

Norbert Freinkel (1926–1989)

During the twentieth century, Norbert Freinkel studied hormones and diabetes in the United States. Freinkel conducted many experiments that enabled him to determine the factors that influence hormones of the thyroid gland and how those hormones affect surrounding tissues. Furthermore, Freinkel studied gestational diabetes, which is diabetes that occurs for the first time during a woman's pregnancy. That type of diabetes is caused by a change in the way a woman's body responds to insulin, a hormone made in the body. Infants who are born from pregnant women with gestational diabetes can possess many different medical conditions such as type 2 diabetes, respiratory distress syndrome, and low blood sugar. Through his research on gestational diabetes, Freinkel found that all pregnant women go through metabolic changes, not just gestational diabetics.

Norbert Freinkel was born on 26 January 1926 to Veronica and Adolph Freinkel in Mannheim, Germany. Freinkel's father was born in Russia and his mother was born in Germany. In 1934, Freinkel, his parents, and his older sister, Betty, boarded the ocean liner SS Albert Ballin in Hamburg, Germany, to take them to the US. On 1 June 1934, Freinkel and his family arrived in New York City, New York. After arriving in New York, the Freinkel family moved to Newark, New Jersey. In New Jersey, Freinkel's father operated a furniture store while his mother stayed at home with Freinkel and his sister.

In 1947, Freinkel graduated from Princeton University in Princeton, New Jersey, with a Bachelor of Arts degree. Two years later, he earned a medical degree from New York University Medical College in New York City, New York. After earning a medical degree, Freinkel completed his residency at Bellevue Hospital in the New York University Medical Division in New York City, New York.

In 1950, Freinkel joined the US Army, which he remained until 1952. During that time, he served in the department of biophysics at the Walter Reed Army Medical Center in Washington, DC. At Walter Reed, Freinkel co-authored several scientific publications about thyroid function and how thyroid conditions can affect the way in which the body metabolizes iodine. The thyroid is a gland at the base of the neck that secretes the hormones that regulate growth and development.

In 1952, Freinkel left the military to pursue postgraduate training in Boston, Massachusetts. From 1952 to 1955, Freinkel conducted research at the Harvard Medical Service in Boston, which operated at the Thorndike Memorial Laboratory of Boston City Hospital, later renamed Boston Medical Center. At the Boston City Hospital, he married Ruth Kimmelstiel. Kimmelstiel attended Duke Medical School in Durham, North Carolina, where she was one of five women in the class. Shortly after graduating medical school, Kimmelstiel became one of the first female dermatology residents at Harvard University in Boston, Massachusetts.

In 1955, Freinkel became a research fellow with Rudolph A. Peters at the Institute of Animal Physiology in Cambridge, England, where Peters studied biochemistry. After one year, Freinkel and his wife moved back to the US where he became an assistant professor of medicine at the Harvard Medical School in Boston, Massachusetts. He simultaneously worked as an assistant professor and as the director of the diabetes and metabolism division of the Thorndike Laboratory at Boston City Hospital in Boston, Massachusetts, until 1966. There, Freinkel co-authored many articles with Sidney Ingbar, a thyroid specialist at the Thorndike Laboratory, including an article that they published in the *Journal of Clinical Investigation*. Their publications investigated the thyroid gland and how different substances in the body affected the human thyroid.

Throughout the 1960s, Freinkel continued to research metabolism and thyroid functioning, and continued to publish the results of his research. At this time, Freinkel began investigating insulin

homeostasis, which refers to the tendency toward a stable equilibrium in the blood regulated by insulin, a hormone made by the pancreas that helps the body use or store sugars found in carbohydrates. He also studied alcohol hypoglycemia, which is a liver disorder that results from low blood sugar caused by the consumption of and digestion of alcohol. Insulin and blood sugar are both major factors in diabetes, a disease where the body's response to insulin is abnormal.

In 1966, Northwestern University Medical School in Chicago, Illinois, recruited Freinkel to be a part of their research team. After accepting the Charles F. Kettering Professorship of Medicine position at Northwestern, Freinkel moved to Chicago. Additionally, Freinkel served as the chief of the Center of Endocrinology, Metabolism, and Nutrition at the university. During the 1970s, Freinkel combined his previous research about the thyroid gland, insulin, and blood sugar with his research pregnancy. In particular, Freinkel studied gestational diabetes in pregnant women and the metabolic process involved in the digestion of food in pregnant women.

During the 1970s, gestational diabetes negatively impacted the health of pregnant women and resulted in poor birth outcomes. Freinkel studied insulin and glucose interactions in the body and the way those interactions can lead to gestational diabetes. In 1980, Freinkel published the article "Of Pregnancy and Progeny." In the article, Freinkel concluded that pregnancy causes a woman's metabolism to change. Therefore, during pregnancy women break down, digest, and store food differently. According to Freinkel, some women's metabolism changes more drastically than others, which is why only some women become diabetic during their pregnancies.

Throughout his career, Freinkel authored more than 260 publications. In 1981, Freinkel was awarded honorary degrees from the University of Uppsala in Uppsala, Sweden, and from the University of Umea in Umea, Sweden, for his research about diabetes and pregnancy. In 1966, Freinkel also received the Lilly Award from the American Diabetes Association, headquartered in Arlington, Virginia. The award was presented to him in recognition of his research in the field of diabetes. In 1977, the National Institute of Health, headquartered in Rockville, Maryland, established a federally funded diabetes and pregnancy center with the help of his leadership and guidance. In 1977 and 1978, Freinkel was the president of the American Diabetes Association in Arlington, Virginia. Freinkel died on 5 September 1989 from a heart attack while visiting Russia.

Sources

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