

Stanley Rossiter Benedict

Creator of Laboratory Tests for Glycosuria

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In 1674, Thomas Willis tasted the urine of diabetic patients to identify its sweetness. Dobson, by fermentation technics in 1715, showed this sweetness to be due to the presence of sugar. Vogel in 1815 discovered the reducing property of glucose solutions in the presence of alkaline compounds of metallic salts. It was Stanley R. Benedict about 100 years later who developed the chemical tests for sugar in the urine, which became almost universally used throughout North America. It took almost 250 years to go from tasting the urine to Benedict's tests.

In the spring of 1884 Rubner was gathering his data for the final announcement of his brilliant demonstration of the application of the law of conservation of energy to mammalian metabolism. In his laboratory at that time was an American named Wilbur O. Atwater. This same Atwater was destined to play, indirectly, a most important role in the life of a child born in Ohio at that time. Stanley R. Benedict was born in March of 1884 in Cincinnati. He was next to the youngest of six children in the Benedict household. His father was Professor of Philosophy at the University of Cincinnati. His mother was a writer and teacher. His maternal grandfather was Professor of Greek and Sanskrit at the University of Rochester. The boy Stanley grew up in an atmosphere of intellectual discussion and inquiry for the truth.

Stanley himself expressed a desire to study medicine and enrolled at the University of Cincinnati for his undergraduate work. While a student at the University, he came under the influence of Dr. J. F. Snell. Snell was a disciple of Atwater and was fresh from his laboratory, full of enthusiasm for the new developments in biochemistry and metabolism. Snell fired young Benedict's imagination and interest to the point where he

gave up the idea of studying medicine. After graduation from the University of Cincinnati in 1906, with an B. A. degree, his interest was entirely in the fields of biochemistry and nutrition. Benedict then matriculated in Yale University in order to work with Russell H. Chittenden and Lafayette B. Mendel; he received a Ph.D. degree from Yale in 1908.

Mendel was at the peak of his achievement at the time that Benedict was working with him. It was in Stanley Benedict's first year at Yale that Folin introduced analytical technics of high accuracy using small samples. These analytical methods gave the clinician, for the first time, opportunities to study quantitatively the principal constituents of the blood and urine on a day-to-day basis. Benedict made a critical study of these methods and modified practically all of them. However, Benedict was especially interested in the methods for the determination of glucose in urine and blood. The problem was to find chemicals that would be reduced by glucose and not by the numerous other reducing agents present. He developed both qualitative and quantitative tests for sugar in the urine. These were recognized as superior from the standpoint of simplicity, convenience and accuracy.

Benedict was called to Syracuse University after receiving his degree from Yale. He remained for one year as an instructor. From there, he went to Columbia University where he became an associate in biochemistry. Graham Lusk, who was then building up the physiology department at Cornell University Medical College, was impressed with young Stanley Benedict. Through his influence, Benedict was invited to Cornell in 1910. He remained at Cornell until his death in 1936.

Professor Benedict taught biochemistry to the first year medical students until shortly before his death. He gave practically every lecture himself and was in

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and out of the student laboratory at every session. He demanded clarity, logic and above all, brevity, from the students. Long-winded circumlocutions, to evade direct answers and mask improper preparation, were usually not tried twice. A simple "unprepared" or "do not know," the students learned, would be dealt with sympathetically if not repeated too often.

In his lectures, Benedict evidenced a deep but real sense of humor. At one time in a discussion of the isolation of thyroxin, I heard him say, "I, too, isolated thyroxin and have my notes to prove it, but I knew so much about the aromatic iodide compounds that I threw the active principle down the sink and kept the residue." While he was justly proud of his achievements, he readily acknowledged an error.

No discussion of Stanley Benedict would be complete without mentioning his relationship to Otto Folin. These two men were not the bitter antagonists that many people inferred from reading the "Letters to the Editor" in the *Journal of Biological Chemistry*. They had a mutual interest in the search for truth. Criticism that was constructive was acceptable and each one was continually trying to find the flaws in the other's concepts and technics. The high esteem that Benedict held for Folin was well known by his close associates. While their discussions were almost bitter at times, Benedict almost worshipped Folin. These two men worked together in one joint effort. They were the consulting biochemists to the Metropolitan Life Insurance Company and helped organize its laboratory. Their influence was so far-reaching that it can be said that they were responsible for the present policy of the life insurance companies, to support research in the medical fields.

There was one activity of Stanley Benedict's which is not too well known. He played a most important part on the Ewing team in the early days of cancer research at the Memorial Hospital in New York City. As Chief Chemist to the Memorial Hospital, he was responsible for the development of its laboratories and the formulation of the chemical experimental work.

In addition to this full program of research and

teaching, Stanley Benedict was editor of the *Journal of Biological Chemistry* from 1925 until his death. To this work he devoted a tremendous amount of time and energy. His duties as editor rarely allowed him to take a complete summer vacation to recuperate from the intense work of the school year. It can be said that this sense of responsibility to the journal hastened his death in 1936.

Few people realized that Benedict suffered from severe hypertension. His apparent withdrawal from a full social life was in part a protective mechanism to avoid as much stress as possible and to conserve his energies for the constructive work in which he was so deeply interested. Even his hobby was one which allowed him to avoid strenuous physical exercise. Benedict was a photographer of more than average ability. In line with his training, he experimented with developing solutions and reducing agents. The technical problems of photography were more exciting than the esthetic. His knowledge of optics was more than superficial as evidenced by work on the comparison colorimeters.

Stanley Benedict was a severe but just critic. He was respected by his associates and contemporaries. He was difficult to know. He was a very shy person and, because of this reticence, he was accused of being cold and distant. Those who gained his confidence knew better.

The name of Benedict is well known to physicians and diabetic patients because of his qualitative and quantitative tests for glycosuria, which have been so widely adopted. To his students, and friends in the scientific world, his memory will survive because of his substantial achievements in teaching, editing and research.

ACKNOWLEDGEMENTS

I wish to acknowledge the help received in gathering this material from Dr. Eugene DuBois, Dr. Dayton J. Edwards and Dr. Connie Guion, all of Cornell University Medical College.