Charles Wesley Turner, 1897–1975: A brief biography[1]

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Charles Wesley Turner was born in Chicago in 1897, one of seven siblings born to a Methodist minister. He spent his early years on his brother's farm in Wisconsin, leading to an enduring interest in agriculture, particularly in milk production. He obtained a B.S. in agriculture at the University of Wisconsin and soon after married Anna Schwartz. In 1919, and after a year of teaching at the University of Missouri, he received his M.A. degree there in 1921. He returned to the University of Wisconsin for work on his Ph.D., which he earned in 1927. While there, he was influenced by the research of several pioneer investigators in the Department of Zoology (F. L. Hisaw, H. L. Fevold, and others) in the newly emerging field of endocrinology. This led him to a lifelong interest in the role of hormones on development, growth, and lactation by the mammary glands. He also studied the influence of hormones on reproduction and growth, as well as egg laying in chickens.

Dr. Turner was a distinguished faculty member of the University of Missouri for 48 yr. He and his wife, Anna, had three children (Charles, 1920; Marilyn, 1925; and Barbara, 1930) and nine grandchildren. After Anna's death, he married Danelle Shelly, only to be widowed again. He married Kathryn Connally late in life.

He trained 45 Ph.D. students, all of whom were required to first obtain an M.S. degree, and 17 postdoctoral fellows. Together they published more than 500 journal articles, book chapters, research bulletins, and books. He wrote the first modern textbook on the comparative anatomy of the mammary glands, which described the embryology and histology of the mammary glands of many diverse species. One of his most famous book chapters was "Mammary Glands" in the classic book *Sex and Internal Secretions*. His research brought him worldwide recognition and many awards.

Much of Turner's investigations dealt with the influence of the ovaries and pituitary on the mammary glands. He and his students found that injections of estrogen alone promoted mainly ductal development in immature animals, whereas administration of both estrogen and progesterone elicited growth of the lobuloalveolar system essential for lactation. He observed that when these hormones were administered to hypophysectomized animals, they did not stimulate mammary growth, but, when the ovarian hormones and pituitary preparations were injected together, they produced full mammary growth. Turner developed the hypothesis that the ovarian hormones acted via the pituitary to produce specific "mammogenic hormones" that acted directly on the mammary epithelium. He believed these hormones differed from other hormones in the pituitary, but subsequently his students and others showed that most of the mammary growth-promoting activity of the pituitary was due to prolactin.

Turner and his students were among the first to investigate the physiology of prolactin. Together with William U. Gardner, one of his early students, the first mammalian bioassay for prolactin was developed. After receiving his Ph.D., Garner went to Yale University and became widely recognized for his work on the role of the pituitary on development of mammary cancer. Another student, Ralph Reece (later at Rutgers University), was the first to demonstrate that estrogen increases pituitary prolactin content and initiates lactation. They also reported that the milking stimulus induced rapid release of prolactin from the pituitary as indicated by a sharp drop in pituitary prolactin content. The suckling or milking stimulus is well established as being mainly responsible for maintaining milk secretion. Later, with Turner's work as background, Dr. Joe Meites and one of his students, Carl Nicoll (Michigan

[1]Harold Biellier, Harold Johnson, Boyd O'Dell, William Pfander, Jerry Brooks, and Marilyn Dahl (daughter) all contributed information to this sketch.

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State University), showed that estrogen can act directly on the pituitary a well as via the hypothalamus to increase prolactin secretion. They also reported that the milking stimulus elevated prolactin levels in the blood. For his Ph.D. thesis, guided by Turner, Joe Meites tried to explain why lactation is held in abeyance during most of pregnancy and is initiated only at about the time of parturition. In these and subsequent studies, it was found that the high secretion of estrogen and progesterone during gestation prevented prolactin from initiating lactation, but near the end of the pregnancy with the fall in secretion of ovarian and placental estrogen and progesterone, the elevated levels of prolactin present were able to initiate milk secretion. Some of his other outstanding students were J. J. Trentin (Baylor University), John Mixner (Rutgers University), and C. E. Grosvenor (University of Tennessee, Memphis).

Turner received the American Dairy Science Association (ADSA) Borden Award in 1940. He served as Director of ADSA in 1949–1950, and in 1951 he received a Fulbright-Hays Research Scholarship to go to the Ruakura Animal Research Center, Hamilton, New Zealand. He was presented the Gamma Sigma Delta award for research in 1955 as its first recipient. After his death in 1975, a graduate student fellowship in his honor was established at the University of Missouri.

Turner held memberships in the ADSA, the American Society of Animal Science, the New Zealand Society of Animal Production, the Endocrine Society, the Society of Experimental Biology and Medicine, the American Association of Anatomists, the Columbia Kiwanis Club, and the Missouri Methodist Church of Columbia.

His daughter, Marilyn, likes to recall the vacations shared with her dad, sometimes in conjunction with professional meetings. By the time she left home, they had visited all the states but one and examined hundreds of historical landmarks.

A warm and generous personality was one of his trademarks, and his door was always open for talks with his students and visitors. In the days before World War II, when times were hard and students were needy, he frequently made them small loans. New students were initially assigned to a senior graduate student or postdoctoral fellow to learn laboratory techniques. After they gained experience and mastery of some essential laboratory procedures, Turner would discuss a research project with the student and would closely follow the research. Turner always was ready with suggestions and encouragement and stimulated his students to develop research ideas of their own. When the results of studies were particularly interesting, he encouraged his students to write an article for publication. Turner believed that teaching graduate students how to write was one of his primary responsibilities. His own writing skills served as one of the best examples for his students. There was a good spirit of cooperation and collaboration among Turner's students, resulting in many multiauthored publications, with the students as senior authors. This and the work ethic he projected to them gave them a good start for obtaining employment after they completed their doctorate requirements.

Turner's graduate students and postdoctoral fellows considered themselves fortunate to have had the opportunity to study with such a distinguished scientist and such a fine and optimistic personality.