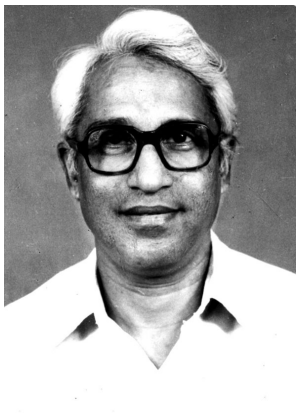
Umakant Waman Kenkare (1927–2019)

Professor Umakant Waman Kenkare passed away peacefully on 12 October 2019 after brief illness at the age of 92. He was born at Sanvorden, Goa on 3 March 1927. He obtained his BSc degree from the University of Bombay in 1949, MSc in 1952 and PhD in 1961. Thereafter he joined the laboratory of S. P. Colowick at the Department of Microbiology, School of Medicine, Vanderbilt University, Nashville, USA, as Research Associate for two years (1961–63). He worked as Research Staff Biophysicist at the Department of Molecular Biophysics and Biochemistry, Yale University, New Haven, USA, for 2 years (1963–65). After returning from USA he briefly worked as Biophysicist at the Nutrition Division, Indian Veterinary Research Institute, Izatnagar, during 1966–67, before joining the Molecular Biology Unit at the Tata Institute of Fundamental Research, Bombay in 1967, where he worked as Fellow, Reader, Associate Professor and Professor. He also worked as a Visiting Scientist at the Department of Physiology, Vanderbilt University, School of Medicine, USA, for 2 years (1977–79). After his superannuation at TIFR, he worked as CSIR Emeritus Scientist at National Facility for Animal Tissue and Cell Culture, Department of Biotechnology, Pune from 1988 to 1992.

He was elected as Fellow of the Indian Academy of Sciences, Bangalore in 1986. He was also a Fellow of the Indian National Science Academy, New Delhi in 1990. He served as an editorial board member of *Molecular and Cellular Biochemistry*.

Kenkare's scientific achievements are in the areas of enzymology and protein chemistry. He received his initial training during his PhD in the laboratory of B. M. Braganza in Bombay where he worked on the enzymes of folic acid metabolism in relation to normal and abnormal growth. His work in the laboratory of S. P. Colowickat Vanderbilt University on yeast hexokinase provided one of the earliest demonstrations of the reversibility of protein denaturation. His work in the laboratory of F. M. Richards at Yale University on the chemical modification of ribonuclease-S established the structural similarity of this enzyme in solution and crystalline states.

After returning to India his early work in Molecular Biology Unit at TIFR, Bombay on the kinetic parameters of the enzyme alkaline phosphatase under varying conditions of pH, temperature and solvent composition led him to predict about the chemical groups which might be participating in the catalytic activity of this enzyme. His main achievements at TIFR are on his work on the structure, regulation and function of brain hexokinase that is bound to mitochondria. This enzyme plays an important role in the control of glycolysis in brain, and it is the first enzyme of glycolysis which phosphorylates glucose to produce glucose 6-phosphate. He developed a mild procedure for solubilization of this enzyme from mitochondria and also purified it by a simple procedure. Using various chemical modification methods including affinity reagents he showed the role of a thiol group in the activity of this enzyme.



One of his significant achievements came towards the end of his two-decade old career at TIFR about the regulation of brain hexokinase by its product-inhibitor glucose 6-phosphate. Inhibition of this enzyme by glucose 6-phosphate is an important regulatory step in the control of glycolytic flux in the brain. Although the regulation of brain hexokinase by glucose 6-phosphate has been known for a long time, the mechanism and the site of regulation have been controversial. His work using difference spectroscopy, binding experiments and other biochemical studies showed that the regulatory binding site for glucose 6-phosphate on brain hexokinase is formed upon binding of the substrate glucose, and this enzyme has no pre-existing allosteric site for glucose 6-phosphate[1]. This work also showed that the de-inhibitor inorganic phosphate also binds to the same allosteric site to which glucose 6-phosphate binds.

Kenkare had pioneered in this country, the use of magnetic resonance methods for studying the structure and function of enzymes. He had used water proton relaxation rate measurements and electron spin resonance spectroscopy to show that brain hexokinase has two divalent cation-binding sites for manganese. One of these sites on the enzyme binds the metal directly whereas the second site is through the nucleotide ATP and involved in catalysis. Using FTNMR spectroscopy he showed that there is lack of anomeric specificity in the interaction of brain hexokinase with sugar substrates. These studies led to construction of a partial map of the active site of brain hexokinase.

Kenkare enjoyed his research work and he advised others to enjoy their work. I have pleasant memories of my association with him as his PhD student at TIFR. I remember my first meeting with Kenkare. He asked me a few questions, giving me enough time to answer. He tried to test my thinking ability and my knowledge about enzymes. My training as a researcher started on that day. I did my research in his laboratory on the chemical modification of brain hexokinase, and two-dimensional peptide mapping of this enzyme, and I learnt many things from him. During my PhD (1975–80) he was away for two years (1977–79) at Vanderbilt University as a Visiting Scientist, but we discussed the progress of work and ideas through long letters (there was no e-mail).

Not many people know that Kenkare was an excellent teacher. He used to teach Bombay University students, sometimes at TIFR. I attended some of those classes at TIFR. He used to explain difficult concepts in a simple and interesting way which kept the audience attentive.

1. Mehta, A. *et al.*, *J. Biol. Chem.*, 1988, **263**, 15492–15497.

GHANSHYAM SWARUP

CSIR-Centre for Cellular and Molecular Biology, Hyderabad 500 007, India
e-mail: gshyam@ccmb.res.in