted more than anything else to be admitted as an equal, gone the need to accept their pity. Only someone who has lived through all this can fully understand how much it means.

G. Katsch, the grand old man of German diabetology, declared that the diabetic enjoyed "practically normal health". There is a germ of truth in this assertion, but it errs on the side of optimism. It certainly should not be applied to diabetic children or young people, even when they enjoy the best of living conditions in the most favourable environment.

I suppose it was the constant preoccupation with my health as a child that awakened in me the ambition to become a doctor. I dreamed that some day I would help to solve the problem of the cause of diabetes. I was encouraged in this resolve by an observation of Joslin's to the effect that diabetic doctors have the longest lives of all members of the profession. I have not yet penetrated the secret of diabetes,

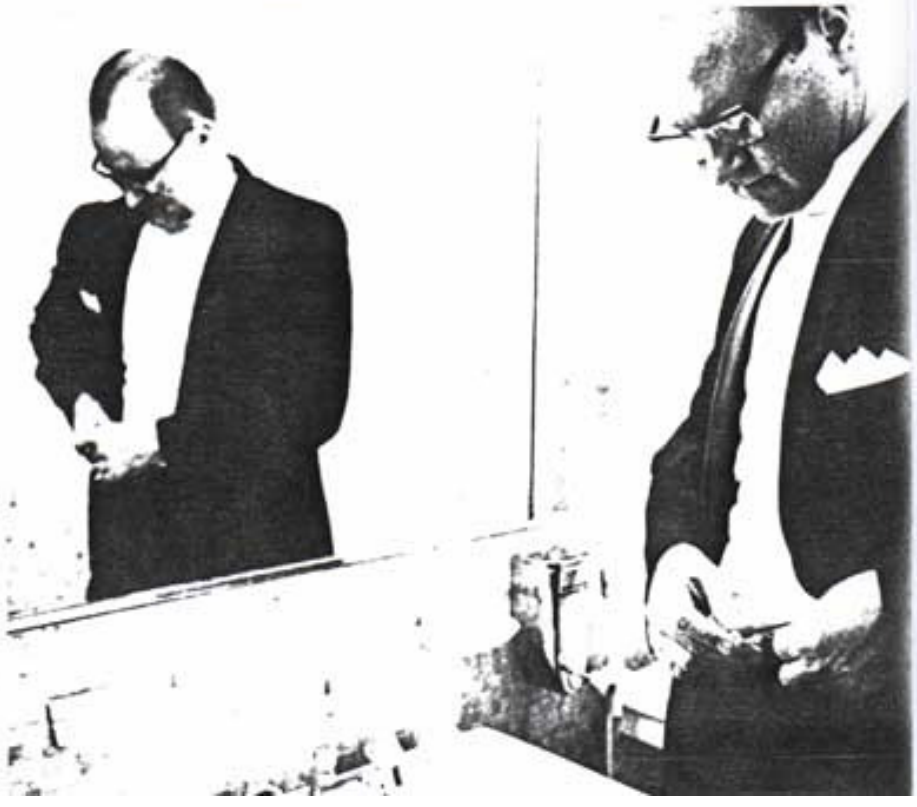
* General practitioner



Children are easily shown how to draw up insulin in the syringe in order to prepare an injection. However, they are often reluctant at first to use the needle. Dr Kurow tells them: "I will show you, it doesn't hurt. Just shoot it into me." When they see how casual the doctor is they feel reassured.

young patients, forced to inject insulin into themselves for the rest of their lives. In the beginning, the fear of the syringe can assume grotesque proportions, at times even driving them to toy with the idea of suicide. In these cases, I am in a position to perform a simple demonstration which deeply impresses the patient: I give myself an injection in front of him. The fear of the pain caused by the prick, which the fine needles used today renders barely noticeable, soon vanishes. And I generally manage to overcome the young patient's final resistance when I drop the remark that I am still alive after injecting myself something like 28,000 times in the course of my 38 years as a diabetic.

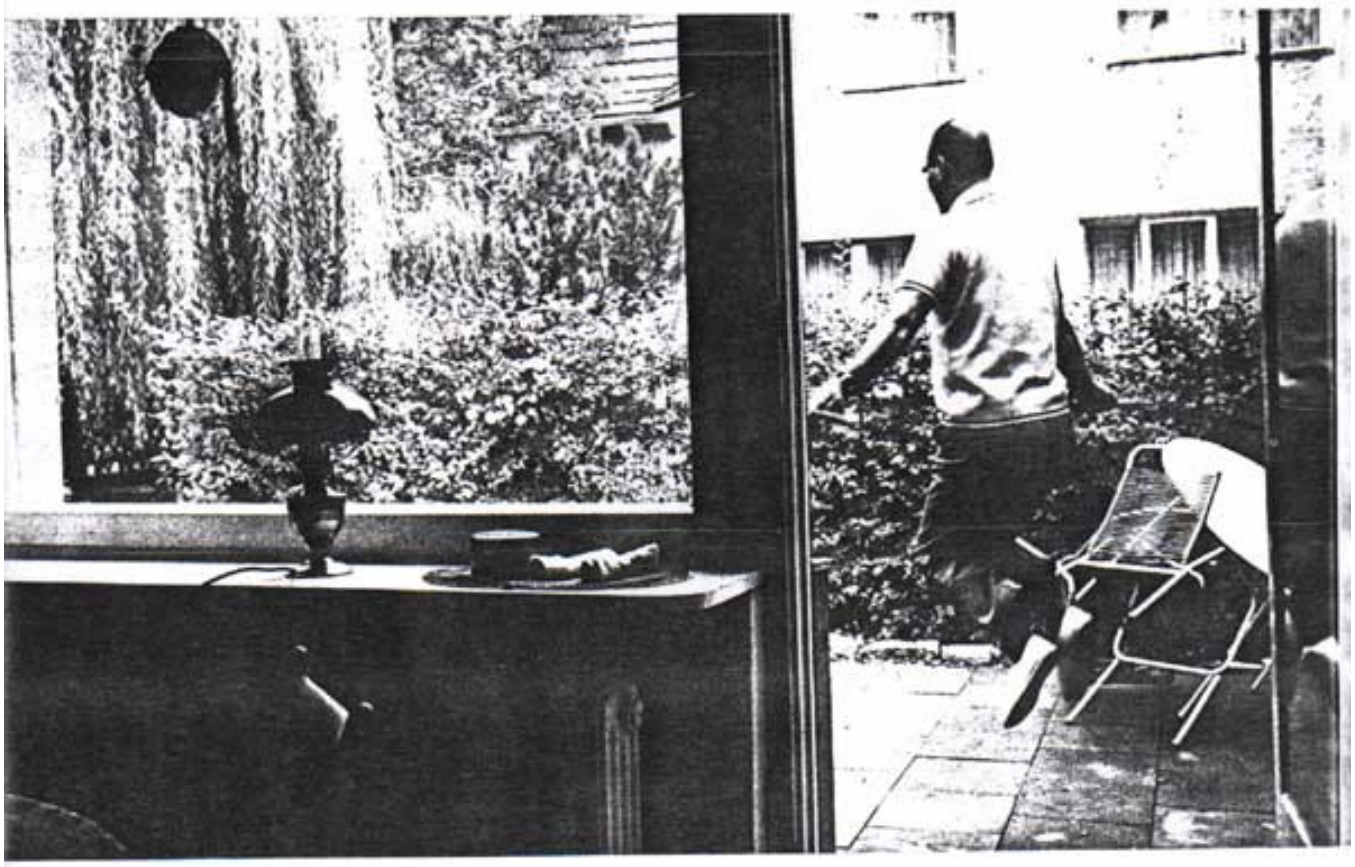
I devote the greater part of my consultations to giving advice, experience having proved that wise counsel can have a decisive influence. According to international experts who have studied diabetic cases for nearly fifty years, the patient's chances of survival are very greatly strengthened if only he will conscientiously follow the recognized drill: correct diet, adequate exercise, insulin, with or without tablets. This observation applies particularly in the ten to fifteen years following the discovery of the disease.



△ *Dr Kurow and his wife are both diabetics. They are seen in a special restaurant and pastry shop which caters for diabetics. With the menu comes a list showing the caloric content of each item.*

The doctor stresses that regularity is an important part of keeping fit. "No matter where you are, even at a formal dinner party," he says, "you can always find a spare moment to give yourself a shot." ▷

◁ *Part of the doctor's work is to give good advice about diet. Here he is using plastic models of food and indicates their caloric content.*



What conclusion should one draw from this? Personally, I endeavour above all to make practical recommendations which the patient is able to understand. These are hardly mentioned in the textbooks. One point on which I always insist is that as far as possible the food and the way of life of the entire family should be adapted to the needs of the diabetic.

Our most effective weapon against diabetes is diet, regardless of the patient's age or the particular form of the disease. I never tire of pointing out that the diet recommended for all people today—strong in protein, weak in fats, not very rich in carbohydrates and of low calorie content—is pretty nearly exactly the diet prescribed for the diabetic. The latter quickly learns the very easily acquired art of substituting alternative items for the foods prescribed in his diet, and so there is no reason why he should ever deprive himself of appetizing meals. In a good restaurant, for example, he will always find some items on the menu which give him what he needs so he is not obliged to order specially prepared dishes.

Beyond a certain age, people do not readily accept a change of diet. Lists of prohibited foods, in particular, are bad psychology, in my experience. In my waiting room I display a number of approved menus in a glass case. These enable the patients to see at a glance the manner in which their meals can be made up. I have also noticed that the instruction of diabetics goes much better if it is given in small groups of three to twelve persons. This gives the patients the opportunity to get to know each other and to exchange experience. It also has the valuable effect of putting paid to fantastic stories of miraculous remedies for the disease!

Thousands benefit

If diet instruction is carried out in an organized manner, it leads to remarkable results. In support of this statement one need only cite the fact that 4,200 diabetics have been instructed by 70 doctors in the span of two and a half years, with the assistance of a single dietician.

My patients, who generally have thoroughly mastered their lessons, have no difficulty at all in keeping to their diet when they travel. However, I forbid journeys to the tropics because of the risk of febrile diarrhoea, which can rapidly lead to a coma. Each time I have occasion to do so, I insist on the need to keep up the insulin injection in cases of fever and loss of appetite, even in the absence of food.

It is desirable that diabetics should pass their holidays or times of rest in places that are within reach of medical institutions possessing the necessary facilities to treat diabetic complications. The German Diabetes Association has helped to meet this need by starting a rest home open to all diabetics above a certain age.

Physical exercise is an essential element in the treatment of diabetes, yet experience shows that it is commonly neglected. Chronic illnesses tend to induce lethargy, particularly in the case of the old and the corpulent. To combat circulatory troubles and in cases where the patients will not or cannot be persuaded to walk, I advise them to practise rising on the tips of the toes as frequently as possible. I try to persuade patients who are in particular need of some such activity to buy a stationary

Every morning begins with exercises for the doctor. He follows the advice he gives to his own patients.
For long distances an automobile is indispensable, but the doctor likes to take his folding bike along to get exercise whenever possible.

pedal bicycle. Young patients I advise to take up sports suitable for their age, physical capacity and metabolic condition.

My own favourite exercise is water-bicycling. When I was young, I took part in sporting events on several occasions. Now that I am working eight to ten hours a day, I have little time left for sport, but I still do my exercises when I rise in the morning; in particular I like to put in some rope-skipping on the terrace. I guard against the danger of glucose deficiency by carrying a lump of barley-sugar and some toffees in the pockets of all my clothes—which incidentally allows me on occasions to enjoy little titbits which would otherwise be forbidden. Drawing on personal experience, I strongly recommend diabetics who take insulin to have a light meal *before* making any physical effort.

There is a test question I often try out in my discussion sessions. Suppose the diabetic is invited to an evening out which prevents him taking his dinner and having his injection at the proper time: what should he do? The usual answer is that he should take his insulin and eat something later on. This is wrong. The right answer is to bring forward the time of the injection so that he can take a meal before going out. I always found it paid to follow this rule. It should not be forgotten that dancing calls for considerable physical effort.

During my afternoon consultations, patients often seek advice on the way to avoid being handicapped in their careers. They feel that their condition as diabetics is an impediment. While this is a social rather than a medical problem, they rely on my help to overcome the discrimination, real or imaginary, from which they believe they suffer.

Employment and marriage

Where it exists, this discrimination is not just prejudice. It is a fact that a minority of diabetics take little or no care of themselves and so are absent from work more frequently than other employees. These persons are partly responsible for difficulties in employment which unfairly harm the majority; for statistics show that sick leave among diabetics does not, in fact, exceed the average.

In a case with serious complications, a change of occupation may become unavoidable. It is therefore important to guide young patients towards careers compatible with their state of health.

Since heredity represents such an important element in diabetes, it is vital that those about to marry take this into consideration. If one of the partners is diabetic it would be a good idea to seek genetic counselling before marriage in order to lessen the risk of bringing diabetic offspring into the world. The risk would be minimized if one of the couple had no record on either the father or the mother's side of diabetes or of children abnormally heavy at birth.

Other than eye and kidney complications, it is well known that all kinds of infection present a grave threat to the diabetic. One can combat this danger by vaccination, for example, against virus infections. For several years, with hardly any exceptions, I have inoculated all my patients twice a year against influenza. During the winter epidemic of 1969-70, I had fatal cases only among the very few who had not been vaccinated. ■

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...in the job each day

by Dr J. P. Michard *

Before the discovery of insulin, it was common for workers suffering from diabetes to try to conceal the fact. This was not because diabetes was thought to be contagious or was one of the diseases incurring a social stigma, but simply because employers tended to discriminate against workers having a diabetic condition. Today, in France, this type of discrimination is on its way out in industry and is becoming increasingly rare among administrative and clerical staffs.

Occupational health work played a major part in the detection of tuberculosis, and can have decisive influence in the field of diabetes because of the many opportunities for case-finding. First comes the examination of an applicant for employment, when a file can be opened containing the answers given in the interview; this will be followed by medical examinations at regular intervals (in France, once a year for salaried workers), supplemented by more frequent supervision in occupations where that is required by law or the worker's condition.

The weapons at the doctor's disposal are simple enough, but really quite adequate: job interview and urine examination.

The job interview may reveal the classic diabetic symptoms which, however, are in practice fairly uncommon – thirst, excessive quantities of urine, unnatural tiredness. At the same time, where the symptoms do not apparently exist, the interview has the great advantage of allowing the doctor to question the applicant about his family antecedents and thus to identify subjects who present a diabetic risk. These persons include:

— the identical twin of a diabetic;

— a person whose parents are both diabetic;

— a person one of whose parents is a diabetic and the other someone in whose family diabetes has appeared;

— a woman who has given birth to a child weighing more than 4.5 kg. (in Europe, this figure could well be lowered).

Theoretically, it should be easy to obtain this information which is not very complicated. Experience shows, however, that, in about 50 per cent of cases, the second and third questions elicit only vague replies. It is important, none the less, that these questions be answered in every medical file today, even when the information does not call for immediate medical action.

Urine tests must be included in every medical examination of the worker. Not long ago, these tests entailed the use of many test tubes, a spirit lamp or Bunsen burner, and considerable quantities of reagents. Today, one can obtain reagents in the form of tablets or strips of impregnated paper that give instant results.

It has become customary to check the sugar content of the urine from a specimen brought in by the patient, generally obtained after passing water on awakening. This practice entails two risks. The patient may use a bottle which has contained a sweet liquid and has been badly rinsed out, retaining traces of sugar. Secondly, a number of genuine diabetics reveal sugar in the urine very irregularly, often only after a meal rich in carbohydrates. It is better therefore to arrange for the specimen to be taken at the clinic, after the midday meal.

The interview, routinely conducted as part of the recruitment procedure, together with urine tests repeated at all the examinations required by labour legislation, are thus the two basic means for detecting diabetes in the occupational setting.

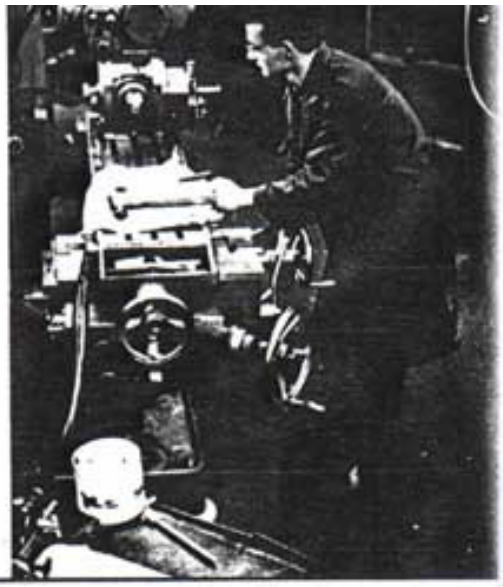
Starting with the result of these two basic tests, the doctor identifies the patients for whom, statistically, a definite possibility of contracting the disease exists, either because they belong to one of the high risk groups last mentioned – although their urine was sugar-free – or because they passed sugar with the urine, if only once, even though there was nothing alarming in their family background according to the interview. If both danger signals are present, diabetes is virtually a foregone conclusion.

In either case, the examination must be taken further. Most often, the presumed diabetic will then be advised to consult his general practitioner, who will have been discreetly alerted in advance. In France, once clear symptoms have been detected, subsequent examinations are covered by social security.

These examinations cover the sugar content of the urine over a 24-hour period and the blood sugar level tested on an empty stomach. If the latter exceeds 1.3 grams and there is clear indication of sugar in the urine, then we have a clear case of diabetes.

Should these examinations prove inconclusive, an oral glucose tolerance test should be given in which the person drinks a liquid containing sugar and then the quantity of his blood sugar is measured. This is the only way to discover diabetes that presents no obvious symptoms. Unfortunately, this form of diabetes is the most common. The incidence of diabetes among the obese or those who have been overweight at one time or another is so frequent that their blood sugar content

* Physician employed by the French National Railways (SNCF).



This diabetic worker in a Paris factory does high precision work; he is never far away from his supply of sugar (left foreground) because lack of sugar in the cells can produce extreme fatigue and eventually coma.

should be tested even in the absence of other symptoms or a suspicious family history.

These, then, are the simple techniques which enable occupational medicine to discover unsuspected cases of diabetes, or cases which may, in fact, be suspected by the applicant for employment but are concealed either from fear of not obtaining the position—the old anxieties still persist—or because the patient has not kept up treatment, diet and attendance for regular supervision.

This second situation is common. It shows how very important it is for the doctor, even when everything is going smoothly, to have regular contact with the patient at reasonably short intervals in order to give the patient the psychological support he needs to make him accept constraints of indefinite duration.

The works doctor is in a good position to keep the diabetic under observation. For his services to be used to best advantage, it is important that he be exactly informed of the history and development of the case, of the diet prescribed and the method of treatment. This implies contact with the patient's physician or with the specialized institution which is in charge of the case.

Supervision is a matter of simple clinical tests and of checking on the organs likely to be affected by complications of the disease:

— *weight:* the overweight diabetic must slim;

— *the arteries:* it is important to take the pulse in the limbs regularly;

— *the skin:* one must confirm the absence of eczema infections, however slight or commonplace;

— *the eyes:* it is a good rule to insist that a thorough examination of the eyes be made at regular intervals and to send the patient to a specialist in the event of optical trouble or visual fatigue.

Supervision also includes regular urine tests, easily carried out, which enable the doctor:

— to follow the disappearance or the reappearance of sugar and to advise on the required daily routine;

— to watch for signs of albumin, the appearance of which forebodes kidney complications;

— in the case of a clinically diagnosed and confirmed diabetic, to watch for the appearance of ketones or sugar residues.

Finally, it is his responsibility to detect the onset of blood sugar deficiency, which is at the bottom of most of the difficulties affecting the diabetic's working capacity. The rise in the reported incidence of disorders from this cause is due to the actual increased number of patients and not to the fact that the illness is now more often recognized and treated.

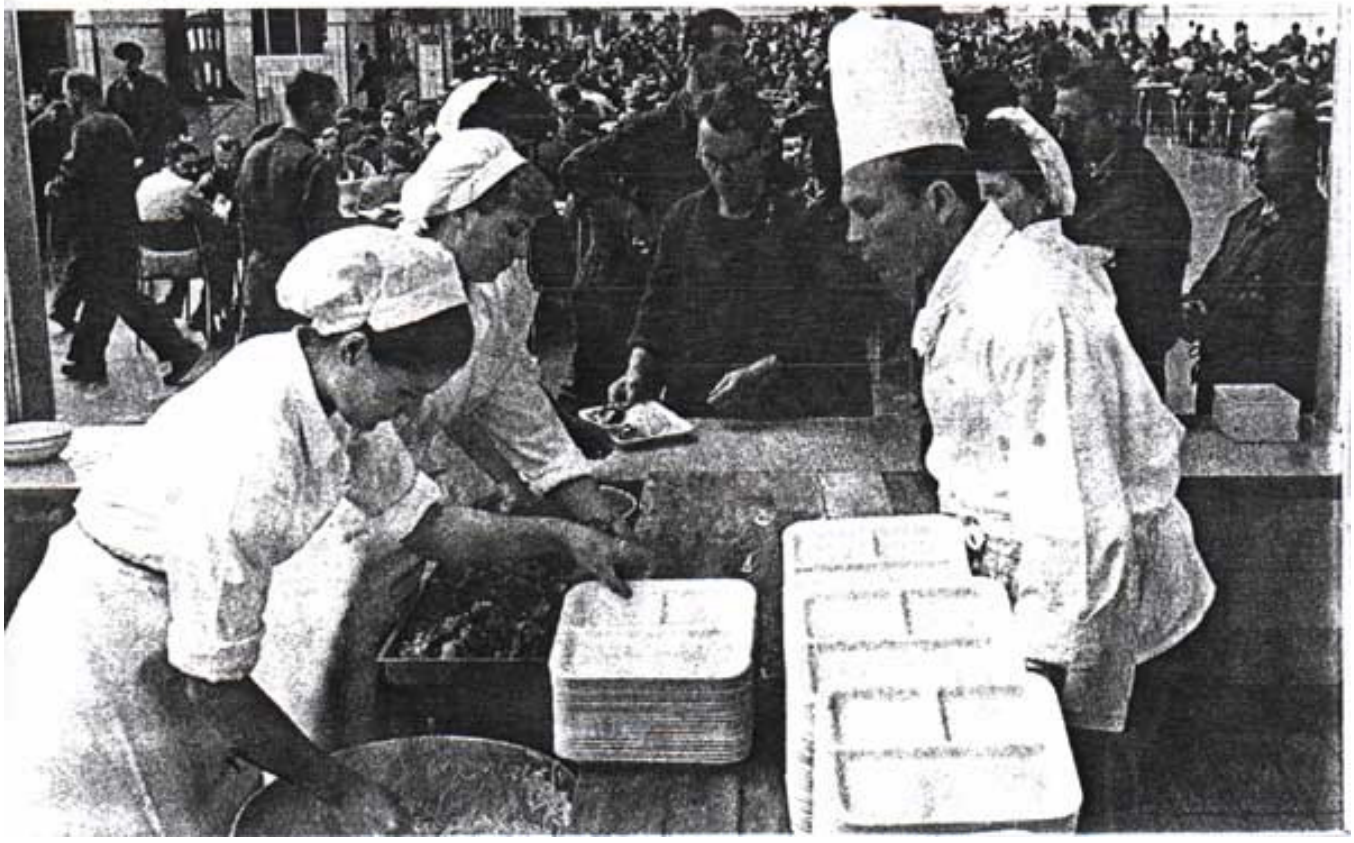
The works doctor will uncover many diabetics. It is clearly his duty to indicate precisely the patient's capacity for work and to explain this to the person affected.

Overall working capacity is seldom diminished, and then only in certain clearly defined cases. These may be grouped under two headings:

1. The unstable *insulin-dependent diabetic*. This patient is characterized by the need for high doses of insulin injected frequently, by frequent changes in insulin sugar balance, production of ketones and faintness brought on by blood sugar deficiency, which can effectively bar regular activity. Such patients are rare and can be given personal attention in every case as well as special conditions of employment, normally taking the form of work of a more or less protected nature.

2. The often neglected *advanced diabetic*. The disease here is aggravated by some complications associated with the aging process, which incapacitate the patient and often occur together—ocular,

It may be difficult for diabetic workers to adjust their diet to the food served in canteens.



arterial or nervous disorders. Early diagnosis and regular supervision are tending to reduce the incidence of such cases. It is often difficult to find suitable occupations for these patients, many of whom are over 50 years of age.

Our first-hand experience at the French railways, going back some 20 years, shows that progressive incapacity is exceptional among patients who have followed the rules. On the other hand, among the weak-willed and the obstinate, difficulties are more frequent and generally lead to early retirement.

It is obvious that, for all types of diabetics, proper treatment calls for adjusting the patient's work to the disease.

Canteen problems

For most patients, the chief practical problem is diet. It has to be limited in calories and fats in order to keep weight down to normal, but contain a modest fixed quantity of carbohydrates. Yet it is becoming more and more customary for workers to take at least their midday meal from a communal kitchen serving a restaurant or workshop canteen. The menus are generally ill-suited to the diabetic; they tend to be too rich in starches, pork products, sauces and fried dishes. This serious problem affects not only the diabetic but is associated with obesity which has become so widespread in our industrial civilization. In France, an estimated 20 per cent of the working population are overweight, i.e. their weight exceeds theoretical norms, for example those established by life insurance companies.

In a few work places, it is possible to obtain a simple diet. Most often, however, the doctor is obliged to advise the patient to eat at home if he can do so, or, failing that, to take a packed lunch with him to work.

The problem becomes more complicated when the patient is constantly travelling, as in the case of many railway workers. These men very often snatch quick meals of bread, sausage, ham, fish and fatty cheeses. In such cases the doctor should ask for the patient to be transferred to a sedentary job. These are only some of the many practical difficulties which underline the importance of the doctor's work in connection with industrial canteens and restaurants.

During the time the diabetic is under medical treatment by means of insulin or tablets for blood sugar deficiency, certain simple rules must be observed:

His work must follow a fixed timetable, so that he may unfailingly take his meals and his treatment at the prescribed times. Shift work, if the work teams rotate, continually disorganizes these health measures and is to be avoided.

In the absence of fuller studies, night work also would be best left alone. It seems unlikely that the diabetic would easily adapt to this very unnatural life rhythm.

The work load must be approximately stable. Unexpected overwork, and unaccustomed physical effort are liable to upset the body's equilibrium.

A worker known to be susceptible to blood sugar deficiency, and, even more, one likely to suffer dizziness resulting from that condition, should obviously be excluded from any occupation entailing the slightest safety hazard; for example, driving vehicles or moving cranes, overhead work, work on dangerous machines without automatic safety devices, and so on.

Notwithstanding these minor constraints, the range of work a confirmed diabetic under treatment can do is very wide. The diabetic's basic ability to work, and his enjoyment of a normal working and social life, are not seriously threatened. ■

Diabetes mellitus — Trend of death rates per 100 000 population

Country	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Australia	12.9	11.9	11.3	11.1	11.6	12.3	12.5	12.3	13.2	13.0	14.2	13.9	16.2
Colombia	3.3	3.6	4.3	4.5	5.0	5.1	5.3	5.5	5.0	5.7	5.6	6.4	–
England and Wales	7.3	7.0	7.3	7.0	7.8	8.4	8.2	8.1	8.3	8.8	8.9	8.7	9.5
Finland	6.0	8.7	9.8	11.2	9.4	9.2	9.3	10.2	12.1	12.4	13.2	12.2	13.2
France	12.7	12.1	12.1	11.5	12.2	12.5	13.9	15.6	15.8	17.0	17.3	18.0	16.7
Germany (Fed. Rep.)	11.8	11.9	11.8	12.5	13.9	13.3	14.5	15.7	14.5	16.3	17.9	18.1	–
Hungary	6.7	7.4	6.9	7.1	7.9	7.6	9.5	9.2	8.4	8.6	10.0	9.8	9.5
Italy	11.8	12.3	10.7	12.2	12.6	13.2	16.1	16.8	16.5	17.8	18.1	20.1	–
Japan	2.8	3.0	2.9	3.0	3.4	3.7	4.0	4.1	4.7	5.2	5.8	6.1	6.4
Netherlands	12.7	13.8	14.5	15.2	15.1	14.1	14.1	15.1	14.8	15.0	17.1	17.5	18.0
Sweden	10.1	11.3	10.9	12.6	13.7	14.4	14.5	15.0	16.0	17.2	17.4	18.6	18.6
Switzerland	13.9	12.6	12.4	14.0	13.6	15.7	19.1	20.4	18.7	18.0	18.6	21.2	20.4
United States of America	15.7	16.0	15.9	15.9	16.7	16.4	16.8	17.2	16.9	17.1	17.7	17.7	19.2

This chart shows that mortality as a result of diabetes is increasing everywhere and to a significant extent in certain countries such as Colombia, Finland, Japan and Italy. The increase is due to a variety of reasons, in particular the rising standard of living, food habits, the increase in the life span, the appearance of diabetes later in life and, finally, better methods of detection.
Any comparison between countries should be done with extreme prudence because of different diagnostic practices.
Source: World Health Statistics Annual, WHO, 1970 and preceding years.

around the world

Only a few drops of water, but so precious (Kenya).

Water for everyone

We cannot live without water. Those of us who have always had it just by turning on a tap, and think nothing of pouring out gallons for a bath, rarely stop to reflect that it is the very basis of our society. In other parts of the world, however, the story is very different. WHO estimates that in developing countries only 10 per cent of the population in rural areas have safe water conveniently available—the other 90 per cent have to find their own water where they can. Even in urban areas in these countries only a third of the population have piped water in the house or in a courtyard outside; another third have at least a communal tap in the street, but the remaining third have nothing.

Where water is scarce, getting it becomes a vital operation. Most of a housewife's day may be spent in fetching a few litres at a time from a distant river. Water must be carefully rationed and there is no way to maintain good standards of personal or domestic cleanliness. In such conditions the whole family is in constant danger of ill health. Diarrhoeal diseases are prevalent and pass with lightning rapidity from one person to another. The highest cause of death in some countries is gastritis and enteritis: there is a direct link between these deaths and lack of sanitary facilities. Water plays a predominant role in the transmission of infections such as typhoid and paratyphoid fevers, bacillary dysentery and cholera, and an indirect role in the transmission of many others.

Without the provision of safe water, little progress can be made against disease. In WHO's experience, the larger the quantity and the better the quality of water, the more rapid and extensive is the advance of public health. Since effective treatment of water began, cholera has been eliminated from most countries, and typhoid is

rapidly following. Countries where health programmes have been accompanied by the setting up of water supply schemes have invariably improved their economic position.

Nowadays, more and more governments in the developing countries realize that a safe water supply is essential to the economic and social well-being of their peoples, and financial assistance for water schemes is increasing. WHO tries to see that these funds are used so that the most people will be aided in the minimum of time. Its assistance includes sending advisory staff and short-term consultants, pre-investment surveys, fellowships, and training activities.

To cope with the problems arising out of population expansion and urbanization, WHO has begun a research and development programme in community water supply. The focal point of the programme will be an international reference centre, which will have a reference library of current literature and translation facilities. Collaborating institutions in each country will send the centre details of their progress in research projects which may be of use to others, and will be able to ask for advice and information. Such exchanges will prevent duplication of effort and save money. Collaborating institutions will keep abreast of technical developments and new problems. They will try to solve their own country's water problems by improving methods, reducing costs, experimenting with new techniques and adapting methods that have proved successful elsewhere. Poorer countries need to find techniques that can be applied locally and develop machines that can be made locally; the same applies to the development of chemicals and other materials that could be substituted for imports.

In the developed countries, more sophisticated technology is now being applied to the problem of toxins, carcinogens, radioactive wastes and other pollutants. Yet, for every scientist involved in such work there are hundreds of others producing new substances, new wastes and new problems; pollution of the environment is reaching huge proportions and, like many rivers and lakes which carry it, knows no frontiers. Concerted action alone can overcome the obstacles preventing us from reaching our important objective—the provision of safe and ample water to all, with the ultimate goal of a better and healthier life.

The meningitis belt

Seven countries in Africa experienced severe outbreaks of cerebrospinal meningitis in the first six months of 1970, with over 41,000 cases and 3,500 deaths. The countries affected—Chad, Dahomey, Mali, Niger, Nigeria, Senegal and Upper Volta—share a common geographical factor. They are grouped in what is known as the "meningitis belt", an area of some 600 kilometres in depth which extends for about 3,000 kilometres from west to east.

The recent outbreaks involved twice as many cases as in the same period of 1969, and there were nearly four times as many deaths.

Meningitis is treated with sulphonamides, which are extremely effective against the organism that produces the disease. WHO provided supplies of these drugs to help curb the recent outbreaks. Scientists have now developed a vaccine against cerebrospinal meningitis, and clinical trials of it are already in progress in Upper Volta and Mali, and will soon begin in Nigeria.

Society, stress and disease

When man becomes maladjusted to his physical, social and psychological environment, the blame is usually placed on the "human factor". Implicit in such criticism is the idea that the human organism, evolved more than 500,000 years ago, is now outmoded.

A number of studies as well as experiments during the last three decades, however, suggest that various environmental influences in to-day's highly industrialized urban societies are of pathogenic significance. In general, the hypotheses imply that man's old adaptation patterns, preparing the organism for fight and flight, have become inadequate and even harmful.

The University of Uppsala, Sweden, and the World Health Organization are sponsoring a series of five international multidisciplinary symposia on various social and medical aspects of "Society, Stress and Disease". The President of the series is Professor Torgny Segerstedt, Ph.D., Rector Magnificus of Uppsala University, and the Secretary General, Dr Lennart Levi, Head of the Laboratory for Clinical Stress Research at the Karolinska Institute, Stockholm, Sweden.

The originator of the stress concept, the Canadian professor of biology, Hans Selye, reported on what led him in 1936 to define the concept of stress.

Even during prehistoric times, man must have felt that heavy work, cold, heat, loss of blood, severe fright, diseases and other forms of strain were followed by exhaustion. As a young medical student, Selye wondered why very different diseases could cause rather similar symptoms. He exposed rats to a variety of noxious influences (stressors) and always found a similar biological reaction pattern (stress). Thus, in spite of the very different stressors to which the animals were exposed, there were great similarities in the reactions. These non-specific reactions to 11 types of influences were termed "stress". Several later series of experiments showed that suitable drug treatment made the test animals more—or less—receptive to stress. This approach is now being tried among human beings in an effort to prevent myocardial infarction in certain high-risk groups of patients through a combination of diet and drugs. ■

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