

YELLAPRAGADA SUBBAROW: DISEASES WERE HIS ENEMIES*

K.V. Gopalakrishnan

Prof. K. V. Gopalakrishnan is a professor at the Indian Institute of Technology (IIT), Madras since 1962. His speciality is internal combustion (I.C.) engines. He has done extensive research work on alternative fuels for I.C. engines including alcohols, hydrogen, etc., and control of air pollution from engines.

In this article, Prof. K. V. Gopalakrishnan highlights the life and contributions of Dr. Yellapragada Subbarow, a pioneer in the field of modern medicine. In spite of his great contributions, the author points out that Subbarow is not widely known, even in his homeland India. The article takes us through the numerous hardships and academic setbacks faced by Subbarow during his early life and how he overcame those with determination. Through his research work, how Subbarow contributed towards successful development of crucial medicines for tropical spruce, filaria and plague, saving countless lives during that time have been highlighted in the article. The author alludes that Subbarow's story serves as an inspiration, bringing about the profound impact of medical advancements on human health and life expectancy.

Keywords: Disease, Research, Medicine

The average life expectancy of a citizen of the Roman Empire (that is about 2000 years ago) was less than thirty years. Today in modern nations it is approaching eighty. In our own country, the life expectancy has doubled in the 50 years since independence. The main reason for this is the spectacular advance in the field of medicine. Many diseases like influenza, typhoid, malaria, etc., which used to claim millions of lives in earlier centuries have been conquered by modern medicine. The medical pioneers who made this possible, Edward Jenner, Louis Pasteur, Alexander Fleming and others have had a more powerful effect on human history than many proud kings, soldiers and statesmen.

The world has, on the whole, gratefully acknowledged the debt that it owes to the great medical pioneers. But there is one Indian in this august group, who inspite of his great contributions is not widely known, even

in his own country. He is Dr. Yellapragada Subbarow. He was responsible for developing medicines that conquered tropical sprue, filaria and that scourge of the Middle Ages, plague. As one American author puts it many of us live today only because Subbarow lived.

Subbarow was born on 12 January 1895, in Bhimavaram in West Godavari district of Andhra Pradesh, as the third of the seven children of his parents. His father was an official in the Revenue Service who had to retire prematurely because of poor health. Consequently, Subbarow had to experience the hardships of poverty in his boyhood. The motivation for breaking out of its shackles and being successful was provided for Subbarow and his brothers by their strong-willed mother, Venkamma. She drove them hard and made tremendous sacrifices for them. But Subbarow also came to resent her domineering ways even while acknowledging her vital role in his life.

**First published in Vol. 37(1), March 1999*

Subbarow attended the Taylor School in Bhimavaram. Spiritual inclinations surfaced in him quite early in life and were to leave their mark permanently on his character. The concept of '*Sanyas*', with its renunciation of emotional ties and dedication to serving the common people attracted him greatly. He was not particularly devoted to his studies and failed in the matriculation examination in July 1911. He was packed off to Rajahmundry, to the house of his elder brother Purushotham, a school teacher and freedom fighter in the hope that, he would become more studious. But Subbarow again failed in the matriculation test, though he came to develop a deep affection and respect for Purushotham. He also came to acquire from his brother a sense of identification with the budding Freedom Movement.

Subbarow was then sent to the Hindu High School in Triplicane, Madras. His father passed away in January 1913. When Subbarow came to his native village on this occasion he realised at last how much his mother was sacrificing to get him educated. Deprived now of even the slender support of her husband, she sold the last of her jewels to enable Subbarow to continue his studies. The sobered son now returned to Madras and put in the effort to pass his matriculation examination. He next entered the Presidency College and passed the intermediate course.

The question arose now for Subbarow as to the next step to take. Much to the surprise of his family he decided to study medicine. But he did not reveal what his real motive was. Knowing that *Sanyas* was not open to him (since it depended on the consent of his mother) he chose medicine as the next best way to serve humanity.

In 1915, Subbarow was selected for the MBBS course in Madras Medical College and took up his studies in earnest. Not an inexpensive course even in those days, it imposed a severe financial burden on his family. A few friends helped him as much as they could, but it was clear that he would need much more substantial resources to complete his studies. He chose a way which was not in tune with his nature, but quite common in India in those days, he decided to get married.

Subbarow mother was delighted with her son's consent to get married, but for a different reason. She thought it would cure him of his 'madness for religion'. On condition that the marriage would be consummated only 3 years after his graduation, Subbarow married Seshagiri, hardly 12 years old, on 10 May 1919. Married life was to prove a sad experience for the bride on account of Subbarow's all-consuming passion for his work.

It is hard for us to imagine today how much the British colonial masters lorded it over our countrymen in those days. They believed that they had a divine right to rule us and show of any cultural assertion aroused their ire. Subbarow, with the nationalist spirit infused by his elder brother, wore white khadi laboratory overcoats. That made one of his British professors sneer: 'Why don't you wait until Gandhi becomes Viceroy?' Subbarow, blessed with a gift for repartee replied 'Gandhiji will not condescend to be Viceroy'. The vindictive professor saw to it that Subbarow was awarded the lesser LMS certificate instead of MBBS.

Subbarow did not have the slightest intention of entering private practice and making money. Developing new medicines

through research to benefit mankind was his consuming ambition, India then offered no scope for this and he was averse to doing it in England. The United States of America thus became the logical choice. Subbarow applied in May 1921, to the Harvard University seeking admission to their post-graduate course in tropical medicine. Late in June he received the admission letter. But he had no hope of taking it up without financial support from some charitable organisation in India, for which he depended on the influence of Purushotham.

Subbarow plans however collapsed due to a sudden double tragedy. Subbarow found Purushotham wasting away with tropical sprue when he visited him. All of Subbarow's efforts to save him proved futile. Eight days after Purushotham's death, news reached Subbarow that his younger brother Krishnamurthy was also dead due to the same disease. A fierce anger had welled up in Subbarow when he watched Purushotham ravaged by this incurable disease. He vowed to himself to discover a medicine to conquer his brother's killer.

With his hopes of going to the USA shattered, Subbarow decided to join the Madras Ayurvedic College as a faculty member. His interest in Ayurveda stemmed partly from its being an Indian system and partly from the fact that it had saved his life earlier from a bout of diarrhoea after allopathic medicines had failed. But he soon realised that research in Ayurveda was well nigh impossible, due to lack of resources in India. Only the rich West could provide him the means to tackle the dreaded diseases he had in mind and that too only through the allopathic system.

Having made up his mind, he once again applied to Harvard University in October 1922,

and received the offer of admission in April, 1923, for the course starting in September of that year, but without any scholarship. So Subbarow had to once again frantically run around for financial support. He secured from a private charity, with some difficulty, the promise to support him partially for 3 years, but the actual payment could not be made immediately. With his father-in-law's help he managed sufficient funds for his kit and passage money, with something left over for managing the early days in America.

His colleagues and relatives bid a fond farewell to Subbarow. To his young wife naturally depressed to see him go, he promised to return within three years. But destiny was to take a different turn. Subbarow never again saw his wife.

On 29 September 1923, Subbarow boarded the streamer S.S. Kashgar at Bombay. But British officialdom was not ready to send him off uneventfully. A British Customs Officer asked him sneeringly why he needed an American degree. Subbarow tart reply: 'to come back and take away your job.'

Subbarow ship dropped him off at Marseilles, from where he travelled by train across France and then by ferry to London. He then set sail for the USA arriving in New York on 26 October (this month long travel may be compared to today's jets taking us from India to the USA in less than 24 hours!). He arrived in Boston, the home of Harvard University, the same night by train.

Subbarow was left with very little money when he reached Harvard. The USA was not then used to large numbers of Asian students studying in their Universities and since the domination of the white nations was

then at its zenith, a wall of racial prejudice greeted Subbarow in his new place. But every society has its share of large-hearted men. His American professor, Dr. Richard Strong helped Subbarow financially to pay his fees and meet his living expenses in the initial stages. Subbarow, a fully qualified doctor, willingly took up the mental job of washing out urinals and bedpans in a hospital since it helped him to meet his living expenses. Another good American, a young doctor, anonymously helped Subbarow financially.

The most valuable lesson Subbarow learnt in the USA was about the process of research. The importance of being systematic and preserving in the search of cures for serious diseases was driven deep into his consciousness. He greatly admired the American system of giving freedom to researchers and providing them the means for doing their work, even when there was no guarantee of ultimate success.

In May 1924, Subbarow passed his examinations and in June obtained the Diploma in Tropical Medicine. A year of severe hardship was the price that he cheerfully paid for it.

Subbarow did not return to India after obtaining his Diploma. He was convinced that only by continuing to work in the USA he could hope to achieve his life's aim, the conquest of diseases. After undergoing a summer course in biochemistry he started working as a research assistant. His first assignment was developing a method for the determination of Phosphorous in human tissue under guidance of Dr. Cyrus Fiske.

After a strenuous effort Subbarow developed a method which became widely used under

the name '*Fiske-Subbarow*' test for this purpose. A research paper describing this method was published in the December 1925, issue of the '*Journal of Biological Chemistry*'. He was highly elated by this first success. His financial position also eased considerably due to the receipt of the first instalment the Indian scholarship and by his being made a regular research scholar in the university. True to character, Subbarow spent the extra personal money in buying a microscope for his research.

Subbarow gained considerably in stature and recognition as a research worker due to his first success. He was given better facilities and also given full freedom to pursue his line of research. A freedom that he much appreciated and felt thankful for. He threw himself heart and soul into his next work, the determination of the biochemical changes that take place during muscle exertion.

Subbarow research established that the concentration of what he and associates named *phosphocreatine* was an accurate indication of the muscle condition. A resting muscle had a relatively high concentration, which went down rapidly as the muscle fatigued. But after the muscle was rested it regained its original level. These results were published in detail in the April 1927, issue of '*Science*' published by the American Association for the Advancement of Science. American students began to look with awe on this coloured alien in their midst.

Subbarow good work led the Rockefeller Foundation to offer him a Fellowship in 1927. Since the stipend was much higher than what he was getting his financial problems at least were solved. But four years had elapsed since he left India and his wife and relatives were

naturally getting increasingly distressed by his obsession with his work, to the exclusion of his family obligations. But that is the way Subbarow was.

Subbarow continued his work on phosphocreatine's role in muscle function and secured his Ph.D. degree in June 1930. He did make one sincere attempt to return to India by trying to secure a suitable position in the All India Institute of Hygiene and Public Health in Calcutta, set up with the aid of the Rockefeller Foundation. But the British were unwilling to yield any high position to Indians and a Briton was selected instead (who promptly left the institute 5 years later when offered a post in Britain).

Subbarow next tackled the problem of pernicious anaemia. An arduous search of years finally yielded Vitamin B12 extracted from liver, as the cure for this deadly disease. Subbarow's results led to a wide search for other vitamins. He must be considered as one of the outstanding pioneers in the field of vitamins.

Subbarow, though ambitious in his aims, was strangely indifferent to claiming credit for his work. In order to help Prof. Fiske, who had supported him in hard times, to secure a promotion, Subbarow officially assigned all the credit for the *phosphocreatine* work to Fiske, minimising his own.

Subbarow gradually came to realise that the giant pharmaceutical firms could offer him much better research facilities than Harvard University. The fact that the pay would also be much higher did not weigh with him. Accordingly in April 1940, he moved over to the Lederle Laboratories at Pearl River in New York state. Characteristically, Subbarow offered to work for half the salary the company was willing to pay him; if they would

give him the specific research facilities that he desired. These facilities were provided but William Brown Bell, the Chief of Lederle and a Quaker gentleman, did not take advantage of Subbarow's naive offer on salary.

Subbarow had never forgotten the killer of his two brothers, tropical sprue. It was an elusive and tenacious enemy, but Subbarow finally pinned it down with the synthesis of folic Acid, which proved very effective against this deadly disease. The pain and rage that had haunted him since the death of his brothers at last left him.

As an Indian, Subbarow had witnessed the ravages of Filariasis, which in its later stages leads to grotesque swelling of the legs. This too he conquered with *Diethylcarbamazine*. It is still the most effective medicine against this disease.

By this time a new field was opening up. *Penicillin* had been accidentally discovered by Alexander Fleming in 1928, and successfully produced in quantities by the mid forties due to the efforts of Howard Florey and his team in Oxford University. It had dramatically saved the lives and limbs of thousands of soldiers in the closing stages of the Second World War. Since *penicillin* is basically produced from a mouldy type of plant (a kind of mould spreads on stale bread, as we all know), it stimulated a vigorous search all over the world for moulds that could yield similar "antibiotics".

Subbarow naturally was not one who would be left out of such a race. With the vast resources now at his command, he directed an extensive testing of thousands of types of moulds found in the earth, on decaying vegetables, etc. This drudgery paid off spectacularly, resulting in the ultimate development of *Tetracyclines*, a broad-spectrum antibiotic that is today widely

used all over the world. During our recent Surat Plague epidemic, for example, it was the medicine most in demand. Thus plague, which had terrorised the world for centuries (also known as Black Death) was finally tamed.

Subbarow next targets were highly ambitious—cures for polio and cancer. He did achieve some success against a particular type of cancer, leukaemia. Teropterin, the medicine that he developed for this could produce significant remissions in cases of Leukaemia. But these challenges were too great for even Subbarow and though he did not know it, the shadows were closing in for him.

On the morning of Monday, 9 August 1948, Subbarow did not turn up for work. Since they knew him to be an incurable workaholic, his associates were worried and late in the afternoon when they entered his apartment, they found him dead from a massive heart attack. The shock was all the greater since he was apparently in good health and never complained of any of the classical symptoms of heart trouble. His body was cremated as per the wishes of his family and the ashes scattered on rivers and seas. Thus, came to a premature close (he was only 53 years old) a brilliant and dedicated career.

Subbarow was one of those people 'with a mission in life'. He regarded diseases as his

personal enemies. Finding cures for dreaded diseases alone mattered to him. Everything else, be it his family or even his personal health, was secondary and deserved to be neglected or repudiated if it clashed with his main aim. He sacrificed much and suffered much. His wife and other family members suffered equally because of his obsession with his work. The sole gainer was humanity at large, delivered from the clutches of several diseases because of his efforts.

Subbarow never visited India during the quarter of a century that he lived in America. But he remained at heart always an Indian and never became an American citizen. What he valued was the splendid opportunity for research that America offered. Money he did not care for and as for name he was self-effacing to a fault.

His countrymen, largely unaware of his contributions, are only now beginning to realise the impact of his work and becoming proud of it. A commemorative stamp was released by the Indian government on 12th January 1995, to mark the centenary of his birth.

But the most effective tribute Indians can pay Subbarow is through more of our young men and women, following his example in dedicating themselves to the service of their fellow men.