Constance V. Kies (1934–1993)1

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Connie Kies once wrote: “Nutrition is truly a science of the twentieth century” (Kies 1989), now an appropriate metaphor for her own life. Just as medicine and human ecology provided the foundation for the nutritional sciences, they also were merged by Kies in her own life to further her education and develop her research. When looking at pioneers in the field of nutritional science, one finds Kies outstanding among her peers. She was highly gifted and regarded as a scientist, and able to pursue her doctorate, receive grants, write for prestigious journals and become a full professor in an era when few other women did all these things.

Kies was born in 1934 in Blue River, Wisconsin, where her father was superintendent of the school system. Her mother was also an educator, who taught in the Madison, Wisconsin, public schools prior to her marriage. When Kies was a young girl, her family moved to Platteville, Wisconsin, where she was reared on a farm with her three sisters Carolyn, Cosette and Camilla. As a child, Kies was an avid reader in all areas of study, and her skills in academia certainly were apparent even as a teenager—she was valedictorian of her class at Platteville High School.

Kies attended college locally at Wisconsin State College, Platteville (now the University of Wisconsin-Platteville), where she continued to shine; her work allowed her to earn a Regents Fellowship in her first year of college, which was followed by additional scholarships in her undergraduate years. In 1955, Kies received her B.S., with highest honors, in English, complete with minors in history, geography, library science and home economics.

Following graduation, Kies followed in the footsteps of her parents and became a public school teacher for three years. While teaching, she realized that her choice of vocation was the result of traditional gender expectations, and she began to concentrate on saving money to attend graduate school. Also during this time, her interests and readings began to focus specifically on human physiology.

The University of Wisconsin-Madison was Kies’ choice for furthering her education. There, she earned her M.S. in foods and nutrition in 1960 and her Ph.D. in human nutrition and medical physiology in 1963. In the laboratories of the School of Home Economics, University of Wisconsin-Madison, Kies first worked with Dr. May Reynolds and then Dr. Hellen Linkswiler. Efficient and well organized, even as a student, Kies worked as a research assistant by managing the nutrition program’s “diet squads,” a program in which subjects consumed meals for metabolic studies. Additionally, she gained experience in the practice of nutrition by working part-time as a dietitian at the Madison General Hospital.

As a graduate student, Kies’ research emphasized nonspecific nitrogen (i.e., nitrogen from any metabolically usable, nontoxic source such as nonessential amino acids, excess essential amino acids or nonprotein sources such as urea or diammonium citrate) (Kies et al. 1965, Kies 1972, Kies et al. 1973). She was able to continue her research at the University of Nebraska-Lincoln, where she began working as an assistant...
professor immediately after earning her doctorate. Her research with amino acids and nitrogen excretion mirrored that of a former leading nutrition researcher at the University of Nebraska, Dr. Ruth Leverton. Similar to Leverton, Kies used controlled human feeding studies (involving subjects housed in the university’s live-in facilities along with free-living subjects), a hallmark of her research program. By using human subjects to study nutrients and their interactions, these two notable women made landmark advances in the area of protein metabolism.

Kies’ work with nitrogen balance made important contributions to the field. By working with the premise that urea was used as a nitrogen source in ruminant animal feed (Kies et al. 1973), Kies determined that urea could also be effectively used in human metabolism to maintain nitrogen balance (Kies and Fox 1978). The practical applications of her research showed that high levels of blood urea nitrogen could be reduced if patients were fed idealized patterns of essential amino acids in protein-free or parenteral feedings (Kies 1972); by doing so, Kies hypothesized that uremic patients could use endogenous urea as a source of nitrogen for the synthesis of nonessential amino acids (Korslund et al. 1977). By showing that protein quantity was as important as protein quality, Kies established that increasing the total quantity of low-quality protein foods can support protein needs of human adults (Kies and Fox 1970).

Growth among children, however, was a different matter, and Kies was not content to simply extrapolate her research to determine the nutritional needs of children. Working with Dr. Hazel Metz Fox, her colleague at the University of Nebraska, Kies explored the nutritional status of preschool children. At that time, most studies of children were oriented toward family resources and human development, but Kies used her laboratory to examine the children’s urine levels of creatinine, nitrogen, thiamin, riboflavin, pantothenic acid and niacin (Crispin et al. 1968, Kerrey et al. 1968). Such work was groundbreaking for the field, particularly because she and her colleagues’ study contrasted low- and high-income children.

Fundamentally, Kies’ research was based on her belief that “everything in the diet influences everything else” (Kies 1988). After working with nonspecific nitrogen for many years, her laboratory personnel moved on to explore internutrient metabolism. Recognizing the health benefits of low-fat and high-fiber diets, she became interested in the relationships among minerals, dietary fiber and fat. Kies untangled the effects of hemicellulose, cellulose and pectin and found that hemicellulose tended to increase fecal excretion of zinc, copper and magnesium (Drews et al. 1979). Furthermore, she and her colleagues showed that hemicellulose supplementation enhanced urinary excretion of vitamin C, while pectin and zinc led to a decrease in urinary excretion of this vitamin (Keltz et al. 1978).

Kies later studied the relationship between dietary fat and mineral absorption, which showed that the apparent absorption of iron, zinc and manganese decreased when dietary cholesterol and fat were reduced to the current recommendations of the Dietary Guidelines for Americans (Kies 1988). At the same time, her laboratory was able to show that total cholesterol, (VLDL3) and (LDL3) cholesterol could be reduced by consuming a diet consistent with the Dietary Guidelines (Garcia et al. 1991). In a study published posthumously, Kies also demonstrated the beneficial effects of dietary fiber in reducing total and LDL-cholesterol (Ganji and Kies 1996).

Toward the end of her career, Kies continued to study the relationship between nutrients, with a great deal of her laboratory time committed to manganese and, particularly, copper research. Her interest in these minerals was based upon her strong interest in protein metabolism, given that the human body’s need for both of these minerals is tied to dietary protein intake. Although first recognized as an essential nutrient in 1931, copper’s role in human physiology had not been a particularly strong area of research until Kies became involved, leading other researchers to study copper metabolism. Kies’ work helped to clarify the problems of copper bioavailability and utilization, but competition for absorption among minerals remains a complex matter. Her laboratory work showed that calcium supplementation increased copper absorption while supplements of magnesium, selenium and potassium decreased it (Kies and Harms 1989). Kies further showed that phytates, tannins (e.g., from tea), dietary fiber and lead inhibit utilization of dietary copper (Kies and Umoren 1989). Kies excelled not only in her laboratory skills but also in her writing ability. Her first paper was published in 1965 in The Journal of Nutrition. Throughout her career, Kies published 13 papers in The Journal of Nutrition, and her writings were well represented in other leading journals, such as The American Journal of Clinical Nutrition, Federation Proceedings, and The Journal of the American College of Nutrition. Altogether, she published more than 100 peer-reviewed journal articles and also contributed chapters to many books regarding minerals and plant proteins. Inspired by an invitation from the Agriculture and Food Chemistry Division of the American Chemical Society, Kies organized national conferences to present the latest findings related to iron, calcium and copper. She went on to edit or co-edit the monographs from these conferences, which are still in print, and more recently co-edited a book regarding electrolytes in sports nutrition.

Throughout her 30-year career at the University of Nebraska-Lincoln, Kies was active as a professor on campus and was well known both nationally and internationally. As a young scientist, she was awarded the Borden Award from the American Home Economics Association in 1973, which was followed by the University of Wisconsin-Platteville’s Outstanding Alumnae Award in 1974. In 1983, she received an Outstanding Research Award from Ross Laboratories, and in 1986, the American Chemical Society presented her with a Distinguished Service Award.

Kies was an active member of many professional organizations, which allowed her to interact with colleagues from around the world. She was a member of the American Institute of Nutrition (now the American Society for Nutritional Sciences), the American Dietetic Association, the American College of Nutrition (of which she became a Fellow in 1989), the Institute of Food Technologists, the American Oil Chemists’ Society, the American Society for Parenteral and Enteral Nutrition, and the Society for Nutrition Education. Even though her research emphasis was on nutritional biochemistry, Kies was both a certified home economist and a registered dietitian.

Many of her students fondly remember Kies as an extraordinary teacher. In 1989, 1990 and 1991, she was nominated by the University of Nebraska’s College of Home Economics for their Outstanding Faculty Teaching Award; in 1989, she was granted the College’s Distinguished Faculty Scholarship Award. Kies was dedicated to her students, even to the point of continuing to advise them after she developed cancer. By the time she died, Kies had been the major professor for 173 M.S.

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*Abbreviation used: VLDL, very low density lipoprotein; LDL, low density lipoprotein.*
students and 32 Ph.D. students. Many of these were international students who returned to their native lands to teach and conduct research.

Through a Distinguished Visiting Faculty Award, in 1987, Kies traveled to the People's Republic of China where she worked with the Ministry of Public Health and the Department of Food Hygiene at Shandong Medical University, one of the oldest medical schools in China. Kies was invited by the medical school to introduce to their faculty the methodology involved in conducting human metabolic studies, and she was successful in recruiting many Chinese students to travel to the United States to continue their education.

Indeed, Kies' research attracted many students from foreign countries, and her laboratory took on an international "flavor". In exchange for housing, these international students and their American peers agreed to participate in Kies' metabolic feeding studies by eating controlled diets and carefully collecting urine and stool samples for analyses. This arrangement proved to be beneficial for both the students and for Kies, because her research showed that men's and women's needs for protein, essential amino acids and minerals do not differ by race or ethnic group. Conversely, Kies' research with plasma lipoproteins and lipids did show significant race effects, with Asian women having significantly higher values (Garcia et al. 1991).

In August 1993, Connie Kies was diagnosed with uterine cancer. Despite her terminal illness, her commitments to education and research never wavered, and she insisted that her graduate students come to her bedside so that she could continue to advise and direct them. Unfortunately, her disease progressed quickly, and she died in Lincoln, Nebraska, on November 30, 1993. Dr. Kies' body was cremated, and her ashes were placed in her family's plot in Platteville, Wisconsin. She is survived by her sister Dr. Cosette Kies of DeKalb, Illinois.

LITERATURE CITED


