IN MEMORIAM

KARL D. NOLPH, MD, FACP, FRCPS (GLASGOW)

**BOARD OF CURATORS' PROFESSOR EMERITUS OF MEDICINE, UNIVERSITY OF MISSOURI
1937 – 2014**

The world of nephrology lost a legend and one of its most active, visible and respected members with the death of Karl D. Nolph on June 16, 2014, at the age of 77. His last few months of life were spent at home in the company of his close family and friends, who included his beloved and devoted wife Georgia Nolph, MD, and their 2 children Erica and Kris with their spouses and 5 grandchildren.

Karl had a very distinguished academic career that should be a model to the younger generation. His pioneering work in collaboration with Jack Moncrief, MD, and Robert Popovich, PhD, in the development of continuous ambulatory peritoneal dialysis (CAPD) in 1977 has in fact revolutionized the field of peritoneal dialysis. Worldwide interest in this new dialysis treatment was sparked by the *Time* magazine story on CAPD in December of 1978. Karl remembered his encounter with a *Time* magazine reporter as follows: "A reporter from a New York newspaper called me to ask for the location of CAPD training centers in New York City. I explained that the only USA CAPD training programs (at the time of the call) were in Austin, Texas, and Columbia, Missouri. The reporter was incensed and said, "Dr. Nolph, do you really expect me to believe that there is something available in Texas and Missouri that is not available in New York?" Peritoneal dialysis experienced astounding growth in the 70s and 80s. This inevitably led to the worldwide dissemination of CAPD knowledge. In the 80s, Karl successfully

organized several national and international conferences on peritoneal dialysis. Participants in the conferences came from all over the globe. Additionally, he was invited to demonstrate his techniques and skills to the dialysis community all over the world. He visited almost all countries in the 6 continents. Karl, along with Drs. Moncrief and Popovich spearheaded the National Institutes of Health (NIH)-sponsored CAPD Registry—the Precursor of the United States Renal Data System (USRDS). At the suggestion of the NIH, he started the First National CAPD Conference, a University of Missouri-sponsored meeting in Kansas City, in 1980, which later evolved into the International Peritoneal Dialysis Conference, and eventually the Annual Dialysis Conference (ADC). Karl successfully organized this conference (ADC) for 35 consecutive years. Only 4 months before his death, he was the key figure in organizing the 34th ADC in Atlanta in February 2014.

Academically, Karl had a fascination for physiology. If you talked to him about electrolyte and water transport, he would drop everything and get involved in a very animated discussion. The majority of his research years was spent in trying to understand peritoneal membrane kinetics. Electrolyte and water transport across the membrane dominated his original inventions. Even in retirement, he mentored and inspired many a budding young nephrologist to carry the torch forward. While retired, he kept abreast of the field by reading journal

articles that dealt with water and sodium transport. I delivered the last batch of journals to him a week before his death. His scientific accomplishments included 636 scientific publications, 343 abstracts, 43 edited or authored books, 6 patents, and 7 scientific videos. He gave 923 invited talks in all continents, and chaired 178 scientific meetings. Dr. Nolph was Editor-in-Chief of *Peritoneal Dialysis Today*, associate editor of 7 journals, guest editor of 8 special issues, and served on the editorial boards of *Nephron*, *Kidney International*, and 22 other journals. He was appointed to various key positions on 115 scientific committees and societies, was a founding member of the International Society for Peritoneal Dialysis, and president of the American Society for Artificial Internal Organs. His curiosity and depth of knowledge of sodium and water transport led him to conceptualize a water-only pathway through cells in 1967, several years later identified as aquaporin. In 1972, in an article published in the journal *Transaction of the American Society of Artificial Internal Organs*, he reported disproportionate water removal utilizing a hypertonic dialysis solution during a peritoneal dialysis exchange. The mechanism for such water removal was unknown at the time. He suggested the possibility of transcellular water movement free of electrolytes across the peritoneal membrane. He depicted a cartoon in that article that indicated a direct passage of water without electrolytes through a channel in cells. He says in his article, "The net result would be the removal of extracellular water without sodium and associated anions via a transcellular water movement" (1). Although he did not use the term 'channel' through cells, but did suggest transcellular movement of electrolyte-free water and the figure clearly depicts the concept of a channel. He goes on to describe a sodium sieving process in this and subsequent articles. What is fascinating was his visualization of mesothelial and endothelial water movements through pathways which later were identified as aquaporin channels.

Karl had a unique way of teaching physiology to trainees. He was the most sought after teacher even in his retirement. He trained and inspired trainees from countries across the globe, including Poland, Switzerland, Denmark, France, Scotland, India, China, Hong Kong, Taiwan, Japan, Singapore and almost all countries in Europe. In his laboratory, many foreign physicians from Greece, Poland, Brazil, South Korea, and Japan, learned various laboratory methods and participated in research.

Karl was born in Brookville, Pennsylvania, on February 6, 1937. His education period was highlighted by numerous awards and recognition including his 1956 high school graduation Magna Cum Laude, where he was

valedictorian, and again Magna Cum Laude from Franklin and Marshall College, Lancaster, Pennsylvania, in 1959, as well as the Robert Spencer Morris Prize in 1963 at the University of Pennsylvania Medical School, Philadelphia. After completing his residency in Internal Medicine at The Bryn Mawr Hospital, Bryn Mawr, Pennsylvania, in 1965, he did his Post-Doctoral Fellowship in Renal-Electrolyte Disorders at the Hospital of the University of Pennsylvania. Karl came to the University of Missouri in 1969 as faculty, and became associate professor in 1973. He was named the Director of the Division of Nephrology in 1974 and became a professor of medicine in 1976. He was a very effective leader of the Division of Nephrology at the University of Missouri for 24 years, where he created an atmosphere of great team work. Under his leadership, the Division of Nephrology had very high visibility both nationally and internationally. He mentored many successful scholars, who currently hold very important positions in the field of nephrology.

I saw in Karl a mentor, leader, teacher, inspiring researcher, and a fine clinician. Over and above all, he was a close friend and confidant. He not only always gave due credit to everyone, he went beyond that. He cared for people who worked for him.

Despite being a legend and highly respected scientist, Karl was humility personified. When interacting with people, Karl had the unique ability to narrow the gap between himself and others. He never spoke of himself and he always cared for others. Karl possessed a quality in him that lifted every person that came in contact with him. I often heard him say "speak kind words and you will hear kind echoes."

In Karl I lost a close friend, mentor, advisor, philosopher, and a big brother. He was a humble and simple family man who cared for his fellow human beings. Karl has impacted scores of people's lives, both patients and caregivers. His legacy will always be remembered.

REFERENCES

1. Ahearn DJ, Nolph KD. Controlled sodium removal with peritoneal dialysis. *Transaction (ASAI)* 1972; 18(4):23.

Ramesh Khanna, MD
Karl D. Nolph, MD Chair in Nephrology
Professor of Medicine
Director, Division of Nephrology
University of Missouri-Columbia

khannar@health.missouri.edu
oserc@health.missouri.edu

doi: 10.3747/pdi.2014.00209