

# FLUORIDE

Quarterly reports

## In Memoriam

**ANDEZHATH KUMARAN SUSHEELA, , ASHOKA FELLOW, PHD, F.A.Sc., F.A.M.S., F.N.A.Sc. (INDIA): A DISTINGUISHED SCIENTIST, A RELENTLESS ADVOCATE FOR PUBLIC HEALTH, AND A PIONEER IN THE FIELD OF FLUOROSIS RESEARCH 1937–2023.**

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IN MEMORIAM



Professor Emeritus Andezhath K Susheela, Ashoka Fellow, Ph.D., F.A.Sc., F.A.M.S., F.N.A.Sc. (India).  
1937–2023

**PROFESSOR (DR) A.K. SUSHEELA: A DISTINGUISHED  
SCIENTIST, A RELENTLESS ADVOCATE FOR PUBLIC  
HEALTH, AND A PIONEER IN THE FIELD  
OF FLUOROSIS RESEARCH**

It is with deep sorrow and a heavy heart that we bid farewell to a distinguished scientist, a relentless advocate for public health, and a pioneer in the field of fluorosis research, Professor (Dr) A.K. Susheela. Her passing on September 18, 2023, has left an indelible void in the world of medicine, and her legacy will continue to inspire generations to come.

Professor Susheela was a prominent figure at the All India Institute of Medical Sciences (AIIMS) in New Delhi, where her dedication to understanding and addressing the critical issue of fluorosis led to ground-breaking discoveries. Her tireless efforts in research and advocacy brought the debilitating effects of excessive fluoride exposure to the forefront of public consciousness.

Her ground-breaking studies illuminated the devastating impact of fluoride contamination on the health of countless communities, particularly in rural India. Professor Susheela's work was not confined to laboratories alone; she ventured into affected regions, bringing attention to the suffering of those who lacked access to clean water.

**Her** research and persistent advocacy led to critical policy changes and interventions aimed at mitigating the effects of fluorosis. Her work was instrumental in shaping public health initiatives and raising awareness about the importance of safe drinking water.

Beyond her professional accomplishments, Professor Susheela was a compassionate and dedicated mentor who nurtured the talents of numerous students and researchers. Her passion for knowledge and her

unwavering commitment to alleviating human suffering inspired all who had the privilege of knowing her.

Professor (Dr) A.K. Susheela's contributions to the field of medical science and her relentless pursuit of a healthier, fluorosis-free world will forever remain a testament to her profound impact on society. Her legacy will continue to guide the path toward a better, safer, and more compassionate world.

As we mourn her passing, let us remember the extraordinary life she lived and honor her memory by carrying forward the torch of her dedication and commitment to improving the lives of those in need.

Our deepest condolences go out to her family, friends, colleagues, and all those whose lives she touched. May her soul rest in peace.

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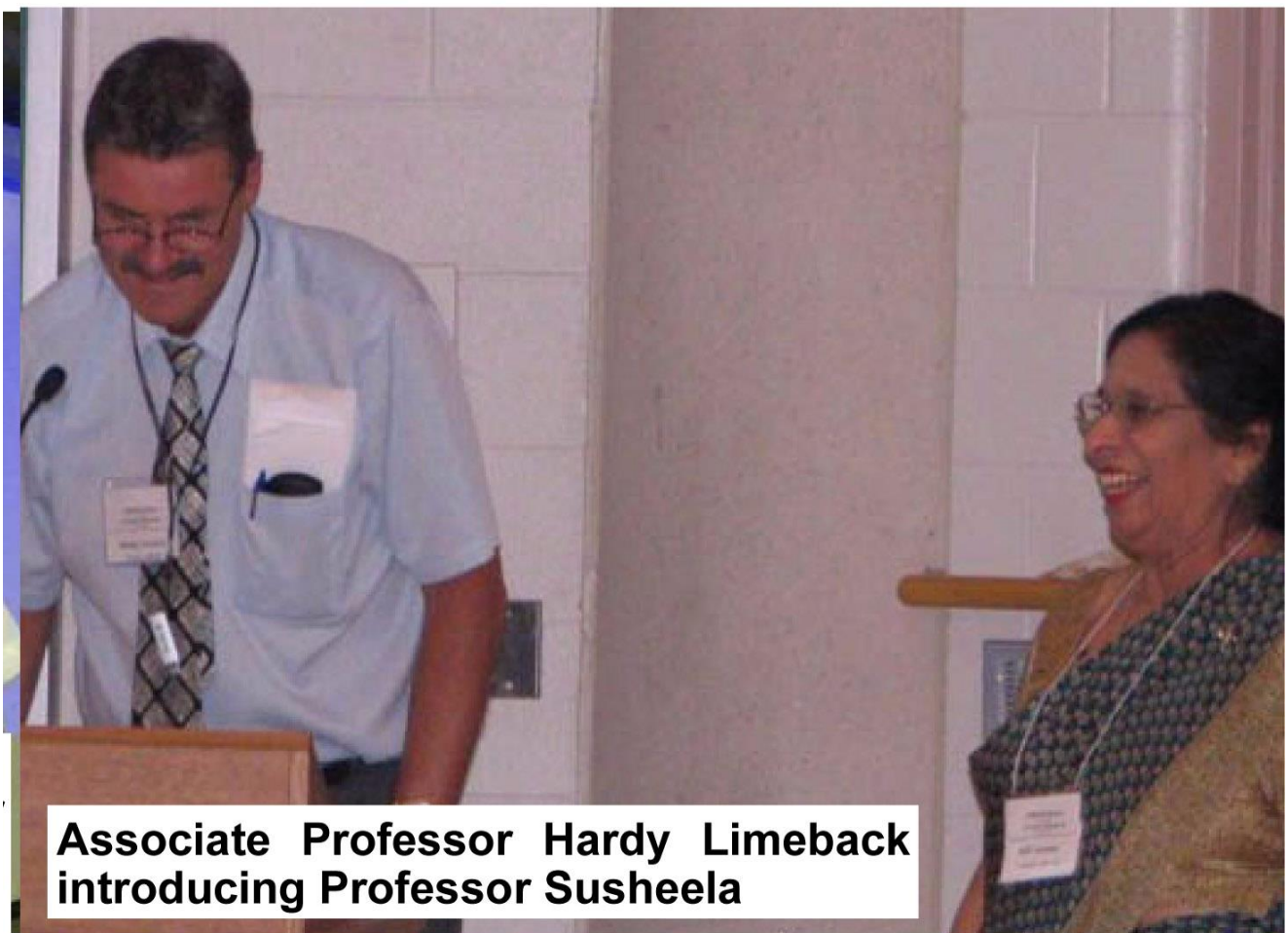
Arjun Khandare and Andezhath Susheela

**PROFESSOR AK SUSHEELA: AN INTELLIGENT  
CARING WOMAN WHO HELPED THE  
FLUORIDE-POISONED PEOPLE  
IN INDIA**

Professor Susheela was one of the reasons I explored fluoride toxicity in my research at the Faculty of Dentistry, University of Toronto. Her research on the effects of fluoride on people in endemic fluorosis areas of India was highly cited in our US NRC 2006 Committee on Fluoride in Drinking Water and I had the great pleasure of hosting her in Canada In 2008 at the 28<sup>th</sup> ISFR conference. What an amazing woman she was; so poised,

dignified, intelligent and caring. Helping fluoride-poisoned people in India was a monumental undertaking but she dedicated her life to the cause. The world is a better place because of you, Andezhath.

Professor Emeritus Hardy Limeback  
Associate Editor, *Fluoride*  
University of Toronto, Toronto  
ON, Canada.



Associate Professor Hardy Limeback introducing Professor Andezhath Susheela at the XXVIIIth ISFR conference at the Mississauga Campus of the University of Toronto, August 7-10, 2008



Participants in the *Niagara: see the falls taste the wine* tour at the Niagara River near the Niagara Falls. (From the left) Dianjun Sun, Sheik Mohamedally, Umit Demeril, Sohan Singh Sankhala, Bihari Singh, Kim Labuschagne, Jennifer Luke, Hardy Limeback, Tilmann Wurtz, Euridice Prado, Jundong Wang, Jianhua Hong, AK Susheela, Yanhui Gao, Xiaoyan Yan, Ruiyan Niu, Quanmei Zheng, Guifan Sun.

Professor AK Susheela, 5<sup>th</sup> from right in front row, with participants in the *Niagara: see the falls taste the wine* tour at the Niagara River near the Niagara Falls, as part of the XXVth ISFR Conference, Toronto, Canada, 2008.



Participants on the *Niagara: see the falls taste the wine* tour at a gourmet lunch in Niagara on the lake. Umit Demeril, Professor Susheela, Associate Professor Hardy Limeback, Lynne Limeback, Tilmann Wurtz, Euridice Prado, Dr Jennifer Luke, Kim Labuschagne.

Professor AK Susheela, 2nd from left, with participants in the *Niagara: see the falls taste the wine* tour at the Niagara River near the Niagara Falls, as part of the XXVth ISFR Conference, Toronto, Canada, 2008.



Professor AK Susheela, 3rd from left, with participants in the Niagara: see the falls taste the wine tour at the Niagara River near the Niagara Falls, as part of the XXVth ISFR Conference, Toronto, Canada, 2008.



Professor AK Susheela at the XXXIInd Conference, Chiang Mai, Thailand, November 25-28, 2014.



Professor AK Susheela on a field trip at the XXXIIInd Conference, Chiang Mai, Thailand, November 25-28, 2014, listening to Dr Sunsanee Rajchagool.

**PROFESSOR (DR) ANDEZHATH KUMARAN SUSHEELA: A TRAIL-BLAZER IN RESEARCH INTO THE NATURE OF FLUOROSIS AND THE EDUCATION OF THE PUBLIC AND THE HEALTH PROFESSIONS ON THE CONDITION**

Professor (Dr) Andezhath Kumaran Susheela, a major contributor to fluoride research, died in New Delhi, India, on September 18, 2023, at the age of 86.

She was born on July 31, 1937, during the 2nd World War, in Kuantan, Malaysia, the daughter of Kumaran Krishman Andezhath and Devyani Ammal Kunnathully. She was brought up initially in Kuantan, Malaysia, and then in Singapore. She moved to India when India was liberated from British rule in 1947. Schooling and early years in college were in Christian Missionary Convents in Kerala. However, for graduate and post-graduate studies she moved to Gujarat and studied at the Maharaja Sayajirao University. After obtaining her doctorate degree in 1964, she moved to take up a research assignment in the prestigious All India Institute of Medical Sciences (AIIMS) in New Delhi. It was the beginning of an academic career which lasted for 34 years in Government Institutions and other institutions.<sup>1</sup>

She contributed significantly to medical science research, with studies on muscular dystrophy and fluorosis, and was associated with eminent clinicians and scientists across the globe including Sir John Walton (U.K.), Ade Milhorat (U.S.A.), Carl Pearson (U.S.A.), Victor Dubowitz (Sheffield, U.K.), Humio Tsunoda (Morioka, Japan), Charles Baud (Geneva), and Philippe Grandjean (Denmark). She considered that the Indian physicians, Amarjeet Singh, SS Jolly, and CG Pandit described the disease of fluorosis in great detail and that their classical descriptions of the clinical manifestations were

still valid. She stated that she had the good fortune to work with SS Jolly and George Waldbott in the early seventies and eighties and learnt a great deal about the disease from them.

She was chosen by Mrs. Vijaylakshmi Pandit, the Indian Commissioner in the U.K. to spend a year in the Regional Neurological Centre with Prof. J.N. Walton in 1966, on a Nuffield Foundation Fellowship in medical sciences. Her mentor, Lord Walton, fine-tuned her skills and talents in muscular dystrophy research and rewarded her with a munificent grant from the Muscular Dystrophy Group of Great Britain to establish her laboratory in India. She was also associated with Dr. Ade. Milhorat, Director of the Institute for Muscle diseases in New York, U.S.A., in 1968 and explored some issues in murine muscular dystrophy. She was also awarded a grant from the Muscular Dystrophy Associations of USA.<sup>1</sup>

On her return to India in 1970 with the 2 grants-in-aid, her laboratory in the AIIMS was fully equipped for muscular dystrophy diagnostic procedures and research. Tests were established for the detection of carriers in the female siblings of affected males. Her laboratory became a referral centre for South-East Asia.<sup>1</sup>

Years later, she shifted her focus to a neglected public health problem in India, involving the management of patient with fluoride poisoning and fluorosis. This journey of research on the nature of fluorosis and its management began in the mid-1970s and lasted for the rest of her life. Her research on the disease of fluorosis disease, led to the publication of 10 books on the disease, several book chapters, and the publication, in prestigious journals, of 120 scientific papers on diverse issues related to fluoride and fluorosis. It was a highly challenging time for her and she travelled the length and breadth of India with her team to train medical faculty and students on all aspects of the disease and its mitigation. She also travelled to other nations, viz., U.K., U.S.A., Canada, Japan, and Australia, to enlighten the policy planners in these countries on fluoride toxicity and to recommend that they withdraw 'Fluoridation' as a public health policy for the people in their respective nations because of the adverse health effects of fluoride. This led to a major policy shift in some countries, including in the U.K and the US Environmental Protection Agency (EPA).<sup>1</sup>

The author was elected for an Ashoka Fellowship for her life time achievement, awarded by the historian and lawyer, Bill Drayton of the Ashoka Foundation, Washington. She was also a Fellow of the National Academy of Medical Sciences, a Fellow of the Indian Academy of Sciences and a Fellow of the National Academy of Sciences.<sup>1</sup>

She found that the medical fraternity in India considered it was evident on scientific grounds that the consumption of safe water (with F <1.0 mg / L) would be good for gaining relief from the disease of fluorosis as fluoride destroyed teeth, bones, and all soft tissues. However she found that they were unaware of the reality on the ground which was that the disease was highly prevalent in India due to fluoride entry to the body through a variety of sources besides water. Fluoride disrupted hormone production, inhibited the actions of enzymes, and was a neurotoxin. This led to patients suffering from a wide range of diseases. The neglect of the disease, was to the extent the patients suffered until death. She found the medical fraternity were unaware of how to detect and prevent the disease. With her persistent efforts in educating doctors and health workers and sensitizing policy planners, there were some positive changes over the years in India but she felt there was still a long way to go.<sup>1</sup>

In the year 2000, she felt strongly that there was a need for a text book on fluorosis to teach fluorosis to medical students and she published *A treatise on fluorosis*. The voluminous findings on fluorosis and linked disorders generated over a period of two decades led to bringing out of the 4th revised edition of her book with the new title *Treatise on fluorosis and linked disorders*. The Treatise



was the result of consultation across the globe. Prof (Dr.) A.K. Susheela, in her orbit changing approach, addressed fluorosis from various avenues and made a dedicated effort, to introduce positive changes in the prevention and treatment of fluorosis for the benefit the human society. As the Executive Director of the Fluorosis Research Rural Development Foundation, a research and consulting foundation and Centre of Excellence for Fluorosis, she focused on increasing knowledge and the management of issues in fluoride poisoning and fluorosis and pioneered approaches to fluorosis management. She was hopeful that her *Treatise on fluorosis and linked disorders* would show a path to follow for economic and social development for those with fluorosis and a strategy to achieve for long term goals that would allow the extraordinary to be achieved.<sup>1</sup>

Her other interests were gardening, cooking, and reading.

Her professional career included:

1957: Bachelor of Science, India;

1959: Master of Science, India;

1964: Doctor of Philosophy, India;

1963-1964: Junior research officer, All India Institute Medical Sciences, New Delhi;

1964-1967: Senior research officer, All India Institute Medical Sciences, New Delhi;

1967-1968: Nuffield Foundation travelling fellow, United Kingdom;

1967: Postdoctoral fellow American Muscular Dystrophy Association, New York;

1970: Grantee, Muscular Dystrophy, Group of Great Britain;

1972: Grantee. American Muscular Dystrophy Association;

1969-1982: Assistant Professor, All India Institute Medical Sciences, New Delhi;

1982-1989: Associate Professor, All India Institute Medical Sciences, New Delhi;

1989-1997: Professor, All India Institute Medical Sciences, New Delhi;

1987: Fellow Indian Academy of Sciences, Bengaluru;

1988: Fellow National Academy of Medical Sciences (India);

1997-2023: Director of programmes, Fluorosis Research and Rural Development Foundation, New Delhi;

2011-2023: Associate Editor, *Fluoride*

2019: Fellow National Academy of Science, India.

Listed in Marquis Who's Who as a noteworthy histochemistry educator

I met Andezhath Susheela at the XXVIIth ISFR conference in Beijing, People's Republic of China, October 9-12, 2007. She felt it was important to provide the public with information on fluoride toxicity and described how she stood outside churches to give out one page information sheets on fluorosis to departing worshippers. She encouraged me to do something similar in New Zealand which has community water fluoridation in many cities and towns. In response I wrote a short book, *Fluoride Fatigue. Fluoride poisoning: is fluoride in your drinking water—and from other sources—making you sick?* which was published on January 1, 2008.<sup>2</sup> I met her again at the XXVIIIth ISFR conference in Toronto, Canada, in 2008.

Andezhath Susheela was dedicated to improving the understanding of both the public and the health professionals on the nature of fluorosis and how it could be managed through finding safe

water sources, eliminating dietary items containing fluoride, eating antioxidant and vitamin rich fresh fruit and vegetables, and avoiding fluoridated dental products. She considered that the sale of fluoridated toothpaste should be illegal in India. She noted that the recommended upper limit of fluoride in drinking water in India was a Country Standard of 1.0 mg/L which was lower than the World Health Organization (WHO) upper limit guideline, set in 1984 and reaffirmed in 1993, of 1.5 mg/L and that the Indian Country Standard had a rider that the “lesser the fluoride the better, as fluoride is injurious to health.” In the 4<sup>th</sup> edition of her book she noted the ‘take home’ message for the professionals and the policy makers of India was that they should not refer to the practices of the “West” but promote the scientific developments in the field of fluoride and fluorosis. She considered that fluoride was a poison, and although slow acting it could cause a variety of health problems, particularly in the Indian context, when the diet is deficient in a number of nutrients as the body was then unable to combat the poisoning effects of fluoride. She noted however that “Trace amounts entering through sources which are beyond anyone’s control needed to be overlooked.”<sup>3</sup> Another view of hers was that promoting the fluoridation of dental products in India should be considered as a “crime.”

The sentence written by Susheela “Trace amounts entering through sources which are beyond anyone’s control need to be overlooked” may appear puzzling. However it appears in all four editions of her treatise so she had several opportunities to correct it if it was a mistake. In the first two editions she proceeded it with the sentence “The ‘take home’ message for the professionals of India is that they should not follow the practices of the ‘West’ but should practise the recent scientific developments in the field of Fluoride and Fluorosis which have led to the concept that fluoride should not enter the body as far as possible.” The words “as far as possible” express the same idea of overlooking what is beyond anyone’s control. I think she was encouraging a focus on doing what was practical and not attempting the impossible. Professor Susheela developed practical and detailed methods to reduce fluoride exposure and considered these were adequate to prevent to the development of fluorosis. When she spoke of overlooking trace amounts entering through sources which were beyond anyone’s control she was not referring to fluoride in water sources, diet, and dental products which were able to be controlled. She saw access to safe drinking water that met the India Country Standard of an upper limit of 1.0 mg F/L, with the rider the ‘lesser the fluoride the better, as fluoride is injurious to health’ as being fundamental in prevention. Similarly, she saw that avoiding fluoride rich foods, such food flavoured with rock salt (fluorite rock powder, CaF<sub>2</sub>), and fluoridated dental products, such as fluoridated toothpaste, as being basic requirements.

She noted that advising to consume fruit and vegetable in plenty did not pay dividends and that it was the consistent and persistent efforts to alter a dietary regime that led to recovery to some extent. Behavioural and attitudinal changes had to be developed and the patients had to practise their revised dietary regime on a daily basis. Simple and easy to practise procedures were developed and introduced. She noted that it was important to provide diet editing and diet counselling to a patient, whether male or female, in the presence of an individual who cooked the food for the family. She advocated a group counselling with all being sensitized. She considered that showing a basket full of fruits, vegetables and green salad leaves and giving advice to consume these on a daily basis did not yield good results. Instead she developed detailed packages for breakfast, lunch, and dinner to use alongside the diet editing (removing high fluoride foods) and diet counselling (advising on which fruits, salad greens, vegetables, and spices to use).

She was a trail-blazer in research into the nature of fluorosis and the education of the public and the health professions on the condition. She will be missed.

Bruce Spittle

Editor-in-Chief, *Fluoride*

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#### **PUBLICATIONS BY AK SUSHEELA**

Fourteen of the 1070 references in the review *Fluoride in drinking water: a scientific review of EPA's standards* were papers in which AK Susheela was one of the authors (Committee on Fluoride in Drinking Water, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies, National Research Council of the National Academies. *Fluoride in drinking water: a scientific review of EPA's standards*. Washington, DC, USA: The National Academies Press; 2006).

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