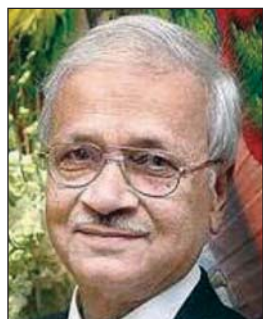


### Dilip Mahalanabis

(12 November 1934–16 October 2022)



On 16 October 2022, the world lost a public health icon and a visionary who played a major role in demonstrating the effectiveness of oral rehydration therapy (ORT), which has been hailed the ‘most important medical discovery of the 20th century’ in the 5 August 1978 issue of the *Lancet*.<sup>1</sup>

Dr Mahalanabis was born in Kishoreganj, Bengal (now in Bangladesh), and graduated from Calcutta Medical College. He was known particularly for his pioneering work in the use of ORT in patients with cholera and other severe diarrhoeal diseases, especially in children. He was the first Indian to be selected as a registrar for the Queen Elizabeth Hospital for Children in London. He joined the Johns Hopkins Centre for Research and Training in Kolkata in 1966, where he applied scientific methodology to measure the loss of salts and water in cholera diarrhoea, particularly in little children, and partook in studies of ORT then ongoing in adults. His most consequential contribution came during the Bangladesh Liberation War in 1971 when an epidemic of cholera struck a refugee camp across the border in West Bengal. Thirty per cent of these cholera victims died. Mahalanabis went immediately to the area, gathered the essential ingredients to make up ORT from the local market (glucose, salt, baking soda), and put them in cellophane packets sufficient for one litre of solution when dissolved in water. With hardly any intravenous solutions available and only two medical personnel to attend, he showed family members how to administer ORT (using cup and spoon) to these cholera patients to replace the rehydration fluids that would typically be given intravenously. To reassure the families who begged for ‘saline’ (that is, intravenous fluid), he called ORT, ‘oral saline’, saline given by mouth.<sup>2</sup> The mortality rate in the sprawling camp where he worked was 3.6%, one-tenth of that elsewhere. His work demonstrated the power and effectiveness of ORT even in these dire circumstances. Treating dehydration from diarrhoea with ORT was possible and could be administered by family and patients while minimizing the use of intravenous fluids; however, it still took several years before his findings were generally accepted.

Agnimita Giri Sarkar (Institute of Child Health, Kolkata, India) told *The Lancet Infectious Diseases* that ‘the work of Mahalanabis contributed to saving nearly 54 million lives, particularly children, over a span of three decades’. She added that ‘there are few innovations in medical sciences which reduced mortality from a disease by 90%. ORT alone is responsible for substantially improving the mortality data of paediatric population globally. It remains as an example of a simple, highly cost-effective innovation.’<sup>2</sup>

Dr Mahalanabis later joined the World Health Organization’s Diarrheal Disease Control Programme, where he planned research and trained research workers in developing countries. His work helped provide the basis for WHO/UNICEF’s eventual recommendation that a single oral rehydration solution formula is safe and effective for children and adults, in either cholera or acute non-cholera diarrhoea. Then from 1988 to 1995, he joined the International Centre for Diarrheal Disease Research,

Bangladesh (ICDDR,B) as Associate Director and Head of Clinical Research. He came at a crucial time when the Centre needed to encourage the independent research of Bangladeshi clinical scientists and attract international specialists who would advance the Centre’s growing programme. More than that, as testified by Mohammed Abdus Salam, Senior Scientist, ‘The Dhaka Hospital with increasing number of patients receiving absolutely free services required increasing operational funds. However, it was becoming increasingly difficult to get money from the core donors of the organization. Under the circumstances Dr Mahalanabis initiated the Hospital Endowment Fund (HEF) to partially support the hospital’s operations cost; thus, reducing the burden on the Centre’s Core funds. This involved securing grants and raising money from various events for the Fund.’

After returning to India from Bangladesh, Dilip and his wife Jayanti founded the ‘Society for Applied Studies’ (SAS), a not-for-profit research organization, through which Dilip continued to mentor young scientists and conduct research. In 2004, Dilip invited Nita Bhandari, who was at the All India Institute of Medical Sciences, New Delhi, to work through SAS. Thereafter, he along with his close friend, M.K. Bhan (President, SAS till his illness in 2019), continued to guide research work consistent with the organization’s vision of creating ‘A world with healthier babies, children, mothers, and families through solutions from research and practice’. The research conducted by SAS found its way into national and global policy. Seminal works include the clinical trials for the first indigenously developed rotavirus vaccine (ROTAVAC®),<sup>3</sup> now a part of the national immunization programme in India; the benefits of kangaroo mother care in reducing neonatal mortality and morbidity in low birth-weight infants,<sup>4</sup> and more recently, the Women and Infants Integrated Interventions for Growth Study (WINGS)<sup>5</sup> that demonstrated a marked reduction in low birth weight and stunting at two years of age by delivery of integrated interventions throughout preconception, pregnancy and early childhood.

For his work, Dr Mahalanabis was elected to the Royal Swedish Academy of Sciences (1994); and shared in the Pollin Prize in Pediatric Research (2002) (USA) and the Prince Mahidol Prize (2006) (Thailand). He was also posthumously conferred the Padma Vibushan, the second highest civilian award by the Government of India. The Indian Council of Medical Research called him ‘a legend’. Dr Gagandeep Kang (Christian Medical College, Vellore) said, ‘[Dilip-da] had a passion for public health that he communicated to everyone he interacted with’. Mahalanabis, she said, stood out as the unassuming champion for affordable and accessible care for the poor. ‘He inspired a generation of young people in Bengal, India, and beyond,’ she told *The Lancet Infectious Diseases*.<sup>2</sup>

Mahalanabis was predeceased by his wife Jayanti. He died at a private hospital in Kolkata at the age of 87 suffering from lung infection and other age-related ailments. Those of us privileged to have known Dilip remember his modesty, gracious courtesy, generosity and gentle humour.

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### S.K. Shankar

(27 September 1947–5 September 2022)



On 5 September 2022, I sent Teacher's Day wishes on WhatsApp to Professor S.K. Shankar. There was no response. A few hours later, someone informed me that Dr Shankar had passed away that morning. With his passing, truly, a colossus of neuropathology has left us. I must state that Professor Shankar was not ever my teacher in a formal sense. But everyone who interacted with him always learnt something from him.

And it was not just pathologists, neurologists and neurosurgeons who benefited from his knowledge and his largesse; schoolchildren and researchers—past and future—fall into this list as well.

Shankar graduated from Andhra Medical College in 1969 and then did his MD in pathology at the All India Institute of Medical Sciences (AIIMS), New Delhi. After working there from 1974 to 1979, he joined the National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, where he rose through the ranks and served in many roles including that of Professor, Dean, Acting Director and Vice Chancellor. In 2021, he suffered a stroke and was bed-ridden for the year after that. It was not easy for him—or his caregivers—as he felt stifled, as if under arrest. For a more detailed obituary, you would do well to read what his mentee, Anita Mahadevan has to say.<sup>1</sup>

His greatest contributions were the formation of the Human Brain Tissue Repository ('Brain Bank')<sup>2</sup> where researchers could make use of fresh and fixed brain and related tissues for research. As is to be expected, Dr Shankar willed his own brain to the Brain Bank. The other concept dear to his heart was the Brain Museum (also the only such museum in India), which is open to the general public. Dr Shankar delighted in having schoolchildren visit the museum and see—and feel, with their own hands!—human brains (Fig. 1).

If I saw an unusual pathology, or had a diagnostic problem related to neuropathology, I would send the slides to him for an informal opinion. His response, in each case, was prompt and complete in every aspect. When I emailed him about a mature ovarian teratoma that contained neural tissue, his reply to me had this statement 'One needs to have an open mind and



FIG.1 Professor Shankar with a group of schoolchildren

observe things as they appear. Biology is an open book.' I had to occasionally request him to perform some immunostains, often gratis, for my cases, as I did not have access to those particular stains. One of them was particularly interesting.

In January 2017, I had seen an appendix, which seemed to resemble the features seen in lymph node toxoplasmosis. This was something that had not been reported in the literature, to my knowledge and was, quite honestly, an apparently bizarre diagnosis. I emailed Dr Shankar one morning and requested that he perform the stain for me, if only to satisfy my curiosity. He agreed to and called me up in the evening to say that he had seen the slide and did not agree with my diagnosis. However, the very next day, about noon, he phoned me and said: 'Your immunostained slides are ready. This is toxoplasmosis. Please call up your patient immediately and ask him to come back to the hospital for treatment before the disease spreads to the heart or kidneys.' We subsequently published this case.<sup>3</sup> I wished to thank him, but he was clear: acknowledgments were to be given to the Brain Bank, not to him. This was in keeping with the philosophy of the man. He wanted the Brain Bank (and the Brain Museum) to achieve its potential in science, in education and in research; he was not interested in personal benefit or accolades.

I used to meet him once every year or two, when Professor Sunil Pandya would come to NIMHANS for a meeting. The three