Vibrio cholerae, there are at least thirty other bacterial pathogens which cause various diseases in humans…'. This is an unrealistically low number. Another ambiguous statement in the chapter titled 'Endotoxin or Exotoxin?' is 'All pathogenic bacteria produce toxins through which they exert their effect'. All pathogenic bacteria produce toxic substances; these are known as toxins if they possess antigenic properties. Secondly, toxins are not the sole mechanism of pathogenicity. Finally, in the past two decades, cases of non-toxigenic *Corynebacterium diphtheriae* causing infections, have been reported.

S. N. De is an unsung hero, but M. S. S. Murthy's tune is off-key.

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PERSONAL NEWS

M. K. Bhan (1947–2020)

India lost a titan of Science and Medicine on 26 January 2020. Professor Maharaj Kishan Bhan, Former Secretary of the Department of Biotechnology (DBT), Government of India, was in the true sense, a born leader. A leader who led by example. Born in 1947, the year India attained Independence, the spark of life left him when the country was celebrating its 72nd Republic Day – he was destined to be part of the country's history, both in life and death.

A true leader, a visionary, a passionate scientist and doctor and above all a wonderful human being, full of joy and happiness, he has given love and affection to all around him.

Born and initially raised in Srinagar (Kashmir), Dr Bhan was raised in an environment of curiosity and exploration, right from childhood. Brought up in an environment that encouraged philosophical conversations and thoughts, he moved from Srinagar to Pune to complete his MBBS degree from the prestigious Armed Forces Medical College. He pursued an MD (Paediatrics) from Postgraduate Institute for Medical Education and Research in Chandigarh, to take on what became his lifelong passion-child health and nutrition. His faculty position at the All India Institute of Medical Sciences (AIIMS) and later post-doctoral research focused on diarrhoeal diseases and child nutrition.

Dr Bhan's career spanned a spectrum of different activities and roles that only a few people would have managed as successfully as he did. Beginning as a trained paediatrician, to becoming an academic clinician at AIIMS, to becoming a Science Administrator at the Department of Biotechnology, his adaptability and perseverance made him successful in each of his roles. He contributed to each of the fields that he was involved in. In recognition of his exemplary research, he was awarded the prestigious Shanti Swarup Bhatnagar Prize for Science & Technology in 1990 and the coveted Padma Bhushan in 2013, for outstanding contributions to governance and civil service which stand out from several other awards he has received from scientific institutions and agencies.

Dr Bhan's most well-known legacy is, of course, the discovery of the strain of the rotavirus vaccine in India. In 1985, when he began his endeavour towards developing the Rotavac, he found a weakened strain of rotavirus in new born babies admitted to AIIMS which was not causing any disease – isolated the strain and called it 116E. Around the same time, Roger Glass, from the US National Institute of Health (NIH) also began characterizing similar strains of rotaviruses that did not result in diseases. After exchanging notes and working tirelessly for decades, Dr Bhan brought together government, NGOs, international organizations and private players to develop the life-saving vaccine. The formulation of the Rotavac witnessed the unique amalgamation of multi-institutional and multi-agency collaboration which is seldom seen around the world and went on to become the first indigenously developed vaccine for the children in India and the globe. The vaccine today is credited with saving the lives of thousands of children around the globe.

However, Dr Bhan's legacy does not end there.

From having given the country its first indigenous Rotavirus vaccine to having created the most vibrant translational biotech ecosystem, he has been a driving force. A great institution builder, he transformed the landscape of biotechnology in our country – from bringing in the whole ecosystem for translational research to developing new institutional governance models and also new models of partnership and funding. Creation of autonomous institutes like InSTEM, NIBMG, THSTI, NABI, the NCR and Bangalore Biocluster and the Public Sector Company – BIRAC, we owe all our success in public–private partnership to his vision. He was a great mentor and our best critic. We built international partnerships and many capacity building initiatives with his vision which focused on empowerment.

Apart from a formidable intellect, for which he is well known, his ability to bring together people to collaborate and work across disciplines was phenomenal. Being a firm believer in collaborations

and translational research, his ability to forge partnerships allowed some of the most productive partnerships in DBT. One successful partnership between the DBT and Bill & Melinda Gates Foundation led to the start of the Grand Challenges India (GCI). GCI was created with the mandate of bringing not only national, but international stakeholders onto a single platform to fund innovations that could dramatically change the lives of people in India and beyond.

Another interesting conversation with Mark Walport, the then Director of the Wellcome Trust brought into existence the most successful – DBT–Wellcome Trust India Alliance.

There are many more such examples.

His ability to engage with the young made him one of the best mentors. He would constantly challenge the young researchers to move out of their comfort zone and take up new innovative ideas. His constant advice was to collaborate and take risk.

At heart Dr Bhan was always a teacher and he mentored several researchers, students and anyone who met him with a thirst for knowledge. He created an additional family with his community of students, mentees and colleagues around the globe, some of them who fondly address him as 'Raj'. He was highly respected and adored for his humility, generosity and leadership. Notably, most of his relationships were built on his ideology of generating ideas, mutual respect and a tremendous desire to help in making better the lives of people and more importantly children sans borders.

Dr Bhan was an embodiment of a noble human being – be it to his professional colleagues or peers, he radiated warmth to people around him. His professional demeanour touched hundreds of lives at AIIMS, in industry and across the health community at large – not only in India but across the globe. The discovery of the Rotavac vaccine will continue to save millions of lives in India and beyond along with which the name of Bhan will continue to be echoed for times to come.

The Department of Biotechnology and the entire scientific community will remain indebted to him for his contribution in setting a road map of growth for the sector.

I have had the good fortune of being associated with Dr Bhan for over 20 years. I worked with him during his term as Secretary DBT from 2004 to 2012 and thereafter continued working with him on many exciting new ideas. Having worked so closely with him has been an experience which will always stay with me.

A true visionary, Dr Bhan leaves behind a legacy and inspiration which will remain unmatched in the domain of public health, but nevertheless will continue to guide the work we have been doing, we are doing and we would be doing in the days to come and to tread on the path of his vision.

With his loss today we have a void which cannot be filled. Our greatest tribute to him will be to continue on the path he has led us and take forward his vision.

RENU SWARUP

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