

History : Remembering the Stalwarts

Yellapragada Subbarow : The forgotten Indian Physician-Scientist

Dr YellapragadaSubbarow was one of the greatest scientists India has ever produced. In terms of scientific output, he is in the same legion as Satyendranath Bose, HomiBhaba and Jagadish Chandra Bose (or even greater, as later discussions will show). But sadly, he is still an obscure historical figure in India and the current generation of learners are almost unaware of this founding father of modern Indian scientific research. No Indian school text book ever mentions the name of this pioneering scientist.

Dr Rao was born in Bhimavaram of modern Andhra Pradesh in 1895. He hailed from a very poor family and his education at Madras Medical College had to be financially supported by his friends and relatives.

After passing with an LMS certificate, he first joined an indigenous Ayurvedic medical college as a lecturer in Anatomy. Then, in 1922, he arrived in Boston, USA for further studies after being inspired by a visiting physician from USA, John Fox Kendrick. He enrolled in the Harvard school of Tropical Medicine for a diploma course. After passing, he joined the same institution as a junior faculty member. He started working with another scientist named Cyrus Fiske and together, they developed a method for estimation of phosphorus in body fluids and tissues. This was considered a landmark discovery in the field of biochemistry and YellapragadaSubbarow's name was entered into contemporary biochemistry text books in the western world. His published paper, titled "The colorimetric determination of phosphorus" is one of the most cited publications in the history of biochemistry and has received more than 20000 citations till date.

But Subbarow's research activities were just beginning. Within a very short span of time, he made his most important discovery, describing the function of ATP in human body. This research earned him a PhD degree and a fellowship from the Rockefeller



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foundation. However, he was still denied a permanent post at Harvard Medical School. Then, he left Harvard and joined the Lederle laboratories at Pearl River, New York as a biochemist. There, he did more spectacular work like artificially synthesizing folic acid, inventing the anti-folate, methotrexate, describing the mechanism of action of diethylcarbamazine (Hetrazan), extracting vitamin B12 from pig liver and discovering the first tetracycline antibiotics. Any one of these achievements should have been enough to guarantee a permanent place in the history of science but sadly, YellapragadaSubbarow remained in obscurity for the next half century. His research on anti-folates paved the way for future targeted

chemotherapy and transformed the vista of pediatric oncology. The landmark paper published in NEJM in 1948 by the legendary Sydney Farber acknowledged the support of Dr Subbarow in that path-breaking research. Lederle laboratories also successfully marketed Aminopterin, the precursor to methotrexate for over a decade, till other chemotherapy drugs came to the market.

Dr Subbarow was also involved in some biochemical research for the US military during the 2nd world war. But naturally, the details of that research are classified. However, his discovery of Hetrazan was one of the results of that military-centred project. This drug has saved the lives of millions all over the world over the next six decades.

Dr Subbarow had authored over 100 brilliant research papers. Some of his early research was destroyed out of jealousy by an American colleague. Thus, some nucleotides discovered by him had to be rediscovered by other western scientists years later (according to Dr George Hitchings). Surprisingly, he never filed patent claims for any of his discoveries. Thus, he shunned the commercial side of science and only concentrated on tireless work to relieve human

suffering. His scientific research is saving millions of lives with cancer, nutritional deficiency or infections every year.

Dr Subbarow had another fascination: he wanted to delve into the scriptures of ancient Indian system of medicine and bring out forgotten cures for contemporary diseases. As discussed earlier, he started his life in an Ayurvedic college. During that short tenure, he published some articles on Ayurvedic system. He had also written a manuscript titled, "Hindu Pharmacology" which was never published.

Dr Subbarow himself was an introvert person and avoided publicity. Compared to other flamboyant scientists of his generation like Einstein, Linus Pauling or Ronald Ross, who were media savvy, Subbarow liked to work quietly in the background. It was only in 1995 that the India government first recognized his contribution to science with a commemorative postage stamp (picture in this article). However, although forgotten in his country of birth, he did get some recognition abroad. After his death, one newspaper of New York described him as "one of the most eminent medical minds of the century". He was revered by the academics in USA. For example, in 1953, in the USA, a newly discovered species of fungus was named after

him: *Subbaromyces splendens*. It was only when a book "In Quest of Panacea" was published in 1987, that Indians woke up to the achievements of this great scientist. Due to his untimely death at the age of 53, he did not get any opportunity to publish an autobiography. Thus, we can only know about his life from his colleagues and friends. Recently, after publication of the Pulitzer-winning book, "The Emperor of all Maladies" in 2010, the name of Subbarow has become somewhat familiar to the educated section of Indian society. However, still there are very few books or documents about this great scientist which are available in India. There are a few books like: -

- Wizard of Wonder Drugs: National Institute of Nutrition, Hyderabad

- In Quest of Panacea: SPK Gupta

But the author of this article (Rudrajit Paul) found that both the books are notoriously difficult to procure. However, there is a wonderful online resource (<https://www.ysubbarow.info/index.html>) which can be used by those interested in medical history. Some papers and documents of his life are archived at the Nehru Museum and Library, New Delhi.

BOOKS EVERY DOCTOR SHOULD READ : 1

Aequinimitas : With other addresses to Medical Students, Nurses and Practitioners of Medicine.

**— Sir William Osler,
New York : The Blakiston Company**