SACHCHIDANANDA BANERJEE

(23 November 1910 - 18 February 2004)

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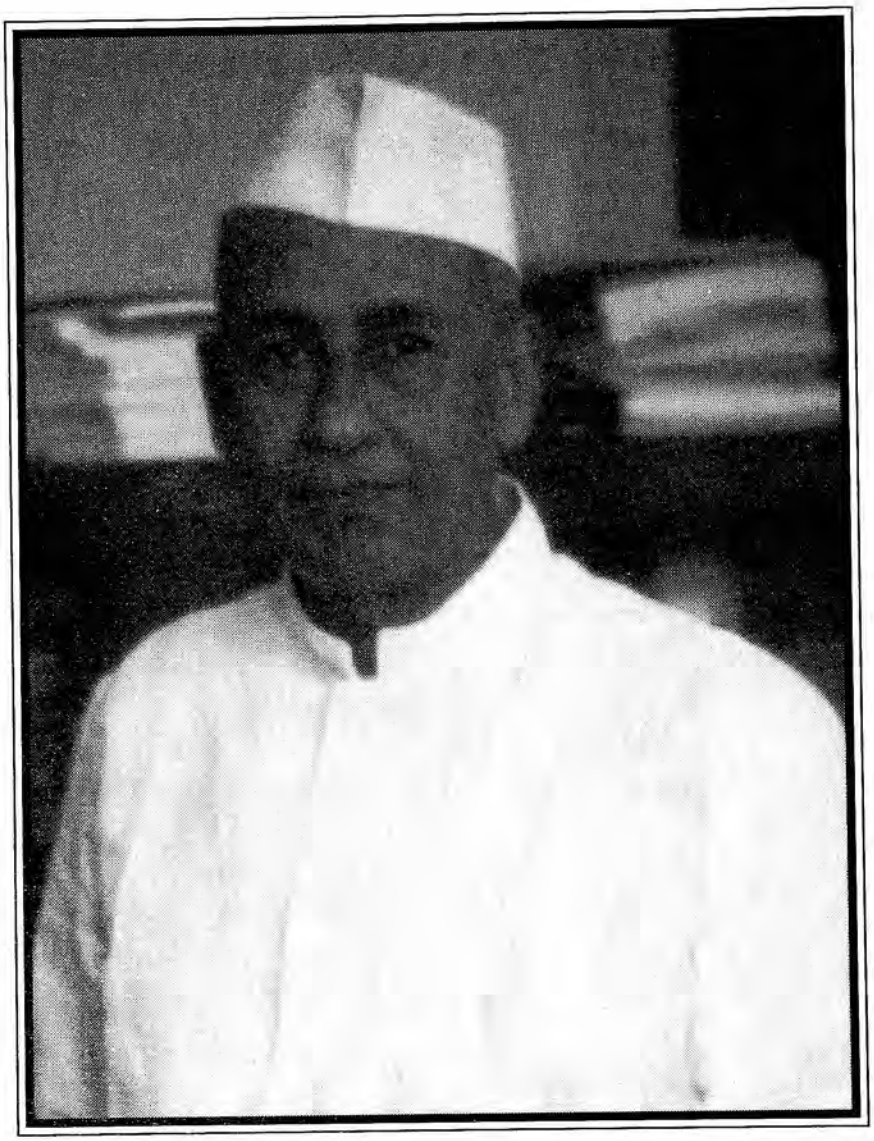

Sachchidananda Banerjee

SACHCHIDANANDA BANERJEE

(1910 – 2004)

Elected Fellow 1952

FAMILY BACKGROUND AND EARLY EDUCATION

SACHCHIDANANDA BANERJEE was born on November 23, 1910 in his ancestral home at Nalahati, a village under P.O. Dainhat and PS Katwa in the Burdwan district of West Bengal. His father Sri Sadananda Banerjee BA worked as a Settlement Officer under the office of the Directorate of Land Records, Govt. of Bengal. He had four sons and five daughters; Professor Banerjee was fourth in the order. He was admitted in the Dainhat English High School in class IV. He came from a Hindu brahmin, orthodox, middle-class and educated family. His maternal grandfather Sri Kalipada Chatterjee was a distinguished pleader. One of his maternal uncles Sri Amalapada Chatterjee was a Professor of Mathematics at TNJ College, Bhagalpur, Bihar while the another Sri Nirmalapada Chatterjee was a Chief Chemist in East India Pharmaceuticals Works Pvt. Ltd., Calcutta. These two had immense influence on the educational background of Professor Banerjee throughout his career. Professor Banerjee passed his matriculation examination in 1927 from the Dainhat school and was placed in the first division. He was very proficient in mathematics. Sri Hrishikesh, the mathematics teacher of the school, was an idol to him. The Headmaster of his school Sri Satkari Chatterjee inspired him in nationalism in those pre-independent days of India. Sri Rangalal Banerjee, a famous bengali poet known for his revolutionary verses who also influenced the work of immortal poet Sri Michael Madhusudan Dutta, was Professor Banerjee's great-great grandfather. This family background also inculcated a sense of nationalism in him. He started to wear Khadi from his early school days.

After his matriculation, Professor Banerjee joined the ISc classes at City College, Calcutta. His maternal uncle Nirmalapada started his research work on colloid chemistry under Professor JN Mukherjee in the same year and stayed with Professor Banerjee's family sharing the same room with him. Inspired and motivated by his uncle, Professor Banerjee decided to built up his carrier in chemistry so that he too could carry out research work in chemistry after passing his MSc examination. Thus, a seed of desire and inclination to do full-time research work was sowed in his mind in 1927 itself. In 1928, another important event took place. The Annual Indian National Congress Session was held at Park Circus, Calcutta, with Pandit Motilal Nehru as its President and Pandit Jawaharlal Nehru as its General Secretary. Sri Subhas Chandra Bose (Netaji) as G O C of a volunteer corps was in charge of the

management. Professor Banerjee attended the two-days Session and was overwhelmed by the deliberations at the Congress. From that time he started to wear dhoti and punjabi (both khadi) only, which he maintained till his last day in this world. In 1929 he passed ISc examination with distinction in chemistry being first amongst the students of the City College but his dream to read chemistry at a higher level was not fulfilled. As desired by his father, he had to join the Carmichael Medical College (presently RG Kar Medical College) to study the medical curriculum of six years duration. In its preliminary university examination, Professor Banerjee stood first in chemistry and received the Dr. Chunilal Bose silver medal for his excellence. After passing the first MB examination, he sought permission from the University of Calcutta to appear at the BSc examination with honours in physiology, chemistry and botany being the pass subjects. He was granted the permission as a non-collegiate student and to do the practical classes in the medical college itself. In 1933 he passed the BSc examination with second class honours standing first in order of merit.

In 1935, he passed his final MB examination and stood first in surgery. Due to financial stringency he could not go abroad for a higher studies. He preferred to join the MSc course in physiology at Presidency College, Calcutta, keeping in mind his dream to be a research scientist. He passed this examination in 1937 standing first in first class and received the University gold medal. Professor Banerjee was married just before his final MB examination in 1935 as arranged by his father. His father-in-law Sri Bibhuti Bhusan Mukherjee was Assistant Deputy Director General, Post and Telegraph, Govt. of India at that time, who became a financial advisor to the Govt. of Nepal afterwards. The marital responsibility prompted Professor Banerjee to start a low-profile medical practice at Calcutta along with his MSc study. Initially he used to charge his patients only the cost of medicines prepared by himself in his own dispensary. His first son was born in 1936, second son in 1939 and a daughter in 1941. In 1939 when his father retired from service, his medical practice got considerable momentum so that he used to meet all his family expenses from his personal income. As the medical practice did not occupy the whole of his time, he decided to undertake research work for his doctoral degree. He met the legendary Professor Biresh Chandra Guha in January 1938 and expressed his desire to work with him. In 1933 when a Student's Union was formed in Carmichael Medical College, Professor Banerjee was made its Literary Secretary. He invited Professor Guha once to speak at a gathering of students and teachers of the college. Professor Guha's inspiring talk on 'Some Nutritional Considerations in India' kindled in him a strong desire to work in the same field. Professor Guha was his examiner also at the M.Sc. examination in the biochemistry paper who gave him the highest marks both in theoretical and practical papers. Naturally Professor Guha showed his keenness to accept him as a research scholar.

PROFESSIONAL CAREER

When Professor Banerjee joined Professor Guha's laboratory in the department of applied chemistry of Calcutta University, Professor Guha was trying to isolate 'ascorbigen', the combined form of ascorbic acid, from cabbage at that time. Professor Banerjee suggested that he would like to see whether the same compound was present in the human and animal urine also. In 1939 he was appointed as the Nutrition Officer of the Student's Welfare Committee of the Calcutta University for one year and received the Lady Tata Memorial Trust Research Fellowship for two years. He performed several nutritional studies on the diet consumed by the hostel students of Calcutta at that time.

Professor Guha arranged for his appointment as honorary lecturer in applied chemistry in the same year. He used to teach vitamins and hormones to the MSc students in applied chemistry who had applied biochemistry as a special paper. Though he spent more than four years in this department, no concrete problem could he pursued which was worthy for a doctoral thesis. Moreover, one had to work independently to submit a thesis for DSc degree. So he applied for Dr A Mitra Research Scholarship in diabetes at School of Tropical Medicine, Calcutta stating that he intended to study the role of vitamin C in diabetes. He was selected and joined the post in April, 1942 leaving the department of applied chemistry with mixed feelings. He started to work on the specified problem after overcoming the initial hurdles. He worked day and night even on those days of bombing by the Japanese during the second world war. On the basis of this work as well as his earlier independent work carried out in the department of applied chemistry, he submitted his thesis *entitled Certain Aspects of Vitamin C Metabolism* to the University of Calcutta for the award of a DSc degree on January 23, 1943 (Netaji's birthday).

The mandatory initial recommendation for submission of the thesis was made by Professor Guha and Professor BN Ghosh. He continued his research in diabetes further to explore its unknown etiological factors using alloxan. In early 1944 he was selected for the award of Ghosh Travelling Fellowship by the University of Calcutta to carry on research work at New York and Madison in USA. He boarded a warship going to USA from Bombay in November 1944 and reached Los Angeles in the West Coast of USA via Melbourne after 24 days. Strengthened by a financial assistance from Watumul Foundation, Los Angeles, he reached New York and joined Professor Vincent du Vigneaud in the Department of Biochemistry of Cornell University Medical College, New York. He developed a methodology to estimate alloxan in biological fluids and performed some isotopic work using heavy water in this laboratory. Necessary facilities for carrying these projects were not available in India at that time. By end of April, 1945, he joined Professor Conrad Arnold Elvehjem in the department of biochemistry at College of Agriculture, Madison, Wisconsin, and studied the role of gluco-ascorbic acid as an antivitamin C. Both Professor du

Vigneaud and Professor Elvehjem were associates of Professor Guha when they all were at England and involved in nutritional research. Professor Banerjee came back to India in a ship carrying ammunitions and very few civilian passengers. While he was on board, the atom bomb destroyed Hiroshima in Japan on 6th August, 1945, and the Second World War ended as Japan surrendered on 9th August, 1945. While in USA Professor Banerjee received the information from the University of Calcutta that he was awarded the DSc degree in physiology, the first doctorate of physiology of the University.

After his return from USA Professor Banerjee rejoined his post at School of Tropical Medicine, Calcutta, only to find that his original laboratory had been occupied by some other departments. He was asked by the Director of the Institute to work under the professor of chemistry which he declined. He continued his work as independent research scholar till he was selected as Professor of Chemistry in the same institute by the Public Service Commission, West Bengal. But due to political turmoil in the country just before independence, his appointment letter was issued after much delay. He joined the post in November, 1947. Besides his research programme, he used to teach the postgraduate medical students the chemistry and clinical uses of vitamins along with other topics. He left this institute and joined Presidency College, Calcutta, in the senior education service of the Government as Senior Professor and Head of the department of physiology on September 8, 1948. This department was started in 1901 where physiology was taught as a basic science outside the domain of a medical college. With limited space and meagre contingent grant it was difficult to run the department in the way he wished. Gradually the academic atmosphere improved with the introduction of modern teaching methods and enforcing strict code of conduct for the students and teachers. Grants from the government and non-government organisations helped to start newer projects. MSc students in chemistry, biochemistry, physiology as well as MBBS students from different parts of the country started coming all the way to Calcutta to do research under the supervision of Professor Banerjee. This was the golden period in the history of the department. This was also a peak-time in Professor Banerjee's academic life.

Twenty-eight students obtained their doctorate degree from different universities working under his guidance during his tenure at Presidency College (1948-1959). The high standard of research done in this department was acknowledged nationally as well as internationally, In February 1959, Professor Banerjee left Presidency College and subsequently joined Sardar Patel Medical College at Bikaner, Rajasthan as Professor and Head of the department of physiology and biochemistry. The college was a new one and started functioning only after his joining. He had to develop the department from the scratch. Some of his research schemes along with their research scholars were transferred from Calcutta to Bikaner. Government of Rajasthan sanctioned sufficient money to equip the

department for smooth running of the research projects and teaching curricula. The department became famous for its research activities even before its first batch of MBBS students appeared for their first university examination. Students from different parts of the country joined the various research schemes in the department and endured the extreme climate of the desert city just to carry on their research work for doctoral thesis. Professor Banerjee was transferred to SMS Medical College, Jaipur, Rajasthan, in January 1964 from where he resigned from his post in June, 1965. During his tenure at Rajasthan (1959-1965"), eleven students received their PhD degree from different universities and there were seven postdoctoral research fellows working under his guidance.

In June, 1965, Professor Banerjee joined Dey's Medical Stores (Manufacturing) Ltd. a premier pharmaceutical house at Calcutta, as Chief Scientific Advisor with overall responsibilities for quality control and research laboratories. Though well equipped, no substantial research work was carried out in this organisation prior to his joining. Gradually the quality control methods of different drugs were modernised and basic research work started. Though initially Professor Banerjee accepted this job just for a change, he started liking the basic pharmacological work. A high standard of work especially with the antibiotics was performed in his laboratories. Seven workers obtained their PhD degree and three did their postdoctoral work under his guidance during his stay in this organisation. While working here, he was invited to participate in an international symposium on 'Comparative Haemoglobin Structure' held in Greece in April, 1966; he represented the scientists from Asia at the inaugural ceremony. He became a front page newspaper item there with his picture dressed in a "black sherwani, white khadi chost payjama, white khadi cap and black shoes. This was his official dress also in other foreign countries. Professor Banerjee left the pharmaceutical house in June, 1977 after completing a twelve-year contract with them.

HIS LAST DAYS

To remain active in life, Professor Banerjee started medical practice in Calcutta; he used to visit his native village also in weekends. The news that a foreign-trained old doctor attended the patients with very little remuneration spread in different villages in such a fashion that his village chamber was flooded with patients. To decrease the work load, he decided later to concentrate more on the treatment of the referred cases of diabetes. He kept his contact with the academic world by reading, writing review articles and delivering seminar lectures. From 1981 to 1985 he contributed sixteen popular articles in a leading Bengali daily 'Aajkaal' on nutritional problems. His contact with Presidency College was restored in 1992 when on its 175th anniversary celebration he was felicitated by the college as one of its outstanding teachers. In the same year the Alumni Association of Presidency College made him its life member, a member of its Executive Committee and finally its

President. His 90th birthday was celebrated by his students and the present-day students of Presidency College in 1999 in a grand fashion. He donated a part of his collection of books and journals with almirah to the Department of Physiology of Presidency College. In the same year, the ex-students of Sardar Patel Medical College, Bikaner, invited him to attend the 40th year of College Foundation Day Celebration as a special guest and made all necessary arrangement for his comfortable journey. He was overwhelmed with the kind of reception he got from the past and present students of the College even after 36 years of his departure from the college. He was the President of the Indian Ergonomics Society till his last days. The Society used to hold its monthly meeting in his residence to avoid inconveniences. A disciple of Swami Nikhilananda, the founder of Ramakrishna Vivekananda Centre at New York, Professor Banerjee believed in God. He was very much disciplined in his whole life. He used to finish his worship after taking an early morning bath before sunrise. He had a peaceful family life. All his children and grandchildren who stayed with him were highly educated, looked after him with utmost care and accepted him as the leader of the family with love and respect. He was very sad only when the independent identity of physiology as a fundamental basic science was denied in course of time by the Indian Science Congress, Indian National Science Academy and National Academy of Medical Sciences. In January 2003, his wife expired after a protracted illness. Within two weeks he suffered a heart attack but recovered gradually. On 18th February, 2004, he had another attack and succumbed to death within two hours. He died the way he wished.

SCIENTIFIC CONTRIBUTIONS

Work done in the Department of Applied Chemistry, Calcutta University (1938-1942)

1. ***Nutritive value of cooked diet:*** By analysing the cooked diet actually consumed by the students of the hostels in Calcutta, it was observed that the nutritive value of the diet consumed in the rainy season was poor while the same was superior during winter.

2. ***On Ascorbic Acid:*** Urinary excretion of ascorbic acid was low and combined ascorbic acid was relatively high in tuberculosis patients. Combined ascorbic acid disappeared from the urine after large doses of ascorbic acid supplementation in these patients.

   A solution of the blue dye 2:6 dichlorophenol indophenol when injected intradermally showed disappearance of the blue colour under different conditions. This test was found suitable for the assessment of ascorbic acid nutrition in persons with fair skin.

Work done in the School of Tropical Medicine, Calcutta (1942-1948)

3. ***On Ascorbic Acid:*** Scorbutic guinea pigs showed decreased glucose tolerance, diminished glycogen deposition in the liver, diminished insulin content of the pancreas, degranulation of beta cells and increase in the alpha cells of the Islets of Langerhans of the pancreas, increase in the size and number of islets in the pancreas and increase in the adrenaline content in the adrenals. The work indicated that vitamin C deficiency produced hypoinsulinism.

4. ***On Diabetes:*** In alloxan-diabetic monkeys and rabbits, the initial hypoglycemia found was due to the release of insulin from the pancreas after alloxan injection followed by hyperglycemia due to secretion of adrenalin. The degraded product of riboflavins prevented the diabetogenic action of alloxan. One gram of ascorbic acid per day for three weeks to the diabetic patients improved the tolerance and the urine became sugar free. No such action was noted after the administration of nicotinamide to these patients. A chemical method for the estimation of nicotinic acid in the presence of sugar was developed.

Work done in the Department of Physiology, Presidency College, Calcutta (1948-1959)

5. ***On the nutritive value of Pulses:*** All the vitamins except folic acid were found to be increased in pulses after germination. The biological values were also increased with a diminished trypsin inhibitor activity.

6. ***On Nutritional Survey:*** A detailed analysis of cooked diet consumed by the hostel students showed their average consumption was 64 gm of protein, 37 gm of fat and 388 gm of carbohydrate with a calorie intake of 2163: the vitamin and mineral content of the diet was found to be adequate. The study also included the determination of haematological picture, basal metabolic rate, vital capacity, different body measurements, and blood levels of glucose, cholesterol, alkaline phosphatase, inorganic phosphorus, total proteins and ascorbic acid to establish normal range of these parameters for metabolic assessment.

7. ***On Energy Metabolism:*** The formula of Dubois and Dubois was found unsuitable for the determination of body surface area in Indians. Based on actual measurement a suitable modification was made and a new nomogram was prepared so that body surface area could be calculated easily from the height and weight of the individual.

   By measuring basal oxygen consumption and composition of different fluid compartments in normal adult Indians, it was observed that basal oxygen consumption had significantly greater correlation with cell mass or cell solid than with the surface area of the body.

Energy intake and energy expenditure of laboratory workers (mild activity), workers in a spinning and weaving mill (moderate activity) and of rickshaw pullers (severe activity) were determined to establish a reference standard for the Indians.

8. ***On Ascorbic Acid and Insulin:*** Ascorbic acid deficient guineapigs showed lowered glucose tolerance, decreased levels of liver and muscle glycogen, high tissue contents of citric, malic and lactic acid, increased excretion of pyruvic acid, oxaloacetic acid, citric acid and malic acid, further aggravated after feeding butyrate, succinate, malate and citrate (only citrate having no effect on malic acid excretion), diminished excretion of alpha-ketoglutaric acid and the decreased activities of succinic, malic and lactic dehydrogenases of liver, kidney, brain, skeletal muscle and heart. All the values restored to normal level after insulin treatment.

   The deficiency of ascorbic acid did not seem to disturb the utilisation of fructose or galactose by guinea pigs.

9. ***On Diabetes:*** Fructose and galactose were removed from the blood very rapidly in both normal and diabetic rabbits and rhesus monkeys with their insignificant presence in the urine. The diabetic animals showed hyperglycemia and glycosuria after feeding with fructose and galactose.

   In diabetes mellitus, both the p-aminohippuric acid and inulin clearances were found to be normal.

10. ***On Cholera:*** Though there was no change in the oxygen content of the whole blood in patients suffering from cholera, they had a low level of plasma bicarbonate and a state of acidemia.

    The value of p-aminohippuric acid clearance diminished with unaltered inulin clearance in cholera patients.

11. ***On Infectious Diseases:*** High dehydroascorbic acid was found in the patients suffering from typhoid fever, meningitis, tetanus, small pox, chicken pox, and in pneumonia.

    Hyperfunction of adrenal cortex was found in patients suffering from infectious diseases as evidenced by increased excretion of urinary 17-ketosteroids and a low eosinophil content of blood after injection of adrenaline.

    Low plasma albumin with concomitant rise in the different fractions of globulin, a normal rate of disappearance of glucose from the blood and a defective utilisation of fructose were evident in infectious diseases.

    The rate of conversion of tryptophan into nicotinic acid and its final disposal was enhanced in small pox.

12. ***On Psychiatric Disorders:*** The whole body tissues were found responsible for biosynthesis of nicotinic acid from tryptophan in both men and rabbits while liver was responsible for the same in rats. Though the tryptophan metabolism in patients suffering from schizophrenia was found to be normal with normal serotonin level, high level of 5-hydroxyindolylacetic acid in urine after feeding tryptophan to these patients was observed. It was postulated that probably the rate of serotonin synthesis in this disorder was accelerated and the consequent accumulation of serotonin was responsible for the mental abberation.

    Improvement in the patient's condition after electric convulsion therapy was found to be due to adrenal cortical stimulation. Urinary excretion of 17-ketosteroids was very low in schizophrenia. Eosinopenic response to injected epinephrine was lower in mania and schizophrenia, higher in depression and normal in paranoia. Eosinopenic response to ACTH injection was also very low in schizophrenia.

13. ***On Ptereoylglutamic Acid (PGA) and Citovorum Factor (CF):*** Both PGA and CF were found diminished in the urine of the patients suffering from cirrhosis of the liver, typhoid fever, renal hypertension, acute malaria, influenza and nutritional anaemia. After feeding PGA to these patients, CF was less excreted in comparison to normal which was enhanced after ascorbic acid supplementation.

Work done in the Department of Physiology and Biochemistry, Sardar Patel Medical College, Bikaner, Rajasthan (1959-1964)

14 ***On Indian Camel (Camelua dromedarius):*** Normal values of different physiological parameters of Indian Camel were determined and found to be markedly different from that of other species. It had a higher serum volume, total body water and intracellular water in comparison to man. The electrophoretic mobility of camel haemoglobin was less than that in human and monkey. There was a minor competent besides the principal components in camel haemoglobin. The amino acid composition and its sequence were determined and it was designated as Haemoglobin Camel (Hb_{camel}). In position 1 of the beta-polypeptide chain valine was replaced by methionine, in 70 alanine was replaced by arginine, in 75 leucine was replaced by isoleucine and in 76 alanine was replaced by lysine when compared with human haemoglobin.

15. ***On Ascorbic Acid:*** Scorbutic guineapigs and rhesus monkeys showed normocytic and normochromic anaemia and leucopenia with diminution in the number of neutrophils and lymphocytes. Bone marrow showed an increase in normoblasts, pronormoblasts and basophilic normoblasts with diminution in granulocytes and lymphocytes suggesting a defect in the maturation from normoblasts to erythrocytes. Plasma iron and total iron binding capacity were low with low liver ferritin and high tissue hemosiderin. Iron supplementation

could not correct the hypoferimia though absorption of iron from the intestine was not found to be defective. An increase in free erythrocyte protoporphyrin, a low sideroblast percentage and a high hemosiderin content were observed in the bone marrow of the scorbutic animals. All these defects could be reversed by the dietary supplementation with ascorbic acid.

Tissue alkaline and acid phosphatase, ribonucleic acid and deoxyribonucleic acid were found to be diminished in scorbutic animals which could be reversed with dietary ascorbic acid. Insulin played the same role but with diverse effects.

Normal cholesterol, low triglyceride and high free fatty acid and other fractions of plasma lipids were the characteristic features of scorbutic guinea pigs. Ascorbic acid and insulin treatment could reverse all the defects. A hypocholesterolimic effect of ascorbic acid had been suggested. In scorbutic rhesus monkeys, there was decreased plasma insulin-like-activity and glucose tolerence, increased triglycerides and free fatty acid and a decrease in other fractions of plasma lipids which were all returned to normal level with ascorbic acid except plasma cholesterol and β-lipoprotein cholesterol, both remaining low.

Serum glycoprotein, mucoprotein, beta-lipoprotein and alpha globulin were increased and albumin, alpha-lipoprotein, $alpha_2$globulin with $beta_2$globulin were decreased in scorbutic guineapigs. Insulin treatment had diverse effects. Hexosamine content of some tissues increased in ascorbic acid deficiency where insulin treatment had no effect. But the low hydroxyproline content in kidney and cartilage of scorbutic animals were corrected by insulin treatment suggesting the role of insulin on collagen synthesis.

16. ***On Energy Metabolism:*** By actual measurement of the body surface area, new constants were suggested modifying the Du Bois and Du Bois formula for the Indians. For adult male it was 74.66, for adult female 78.28 and for children it was 70. Suitable nomograms were prepared accordingly.

The basal metabolic rates and respiratory quotients were determined in adult male, adult female and in children of different age groups. The relationship of the basal oxygen consumption to body weight, body weight 2/3 or body surface area did not differ.

There was no sex variation when the body composition of different fluid compartments were expressed as per cent of body weight and the basal metabolic rate was expressed in terms of fat-free body mass. Measurement of body size, growth and skinfold thickness in the children and youth of Rajasthan indicated good nutrition which was at par with the western countries. Energy intake and energy expenditure on different daily activities were found to be in balance in the medical college students. Ascending and descending stairs

required more energy than cycling; household work carrying in a sitting position required more energy than running or dancing.

17. ***On Nutritional Survey***: The cooked diet consumed by the students of a medical college were analysed chemically. The girl students consumed 46 gm of protein, 44 gm of fat and 213 gm of carbohydrate equivalent to 1438 Kcal. The boys consumed 60 gm of protein, 64 gm of fat and 332 gm of carbohydrate equivalent to 2227 kcal. Both the diets were adequate in vitamins and minerals. FAO recommendation seemed to be too high for Indians.

    Different fractions of plasma lipid were determined in these subjects. No sex difference was observed in these subjects in the fractions of plasma lipids except cholesterol and triglycerides which were found to be low in female subjects in comparison to male subjects, though their dietary intake of cholesterol was comparatively high.

18. ***On Experimental Nutrition***: Rhesus monkeys and chicks were fed unsaturated or saturated fat with or without cholesterol for a prolonged period and their plasma lipids and tissue distribution of lipids were determined at regular intervals. Hypercholesterolemia did not seem to depend on the saturation or unsaturation properties of the oils or the solubility of cholesterol in the oils. The study with chickens also indicated the same. Hypercholesterolemic monkeys showed decreased glucose tolerance and low insulin activity.

19. ***On Cardiovascular Disorders***: Plasma triglycerides, free fatty acid and beta-lipoprotein percentage were found to be increased in patients suffering from coronary artery disease. No changes observed in essential hypertensive patients' plasma lipids. Except lipoproteins and free fatty acid, all the plasma lipids were diminished in corpulmonale and congestive cardiac failure cases.

Work Done in the Research and Development Division, Days Medical Stores (Manufacturing) Limited, Calcutta (1965-1977)

20. ***On Tetracyclines***: Oral administration of oxytetracycline or tetracycline for ten days increased the plasma lipids in rabbits and rhesus monkeys. Pyrolidinomethyl tetracycline injection to rats, rabbits and rhesus monkeys showed diminished glucose tolerance, low hepatic glycogen and increased plasma and hepatic lipids.

    The rate of intestinal transport of chlortetracycline and dimethyl-chlortetracycline were found to be less than tetracycline and oxytetracycline. Calcium, magnesium and iron hindered the absorption of tetracyclines. Tetracyclines hindered the intestinal transport of glucose and amino acids actively possibly due to insufficient energy supply as a result of diminished ATPase activity.

21. ***On Chloramphenicol:*** The high lipid solubility and non-polar nature of chloramphenicol helped the absorption of the drug by passive diffusion through the lipid core of the intestinal mucosa. Glucosamine, acetyl glucosamine, acetyl methionine, calcium, magnesium and iron had no effect on the process, Polymorph A form of chloramphenicol was absorbed at a slower rate in comparison to its amorphous forms.

    Three simple methods were deviced for the estimation of this drug. One was a modification of the USP method while in the second method two chlorine atoms in the side chain of chloramphenicol were converted into alkali chloride and estimated potentiometrically. The third method employed microbiological assay which was found to be very specific for the active antibiotic. Chloramphenicol induced muscle relaxation directly without the mediation through adrenergic, cholinergic or histaminergic mechanisms. The hydrolytic product of the drug also showed the same effect. Both these two had a strong inhibitory effect on rat liver mitochondrial monoamine oxidase.

22. ***On Penicillin***: Maximum rate of absorption was observed with penicillin V potassium *in vivo* and with penicillin G sodium *in vitro*. The rate was minimum with ampicillin trihydrate. The antibiotics were absorbed from the intestine by a passive process.

23. ***On Ascorbic Acid:*** Diminished hepatic glycogen, glucokinase activity and phosphorylated intermediates with increased active phosphorylase, alpha-glucosidase and glucose-6-phosphatase were the characteristic features in scorbutic guinea pigs. The changes reversed to normal after recovery with ascorbic acid. Hepatic glycogen synthase remained unaltered.

    Diminished monoamine oxidase activity in liver and kidney and an increase in plasma adrenaline were observed in vitamin C deficient guinea pigs where the intestinal absorption of hexases did not hamper.

    Biosynthesis of ascorbic acid from D-glucuronolactone diminished in the liver of tetracycline and chloramphenicol treated mice where catabolism of ascorbic acid was also increased.

Work done in the Department of Biochemistry, Cornell University Medical College, New York, USA (1944-1945)

24. ***On Alloxan:*** A microbiological and fluorometric method was developed for alloxan estimation in the biological fluids by converting alloxan into riboflavin.

25. ***Ascorbic Acid and Transmethylation***: Tissues of the scorbutic animals contained less deuterecholine and deuterocreatine as compared to the values from normal animals.

Work done in the Department of Biochemistry, College of Agriculture, University of Wisconsin, Madison, USA (1945)

26. ***On Glucoascorbic Acid***: The clinical symptoms produced in rats and chicks fed a diet containing 10% glucoascorbic acid could not be prevented by the addition of 10% ascorbic acid in their diet The antivitamin C role of glucoascorbic acid was denied.

MEMBERSHIPS, AWARDS AND HONOURS AND ASSOCIATION WITH SOCIETIES

Ghosh Travelling Fellow, University of Calcutta (1944)

Fellow, American Association for the Advancement of Science (1951)

Fellow, National Institute of Sciences of India (now INSA) (1952)

Fellow, National Academy of Medical Sciences (India) (1971)

Foundation Fellow, West Bengal Academy of Science and Technology (1983)

Life Member, Indian Science Congress Association

Life Member, Indian Science News Association

Founder Member, Association of Physiologists and Pharmacologists (Ind)

Member, Physiological Society of India. Member, Biochemical Society, London

Member, American Chemical Society

Member, American Diabetic Association

Member, Society for Experimental Biology and Medicine, USA

Hon. Member, Harvey Society of New York, USA

Member, New York Academy of Sciences

Member, American Association for the Advancement of Science

Member, Nutrition Advisory Committee, ICMR (1950-1 955)

Chairman, Nutrition Advisory Committee, ICMR (1961-1963)

Member, Sectional Committee in Physiology, INSA (1960-1963)

Editor, Journal of Applied Nutrition (Indian Dietetic Association)

Editor, Bulletin of the Industrial Pharmacy Division, Indian Pharmaceutical Association

Past President, Section of Physiology, Indian Science Congress (1952)

President, Indian Ergonomics Society

Awarded Coat's Gold Medal of Calcutta University for best medical research (1945)

Griffith Memorial Prize in science of Calcutta University (1941 and 1943)

Professor NM Basu Memorial Award (1990)

General SL Bhatia Oration, APPI (1987),

Dr. Sunil Ch. Bose Memorial Oration, WBAS&T (1995)

Amulyaratan Lecturer, Calcutta University (1982)

BC Guha Memorial Lecture, 71st Indian Science Congress (1984)

Rajsekhar Basu Memorial Lecture, Vidyasagar College, Calcutta (1997)

Guest Lecture, APPI (1976) and Vidyasagar University (1993)

Professor NM Basu Memorial Lecture, 78th Indian Science Congress (1991)

BC Guha Memorial Lecture, Ind Sci News. Association (1991)

EXTRA CURRICULAR ACTIVITIES

Professor Banerjee used to take part regularly in stage acting in his student days and professional life, involving students and collegues. He was an expert singer, (Tagore Songs only) and used to take part in the social functions of the college. In 1962, the centenary year of the birthday of the poet Rabindranath Tagore was celebrated in Rajasthan by its Government. Professor Banerjee arranged a musical programme at Bikaner where all the Bengali Tagore songs were sung by the Rajasthani Medical Students under his guidance. The show was a grand success. His interest in sports was confined to cricket only.

ACKNOWLEDGEMENTS

The information presented here have been collected mostly from a book entitled *The Days I Left Behind: An Autobiography of a Teacher, a Scientist and a Physician* written by Professor Sachchidananda Banerjee himself and published by Professor S Banerjee Felicitation. Committee, Department of Physiology, Presidency College, 80/1 College Street, Calcutta 700073, in November, 1999. This book of 182 pages will be a source of inspiration to the younger generation of our Universities and colleges who want to devote their lives to scientific pursuit.

Residence
23 B Tarashankar Sarani
Kolkata-700 037
Phone: 033-25567408

ASOK BANDYOPADHYAY
Formerly Professor and Head
Department of Biochemistry
North Bengal Medical College & Hospital
PO Sushrutanagar-734 432 (WB)

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