

Obituary: Karl Schmid (1920–2009)

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On October 13, 2009, Dr. Karl Schmid, Professor Emeritus, Department of Biochemistry, Boston University School of Medicine, passed away in Lexington, Massachusetts, USA at the age of 89. Born on July 23, 1920 in Aargau, Switzerland, he graduated in 1943 from the Federal Institute of Technology, Zurich (Department of Organic Chemistry, Prof. L. Ruzicka, a Nobel laureate) with a Diploma in Natural Science. He received a Ph. D. in 1946 from the University of Basel, Switzerland (Prof. S. Edlbacher) in the field of amino acid metabolism. He left Switzerland in 1947 to join Prof. A. C. Chibnall in Cambridge, UK as a postdoctoral fellow, where he

succeeded in the crystallization of finback whale myoglobin. This experience in protein chemistry was the starting point of his long and fruitful scientific life's work. In 1948, he moved to Prof. E. J. Cohn's laboratory at Harvard Medical School, Boston, USA, where he was engaged in the fractionation of human blood plasma. Dr. Schmid continued investigations on the separation and characterization of plasma proteins as Associate Biochemist at Massachusetts General Hospital, Boston Department of Medicine (Prof. W. Bauer) in 1952–1962. He was an associate professor (1963–1966), professor (1966–1991), and then professor emeritus in 1991 in the Department of Biochemistry, Boston University School of Medicine.

Dr. Schmid was a pioneer in the field of glycoproteins. He showed in 1953 in his article in *The Journal of the American Chemical Society* entitled "Preparation and Properties of Serum and Plasma Proteins XXIX. Separation from Human Plasma of Polysaccharides, Peptides and Proteins of Low Molecular Weight. Crystallization of an Acid Glycoprotein" that glycoproteins are molecular entities and not physical associations of proteins and carbohydrates. For his studies he used "Fraction VI", the supernatant solution of Cohn fraction V, which contained 40% ethanol. This fraction had previously been believed to be free of protein. His successful isolation of the protein was carried out with the aid of heavy metal ions, which enabled separation, accelerated crystallization, and prevented denaturation.

α 1-Acid glycoprotein or orosomucoid is a protein with a molecular weight of 41–43 kDa, is heavily glycosylated (45%), and is negatively charged (pI=2.7–3.2). In 1965–66, Dr. Schmid and one of the present authors identified pyroGlu as the N-terminal amino acid residue. Thus, this glycoprotein represented one of the earliest discovered proteins with pyroGlu. Through discussion during a short trip in Switzer-

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land together with one of the authors, Dr. Schmid completed a manuscript on the carboxyl-terminal amino acid sequence of the protein based on the structures of peptides, which was published in 1971. Subsequently, Dr. Schmid and his co-workers reported the complete amino acid sequence of this glycoprotein in *Biochemistry* (1973). Several comprehensive reviews on the structure and function of α 1-acid glycoprotein are now available and suggest the necessity of more extensive studies to reveal the physiological functions of this disease-related protein.

In collaboration with the groups of Prof. J Montreuil, Lille, France and Prof. J.F.G. Vliegthart in Utrecht, The Netherlands, the structures of all glycan chains were elucidated by means of high resolution ^1H -NMR spectroscopy in 1977.

In addition to various human plasma glycoproteins, Dr. Schmid was interested in glycoproteins of seminal, ascites fluid, lung lavage fluid, and invertebrates. Furthermore, the glycans of collagens, glycosaminoglycans and proteoglycans, had his interest. In collaborative studies with the Vliegthart group numerous glycan structures of these compounds were unraveled. His pioneering work is reported in more than 230 original papers and review articles. His achievements were honored in the First Alpha1-Acid Glycoprotein Meeting organized by Drs. P. Baumann, W. E. Müller, C. B. Eap, and J-P. Tillement in

Prilly-Lausanne, Switzerland (1988). Dr. W. Bürgi described in the Proceedings published by Alan R. Liss, Inc. New York (1989) that the supernatant of Cohn Fraction V proved to be an unexpected source for minor plasma proteins. Indeed, Dr. Schmid had successfully isolated 12 proteins including α 1-acid glycoprotein, α 2-HS glycoprotein, and 3S γ -globulin at that time.

His research society memberships included the American Chemical Society (1952), American Society of Biological Chemists (1954), Society for Complex Carbohydrates (1963), and the Biochemical Society (London) (1965). He was President of the Society for Complex Carbohydrates in 1980, and a member of the Editorial Board of *The Journal of Biological Chemistry* from 1981–1990.

It is noteworthy that more than 40 Japanese scholars spent a certain period of time in Dr. Schmid's laboratory as post-doctoral fellows or scientific coworkers. He sometimes called them the Japanese KS cohort. In 1989, he and his wife Hedi were invited to Japan, where they enjoyed two parties, together with 28 Japanese cohort members including the authors. Dr. Schmid was a warm person with a cheerful spirit. Those who met and worked with him will remember him with admiration. In the scientific community he will be missed, but in particular by his wife Hedi and their children Maria and Marc.