The following is a chapter from the book *Diet Prevents Polio* written by Benjamin P. Sandler, M.D., and published in 1951, at the height of the polio epidemic. Dr. Sandler received his degree in medicine at New York University in 1931. He interned at Morrisania city hospital in the Bronx, New York and later was on the staff there as well as Polyclinic and Montefiore hospitals in New York City. From July, 1941, until February, 1947, he was in the U. S. naval medical corps, attaining the rank of commander.
He has done considerable research in polio and the relationship between diet and disease. He has published six papers on the latter subject, as well as papers on other medical subjects including research on glucose and tuberculosis. His research includes a period assisting the research staff at Willard Parker hospital in New York City during the epidemic there in 1931, and independent research later, when he "gave" polio to a rhesus monkey, transmitted it to a rabbit, and then to another monkey.

Diet Prevents Polio
by Benjamin P. Sandler, M.D., and published in 1951
by the Lee Foundation for Nutritional Research, Milwaukee, WI

Chapter 2: Low Blood Sugar and Susceptibility to Polio

During my research I observed a large number of patients who had symptoms that were caused by low blood sugar.

They complained of the symptoms previously described, namely:

- headache
- dizziness
- weakness
- fatigue
- abdominal pain
- nervousness
- palpitation
- frequent sweats
- occasional fainting spells

Most of these patients were malnourished, which, physiologically, meant subnormal liver glycogen storage. **Their diet was deficient in protein and consisted largely of the cheaper starchy foods.**

I noted that **these patients also had poor resistance to infections** such as colds, sore throat, grippe, influenza, bronchitis, and pneumonia. **By increasing the protein content of their diet and by reducing the sugar and starch content, they improved considerably.** They became stronger, more vigorous and buoyant, and had fewer infections.

A few of these patients had had polio in childhood. Observations of these patients over a long period of time led me to suspect that **their susceptibility to infection was possibly due to their poor diet with its high sugar and starch content**.

Their increased resistance to infection with a better diet confirmed this suspicion. It then occurred to me that their susceptibility to polio could be explained on a similar dietary basis.

Specifically, **I suspected that children and adults contracted polio because of low blood sugar brought on by a diet containing sugar and starch.**

I reasoned that the polio virus was able to cross tissue barriers, reach the brain and spinal cord, invade the nerve cells, damage or destroy them and cause paralysis. And I further reasoned that if the blood sugar never fell below 80 mg polio could never result.

I suspected that during a polio epidemic only those children and adults who experienced periods of low blood sugar would contract the disease and that those **individuals who were in actual contact with the virus but who maintained normal blood sugar levels would not contract the disease**.

Thus, it remained to prove that low blood sugar could be a factor in susceptibility to polio. And, after this had been proved, the following questions had to be answered:

- **What causes low blood sugar in humans?**
- **How can low blood sugar be prevented?**

The prevention of low blood sugar would thus mean the prevention of polio.

Before describing the experiments performed, I should like to make a preliminary summary and state without reserve that:

1. **Low blood sugar is a factor of susceptibility to polio.**
2. **Low blood sugar occurs frequently in children and adults and is caused chiefly by a dietary error, namely, the consumption of sugar and starch**
3. **Correction of this dietary error will prevent low blood sugar and thus prevent polio.**

An experimental method to prove that low blood sugar was a factor of susceptibility to polio was readily available.

In 1938, the only laboratory animal that could contract polio by experimental inoculation was the monkey.

All other laboratory animals were completely resistant to the polio virus. The rabbit is one of these resistant animals.

Without knowing the blood sugar range in the monkey and rabbit, it was suspected that the blood sugar in the monkey reached lower levels than in the rabbit.

These suspicions were found to have a basis in fact through the investigations of Drs. Jungeblut and Resnick of Columbia University who studied blood sugar levels in monkeys, and through the investigations of Drs. du Vigneaud and Karr of Cornell University who studied blood sugar levels in rabbits.

In monkeys, blood sugar values as low as 50 mg. were observed, whereas in the rabbit, values below 100 mg. were never observed. In numerous determinations made on rabbits I have never obtained values below 100 mg.

It was therefore concluded that the susceptibility of the monkey to the polio virus was due to the fact that its blood sugar fell to subnormal values, and that the resistance of the rabbit might be associated with the fact that its blood sugar never fell below 100 mg, and that at this concentration **cellular oxidation of glucose** in the nervous system and other organs would be maintained at such a level as to enable the cells to protect themselves against invasion by the virus.

Physiologists have stated that the normal blood sugar level of 80 mg. holds true for all mammals.

The next step was to **lower the blood sugar of the rabbit** to subnormal values with insulin injections, and then inoculate the rabbit with polio virus. **This was done and it was found that the rabbits became infected and developed the disease**.

The details of these experiments were published in the **American Journal of Pathology, January, 1941.**

Some rabbits showed signs of infection 8 to 10 hours after inoculation. I wish to stress this short period of incubation in the rabbit because it demonstrates that polio can develop in a short period of time. This is important, as we shall learn later, when we discuss the **onset of polio in humans within 24 hours after severe physical exertion.**

The rabbit is also resistant to the dog distemper virus. One of the largest research laboratories has conducted much research with this virus and when I informed the members of the staff about my success in inoculating rabbits with polio virus after

lowering the blood sugar, they inoculated rabbits with the dog distemper virus after insulin and reported to me that they observed signs of infection in the rabbit for the first time.

This corroborating experiment indicates that low blood sugar may cause susceptibility to many infections.

I was thus satisfied that low blood sugar was a factor of susceptibility to the polio virus in monkeys, and that rabbits could be rendered susceptible after their blood sugar was lowered with insulin

(Insulin, as you probably know, is the hormone which diabetics inject into themselves in order to keep their blood sugar within normal range. It is a quick-acting drug and can lower the blood sugar within an hour or so after injection).

I concluded that the concept that low blood sugar created susceptibility to polio in both monkeys and rabbits could be applied to humans as well.

What Causes Low Blood Sugar in Humans?

The next step in the solution of the polio problem was to find out the causes of low blood sugar in humans. Fortunately the answer to this problem was already at hand.

It has been found that the consumption of sugar and starch and foods containing these substances were the chief causes of low blood sugar.

When patients drank a solution of pure glucose they had a period of low blood sugar which began one to two hours after the glucose was taken and which lasted for one to two hours, and longer.

This study of the blood sugar is called the "glucose tolerance test" and is employed for the detection of hypoglycemia or hyperglycemia. When they ate a meal containing sugar and starch they also had periods of low blood sugar which came on an hour or so later and which lasted for from one to two hours.

The low blood sugar was more marked and lasted for a longer time after the glucose solution than after a meal containing starch.

It is an established fact that this paradoxic depressant effect on the blood sugar level is more readily exerted by sugar than it is by starches. I have observed these results in hundreds of cases and similar results have been obtained by other investigators.

It is a surprising paradox: the more sugar (and starch) you eat, the more likely you will develop low blood sugar.

Drs. E. P. McCullagh and C. R. K. Johnston have shown how the glucose tolerance test is readily influenced by diet. Thus the second problem: What can cause low blood sugar in the human? was solved.

How Can Low Blood Sugar be Prevented?

The third problem, "How can low blood sugar be prevented?" was the only one left and this, too, was readily solved.

It had been found by other investigators that a meal consisting of protein, fat, and carbohydrates, but with no sugar or starch, NEVER caused low blood sugar.

The addition of sugar and starch to such a meal could readily produce low blood sugar.

Thus I arrived at a simple formula for preventing polio: eliminate from the diet sugar and foods containing sugar, and reduce the consumption of foods containing starch.

Since eating sugar and starch during a meal may cause low blood sugar after one to three hours, and since elimination of sugar and starch prevents low blood sugar, the invasion of the body by the polio virus will be prevented by a diet containing no sugar and no starch. Protection against polio would thus begin on the very day such a diet was started and protection would last just as long as such a diet was adhered to.

I have found that a diet **completely free of sugar and starch** and consisting of **proteins, fats, and non-starchy vegetables**:

May be adhered to for years with beneficial effect and absolutely NO harmful effect.

There is NO supporting evidence to indicate that sugar and starch are necessary for health or for energy purposes.

The human is a carnivore and can thrive on protein and fat alone, if necessary.

The Eskimos thrive well on meat and fish which yield only protein and fat, and polio is unheard of among them.

American and European explorers in the Arctic regions have lived on meat and fish for as long as 18 months and have maintained perfect health all the time on such a diet. Vilhjalmur Stefansson, the Arctic explorer, has described his existence on such a diet in great detail. He states that he was in perfect health on such a diet which consisted of protein and fat alone.

Eskimos who live on meat and fish are not susceptible to infectious diseases. They do become susceptible when they live amongst white men and eat the white man’s diet with its sugar and starch. It is true that the Eskimo’s fresh contact with the white man exposes him to infectious diseases to which he (the Eskimo) has not had the opportunity to become immune.

The presence of sugar and starch in the Eskimo's new diet is of greater significance. A US public health officer stationed in Alaska has blamed this dietary factor for the great susceptibility of the Eskimo to tuberculosis.

A low carbohydrate meal elevates and stabilizes the blood sugar levels.

This stabilizing effect is important because some of the symptoms of low blood sugar are due to rapid fall in blood sugar level which accompany wide fluctuations in blood sugar levels following the ingestion of sugar and starch.