

Case 7

The Development of Insulin to Treat Diabetes

Carnegie Corporation of New York, 1916

Steven Schindler

Background. The discovery of insulin and its capability of restoring extremely ill diabetic patients to virtually normal health was a miracle of modern medicine in the early 1920s. Prior to that discovery, diabetic patients suffered under radical dietary restrictions and treatment regimes with little hope for recovery. Today, insulin can be taken for granted, but in the early part of the twentieth century, this life-giving substance had yet to be developed.¹¹⁰

Strategy. In 1916, the Carnegie Corporation of New York, still in its infancy, received a project proposal by Dr. Nathaniel Potter for a study of the treatment of diabetes. Dr. Potter noted in his proposal that diabetes had no known cure and could be managed only through strict dietary regimes. Unless a patient had means to receive ongoing treatment from a diabetes clinic, the patient would have to be taught to observe strict dietary rules that, in combination with the effect of the disease, often left the patient emaciated.¹¹¹ The essence of Dr. Potter's proposal was that research should be conducted at a laboratory of high quality near a clinic with diabetic patients. The Corporation trustees agreed to grant Dr. Potter \$7,500 annually, conditioned on his raising an additional \$20,000 himself in external funding.¹¹²

Potter began his research at the French Hospital in New York, but after a year, his own illness compelled him to move to a milder climate. He moved to Santa Barbara, California, where he believed he could continue effective research of diabetes. There, Cottage Hospital, whose trustees recognized the importance of Potter's research, funded the construction of a \$50,000 research laboratory adjoining the hospital. The Carnegie Corporation subsequently agreed to allow its grant to be redirected to the Cottage Hospital facility. After conducting research and treating diabetic patients for a short time, Potter died in 1919.¹¹³ Dr. William D. Sansum, a recognized metabolic researcher from Wisconsin, was recruited by the trustees of Cottage Hospital and the Potter Metabolic Clinic from his post at the University of Chicago to become Potter's successor as the Director of the Clinic. He agreed and promptly took up Potter's diabetes research.¹¹⁴

During this same period, Frederick G. Banting, a twenty-nine-year-old junior faculty member at the University of Western Ontario, also endeavored to discover more effective diabetes treatments. He conceived of his idea to extract insulin from the pancreas of dogs in 1920. While quite a bit of research on diabetes and its connection with the pancreas had already been published, the discovery of insulin remained elusive.¹¹⁵ Earlier in 1920, Dr. Moses Barron of the University of Minnesota published an article addressing the problem of extracting the insulin hormone without its first being destroyed by the stronger digestive hormone products of the pancreas, a problem that had long plagued researchers. Banting read that article and imagined his solution.¹¹⁶

Banting's colleagues encouraged him to seek research support and guidance from Dr. J.J.R. Macleod at the University of Toronto, a renowned researcher in the field of diabetes and metabolism. Banting traveled to Toronto in the fall and again over the Christmas holidays to ask Dr. Macleod for research space and assistance; he was rejected flatly each time. Finally, upon learning that Macleod would be vacationing in Scotland for the summer of 1921, Banting traveled to Toronto a third time to ask for use of the vacant research laboratory; this time, Macleod allowed Banting eight weeks of laboratory use.¹¹⁷ On July 30, Banting and his assistant, Charles Best, injected the first insulin extract into a diabetic dog and observed as the dog showed signs of recovery.¹¹⁸ Over the next two months, they discovered progressively improved methods for extracting insulin from dogs and then cattle and calf fetuses. In January 1922, at the Toronto General hospital, a diabetic child patient of the research

team was restored to health using insulin injections, the first use of insulin in the treatment of humans.¹¹⁹

During the time Banting and Best worked to improve their insulin extraction methods, Dr. Sansum corresponded with the Toronto researchers about one of their early publications. They sent news of developments to Dr. Sansum in hope that his research team would cooperate in seeking to improve the extraction process.¹²⁰ Dr. Sansum's researchers were also successful in insulin extraction; they administered the first doses of insulin produced in the United States to an adult patient, the first U.S. recipient, in May 1922. The patient, a fifty-one-year-old man terminally ill with diabetes, lived to age ninety with insulin treatments.¹²¹ Within two months, the Santa Barbara researchers had developed enough of the substance to use on nine patients at the hospital.¹²² Sansum continued to develop insulin, communicate results, and ask questions of the researchers in Toronto.¹²³

Also in 1922, the Carnegie Corporation granted \$8,000 to Macleod's laboratory at the University of Toronto for further research in the treatment of diabetes.¹²⁴ In a dispute between Banting and Macleod involving control over and credit for the insulin research in the summer of 1922—that would eventually drive the two apart—the Corporation's grant provided Banting with the means to continue his research at the University of Toronto independent of Macleod.¹²⁵

Impact. The Corporation found particularly heartening the notion that two grantees in the same field were coordinating their efforts to advance knowledge and understanding. The Report of the President expressed this sentiment:

Not the least pleasing feature of this investigation lies in the admirable attitude in which two sets of investigators, each of whom has received modest help from the Carnegie Corporation, have cooperated toward a common end.... This [sharing of research] is in entire consonance with the spirit and the purpose of true scientific research.¹²⁶

By virtue of Sansum's connection with the Toronto researchers, the laboratory and clinic under his direction was one of the first to manufacture and use insulin in human patients. The Corporation supported this research with an additional \$15,000 grant in October 1922. Dr. Sansum's successes in insulin use in humans as well as in diet-based treatment of diabetes were published in various medical journals and contributed to the early understanding of insulin's effects on the diabetic patient.¹²⁷ The Toronto researchers also enjoyed continued support from the Corporation. In conjunction with the Toronto researchers, the Connaught Laboratories (affiliated with the University of Toronto) and Eli Lilly Company of Indianapolis, both working in conjunction with the Toronto researchers, began developing large-scale production methods of insulin in 1922. By late 1923, insulin began to appear in drug stores.¹²⁸ Hundreds of thousands of patients near death from diabetes, like the first U.S. patient in Santa Barbara, subsequently recovered relatively rapidly with the insulin treatment.

Notes

110. Michael Bliss, *The Discovery of Insulin* (Chicago: University of Chicago Press, 1982), 11.

111. The Carnegie Corporation of New York: Report of the Acting President, For the Year Ended September 30, 1922, 51.

112. *Ibid.*

113. *Ibid.*, 52.

114. "History of Sansum Diabetes Research Institute," <http://www.sansum.org/history.htm>.

115. Bliss, *Discovery of Insulin*, 31.

116. Seale Harris, *Banting's Miracle: The Story of the Discoverer of Insulin* (Philadelphia: J.B. Lippincott, 1946), 49–57.

117. *Ibid.*, 57–59.

118. Ibid., 68–69.
119. Ibid., 87–88.
120. Bliss, *Discovery of Insulin*, 140.
121. “History of Sansum Diabetes Research Institute,” <http://www.sansum.org/history.htm>.
122. The Carnegie Corporation of New York: Report of the Acting President, For the Year Ended September 30, 1922, 54.
123. Bliss, *Discovery of Insulin*, 141.
124. The Carnegie Corporation of New York: Report of the Acting President, For the Year Ended September 30, 1922, 22.
125. Harris, *Banting’s Miracle*, 200.
126. The Carnegie Corporation of New York: Report of the Acting President, For the Year Ended September 30, 1922, 55.
127. The Carnegie Corporation of New York: Report of the Acting President, For the Year Ended September 30, 1923, 30.
128. Harris, *Banting’s Miracle*, 94.