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The Elmer V. McCollum Centenary Commemorative Symposium: Protein Quality Evaluations

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INTRODUCTION

Renewed general and scientific interest in nutrition provides a reason for refocusing upon the scientific perceptiveness and distinguished contributions of Elmer Verner McCollum (1879–1967). Two of Professor McCollum's students, Day and Prebluda (1980), refer to him as "lamplighter" in public and professional understanding of nutrition. Day (1974) prepared a Biographical Memoir detailing the diverse scientific interests of McCollum, including a chronology of McCollum's contributions and publications from 1903 to 1967. McCollum's interests were broad and varied, including investigations on the purines and pyrimidines, lipids, vitamins, enzymes, amino acids, and proteins and their nutritional interactions. He established the existence of vitamins A and D, as well as the B complex vitamins, and clarified the nutritional functions of many nutrient elements including calcium, magnesium, and phosphorus.

During the 40-year period starting in 1913, McCollum maintained a continuous interest in the nutritional properties of amino acids and proteins, publishing more than 25 papers on this subject. He coined the term "biological value of proteins".

As early as 1915, McCollum attempted to classify the nutritional values of proteins in terms of growth, fertility, success in rearing young, longevity, preservation of youthful characteristics, and stability of the nervous system of rats maintained on a nearly synthetic basal diet to which was added a 9% level of test protein. McCollum and Shukers (1929) reported a quantitative procedure for the determination of the biological value of proteins. The procedure was similar to that employed in the classical paper of Osborne et al. (1919), except that the results were expressed on a different basis, and provided the basis for the modern-day protein efficiency ratio (PER) procedure.

In honor of Dr. McCollum's unique, creative contributions to the study of the nutritional properties of proteins, it was most appropriate to commemorate his pioneering work on the 100th anniversary of his birth. I had the privilege of inviting a distinguished group of his students and disciples to participate in the Elmer V. McCollum Centenary Commemorative Symposium on Protein Quality Evaluation at the 178th National Meeting of the American Chemical Society, Washington, DC, Sept 10–14, 1979. Among the distinguished scientists who participated were A. E. Harper, E. V. McCollum Professor of Nutritional Sciences, University of Wisconsin, V. E. Young, Massachusetts Institute of Technology, and C. Kies, University of Nebraska, whose scholarly papers are presented herein.

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Elmer V. McCollum Symposium

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This symposium commemorates the centennial of the birthdate of Dr. E. V. McCollum. During nearly all of 1979, symposia and exhibits will mark this date—March 3, 1979. Dr. McCollum always thought of himself as a chemist, and he would have been especially pleased with this symposium. His interest in amino acids was a continuing one, and he was engaged with Agatha A. Rider at the Johns Hopkins University in his late years reaching into his retirement in research on the isolation of certain amino acids from natural sources using nonaqueous solutions. He felt the isomeric forms utilized by humans were too expensive and thus research on their functions was inhibited. He sought for isolation methods to reduce the cost.

However, the present remarkable interest in his centennial rests on a very broad base. We can epitomize Dr. McCollum's lifetime contributions by remembering that man has been on this earth for some 3.6 million years. But only in the past 70 years has there developed a perception of what adequate nutrition means. Dr. McCollum opened the door to this "newer knowledge of nutrition" to an extent not surpassed by any other individual. He established the existence of vitamin A, the B complex, and vitamin D. He clarified the specific nutritional functions of magnesium and manganese. This was followed by similar studies for calcium, phosphorus, fluorine, aluminum, iron, zinc, sodium, potassium, boron, and cobalt.

Of at least equal importance was his exceptional ability to communicate nutrition messages to the public. For 25 years he was nutrition editor of *McCalls* magazine. He coined the terms "protective foods", "biological value", and "optimum diets" which were quickly adopted by teachers and soon reached the public. He was an esteemed adviser to the food industries, especially the dairy industry. He was the founder of the first research and development laboratory of the company now designated Kraft, Inc., and a founder of the National Dairy Council.

Dr. McCollum earned and enjoyed remarkable acceptance in government, industry, and the academic world and with the public. However, his first love was always the academic world. In his autobiography "From Kansas Farm Boy to Scientist" (pp 181–182), he states "the rewards of the teacher and investigator in association with superior young men and women are greater than in any other profession. To become well acquainted with a highly selected group of students with natural ability, guide them in the investigation of specific problems, to gain insight into their character and motivations, their desires and decisions as to their purposes and pursuits in life is a delightful situation in human relationships. After several years of cooperative investigation, lasting friendships are formed based on intimate personal knowledge of each other. One who has helped a good student earn his doctorate takes pride and satisfaction in establishing favorable contacts for him and in helping him secure a position of opportunity. Close bonds of friendship continue throughout life. Friendships with my most valued students through the ascendant period of their lives has had spiritual values for one which I believe could not have been equalled in business or a profession other than teaching and investigation. Apart from the rewards arising from cooperative assistance, my relations with my exceptional students have yielded a rich harvest of experience. I find something illuminating and appealing in the personalities of each of them. They have added cheer, meaning and purpose to my life. I have been richly privileged in their companionship. There are ties between us which are not based on interest or necessity. Because I have received from them expressions of their regard, I have a sense of belonging in their company singly and collectively. Their visits and conversations warm my environment".

One can readily imagine the lifelong affection and esteem that Dr. McCollum's students and friends felt for him. Every visit with him over the years was an inspiring and elevating experience. His cheerful and serene outlook and sparkling earthy sense of humor rewarded every visit.

In Dr. McCollum's "A History of Nutrition" (p 8), he discusses the state of knowledge of nutrition among the Romans about 200 A.D. He describes the writings of Athenaeus, a Greek who about the end of the second century A.D. wrote what is regarded as the oldest recorded cookbook and commentary on foods. According to this commentary, Anchimolus and Moschus, sophists of Elis, drank water all their lives, and though they ate nothing but figs, enjoyed as robust a physique as anyone else, but their sweat was so ill smelling that everyone avoided them at the public baths. To this day it is not uncommon to find the practice of similar rather exotic ideas about nutrition.

Chapter 4 of Dr. McCollum's History entitled "Knowledge of Albuminous Substances" covers the development of knowledge about proteins over a 200-year period from the middle of the 18th century to about 1940. Braconnot in 1820 isolated the first amino acid (glycine) by acid hydrolysis and, in the same year, leucine. But it was not until after 1900 that the clear realization came (1900–1915) that protein nutrition was concerned with the kind and amount of individual amino acids derived from the digestion of food proteins. This is one more example of the fact that science does not progress in a straight uninterrupted line but often awaits the appearance of scientists who can perceive the inner meaning of preexisting findings and build upon them. Often there is required long intervals of hard work and many frustrations. This was the experience of Dr. McCollum.

It is worth noting that the speakers who will be following me (it is now 39 years since Dr. McCollum set the cutoff date 1940 that concluded his History) are still uncovering new knowledge relating to the digestibility of proteins and the assimilation of the amino acids under a variety of conditions not previously evaluated. He would have shown great interest in and appreciation of their new contributions to this central topic in human nutrition.

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