



*Om Nath Chopra*





## SIR RAM NATH CHOPRA

(1882-1973)

Foundation Fellow 1935

### *Birth, Childhood, School and University Education, etc.*

PROF. RAM NATH CHOPRA was born in 1882 as the eldest son of Raghu Nath Chopra of Jammu and Kashmir State, in a respectable Dogra family who had migrated from Rawalpindi area to Jammu and Srinagar State. He had early schooling, partly in Jammu and partly in Srinagar and later was sent to Lahore for the completion of his High School and College studies. Being the eldest of a middle class family of five or six children, he was exposed to an atmosphere of "plain living and high thinking". He showed good scholastic ability from young days and this encouraged his father to send him out to Lahore for his High School and University education. He graduated from the Punjab University with a brilliant academic record which so ably impressed his teachers that his father was advised to send him to England for higher studies. Being a successful official of the Kashmir Raj State, his father could afford to do so. Early in 1903 Chopra proceeded to England and enrolled himself in the Downing College, Cambridge. Here he stayed for almost 10 years, obtaining the Science Tripos in 1905, L.R.C.P., M.R.C.S. (Eng.) in 1907 and M.B., B.Ch. (Cantab.) in 1908 and M.D. in 1912. While studying medicine at St. Bartholomew's Hospital in London, he successfully competed for the Indian Medical Service (IMS) examination standing third in order of merit. After a few years of field service in East Africa and in the Afghanistan war near Peshawar, as an IMS Officer, he was appointed in 1921 as Professor of Pharmacology at the School of Tropical Medicine and concurrently, Professor of Pharmacology at the Calcutta Medical College. His professional career and research activities started from this point of time.

### *His Professional Career, Research, and Contributions to Science*

In 1921, more than fifty years age from now, Pharmacology as a distinct and independent scientific discipline was unknown in India. Pharmacology was not included as a subject of study in the curriculum of undergraduate Medical Colleges. No systematic study on the basis of animal experimentation was being undertaken in any of the universities or medical Institutions. It was therefore no easy task for young Prof. Chopra to organise and equip





a laboratory for modern experimental Pharmacological work for the first time in India. With zealous devotion, he succeeded in surmounting all difficulties and during the 20 years of his association, first as Professor of Pharmacology and later as Director with the *School of Tropical Medicine* at Calcutta, he spearheaded a medical research programme in association with his students, colleagues and co-workers, which resulted in a steady stream of research output in various aspects of Tropical Medicine, Experimental Pharmacology and Therapeutics, Drug Addiction, Indigenous Drugs, Drug Standardization, Toxicology, Clinical Medicine, Newer Laboratory Techniques and Methodology in diagnostic work, etc., etc. During this period, Chopra also took particular pains, whenever opportunity presented itself, in training a band of young workers to carry on teaching and research in his field of studies. Thus he slowly built up a virile and progressive laboratory from where emanated several distinguished pharmacologists to carry forward his message all over India's Medical Colleges and Research Institutions. Around 1940-41, prior to his retirement from the School of Tropical Medicine, as many as 33 co-workers and visiting Scientists had contacts and collaborative research enterprises with him. Chopra's position in India in this regard may be compared to those of Oswald Schmiedeberg of Germany and John Abel of America who are credited to have trained nearly 40 and 25 pupils respectively, who occupied at one time most of the important Pharmacology teaching positions in Europe and America.

Chopra's contributions to medical science cover a wide range of subjects. The main theme which seems to have attracted his attention early and to which he returned again and again was the study of Indian indigenous drugs—their chemical composition, the physiological action of their active principles on living tissues *in vivo* and *in vitro*, and the biochemical and biophysical changes brought about in mammalian organisms on the administration of these active principles. The aim and scope of the work, as he conceived it as early as 1922, were as follows:—

1. *To make India self-supporting by enabling her to utilize the drugs produced in the country, by manufacturing them in a form suitable for administration.*
2. *To discover remedies from the claims of Ayurvedic, Yunani, Tibbi and other indigenous sources suitable to the employed by the exponents of western medicine.*
3. *To discover the means of effecting economy, so that these remedies might fall within the means of the great masses in India whose economic condition is very low.*
4. *To prepare an Indian Pharmacopoeia.*

Such a comprehensive and ambitious approach to a complicated problem could not naturally be managed single-handed and Chopra realized from the very beginning, that collaboration with Botany and Chemistry was essential in tackling such problems. He started a partnership between him





and Professor S. Ghosh, Professor of Chemistry at the School of Tropical Medicine, which was destined to last all through his career at the School and which yielded very fruitful and far-reaching results in the field of Indian indigenous drugs. Practically all the indigenous substitutes that are now being used by medical practitioners in India in place of imported drugs may be said to be the outcome of the researches emanating from the Chopra-Ghosh School of workers. From scientific and academic view-points, the work on indigenous drugs had set up a high standard of medical and chemical research in India and had focussed international attention to it. Its value from the economic viewpoints is no less worthy of note, as it has given a definite fillip to the Indian drug industry. Chopra's book on *Indigenous Drugs of India; Medicinal and Poisonous Plants of India* (2 Vols.) and '*Glossary of Indian Medicinal Plants*' will stand as lasting monuments of his enthusiasm and endeavour in a field which has seldom been trodden by scientifically trained medical workers.

There was, however, another side of Chopra's interest in Pharmacology which manifested itself in a large number of his published papers and in his books (joint authorship) on *Tropical Therapeutics* and *Anthelmintics*. He was one of those, like the late Prof. A. J. Clark of Edinburgh, who wanted to bridge the gap between pharmacology, therapeutics, and clinical medicine. He belonged to that group of medical workers who were trained to study and appreciate the whole field of experimental medical science, particularly its 'applied' side, as distinguished from 'fundamental and basic' concepts. Most of his work therefore leaned heavily towards studying problems of 'practical' utility to professional medical practice in the tropics. This is the reason why he moved his interest frequently from investigations pertaining to the field of tropical medicine such as asthma, lathyrism, epidemic dropsy, amoebic dysentery, helminthiasis, malaria, etc., to problems of drug quality, pharmaceutical and biological standardisation and drug adulteration, the scientific study of the effects of habit-forming drugs, e.g., opium, cannabis, alcohol, chloral hydrate, cocaine, hempdrugs, etc., on laboratory animals and human beings, the effects of chemotherapeutic remedies on mammalian system, the devising of laboratory tests for the diagnosis of kala-azar in outdoor clinics and in the field, etc., etc. He had also taken great interest in the action of substances, which are effective in tropical medicine, e.g., the quinine group and in the organic compounds of antimony. Some studies had also been undertaken to clarify the pharmacology and therapeutics of poisons from snakes and other sources. It did not fall to his lot to make epoch-making discoveries from his extensive search in the realm of Indian *materia medica* but he can legitimately lay claim to the first pharmacological study of the now universally known Indian Plant Drug, *Rauwolfia serpentina* (Chopra *et al.* 1933: *Indian J. med. Res.*, **21**, p. 261-271).

In the apparent 'diversity' of topics dealt with by Chopra and in the very wide range of his scientific contributions, there is evident to critical





observers and discerning critics a latent 'central theme', that is, his effort to always interweave and interdigitate the work of the laboratory and the hospital. Though essentially a laboratory man with a preferential liking for experimental therapeutics, Chopra's later experience at St. Bart's Hospital, and at the Carmichael Hospital for Tropical Diseases and in the Army Medical Service rounded off his university training in pharmacology and served to extend his knowledge and interest to the science of disease as a whole, and he became ultimately a combined product of the laboratory and the clinic. Judged from this angle, Chopra's contributions are undoubtedly very significant and give clear evidence of the range and versatility of his mind.

In 1930, Prof. Chopra was selected as Chairman of the Drugs Enquiry Committee appointed by the Government of India to suggest ways of preventing the widespread drug adulteration, substandard drug manufacture and distribution, and drug faking that were rampant then throughout the country. He toured all over India and gathered first-hand information of the sorry state of affairs regarding haphazard distribution through unqualified quacks and charlatans of many imported and locally manufactured drugs in the Indian market. With a view to remedy the situation and to stimulate manufacture of good quality, standard drugs for consumption in India, the Drugs Enquiry Committee (Chopra Committee) recommended All-India legislation for a 'Drugs Act' and a 'Pharmacy Act', more or less on the lines of the American Food, Drugs and Cosmetic Act. This recommendation came into statutory force in 1940 for the Drugs Act and in 1948 for the Pharmacy Act. The tremendous development of ethical drug manufacture and the growth of pharmaceutical profession in India today may therefore be credited to the forward-looking vision of Chopra and his strong advocacy for the pharmaceutical service through professionally trained pharmacists. The word 'Pharmacy' was introduced for the first time in Chopra Committee's report published in 1931. The word 'compounder' was in use in India before that time to designate those working as dispensers and purveyors of drugs.

The pioneer work of Chopra in building up Indian Pharmacology, in giving an impetus to Pharmacy in India, in boosting up medical and scientific research on 'applied problems' of peculiar interest in India soon marked him out as an outstanding Indian in the field of scientific medicine. Honours, too numerous to mention, in appreciation of his manifold contributions came to him from all quarters. From his Alma Mater (Cambridge University), he was admitted to the M.A. and Sc.D. degrees. From the University and the College of Physicians and Surgeons of London, he was first made an MRCP and then FRCP. The Pharmaceutical Society of Great Britain admitted him as an Honorary M.P.S., a rare distinction for a non-pharmaceutical scientist. From the School of Tropical Medicine and the University of Calcutta, he was awarded the Minto Medal, Mouatt Medal, Coates Medal, etc. The *Deutsche Pharmakologische Gesellschaft* made him an Honorary





Member and he also served in the Expert Panel on Drug Addiction of the World Health Organisation at Geneva. Of the few Honorary Members admitted to the American Society for Pharmacology and Experimental Therapeutics, Inc., Col. Chopra was one along with Sir Henry Dale of Great Britain and Geheimrat Professor Walther Straub of Munich, Germany. As a distinguished member of the Indian Medical Service, he was raised to the rank of a Brevet-Colonel much before his regular turn. He was made a CIE and later Knighted with a K.I.H. (Gold Medal). He was made the Chairman of the Drugs Enquiry Committee of the Government of India in the year 1930 and later, the Committee on Indigenous Systems of Medicine (1958). He was twice chosen as the Sectional President in Physiology and Medical Sciences of the Indian Science Congress and became also its General President in 1948. He was a Foundation Fellow of the National Institute of Sciences of India (now Indian National Science Academy). He was a Life Member and Fellow of the Asiatic Society and served as its Vice-President from 1938-40. He was also a recipient of the Barclay Memorial Medal of the Asiatic Society. He also served as the first Chairman of the Board of Editors of the *Journal of Research in Indian Medicine* published from Varanasi.

When he retired as the Director of the School of Tropical Medicine in Calcutta in November, 1941, on reaching the official age of superannuation, he never thought of sitting idle at home to enjoy his well earned rest. He was called upon immediately to take up the duties of the Director of Medical Services and Drug Research in Jammu and Kashmir State. It so happened that he worked for the next 20 years there, directing drug research and inspiring many of his students and collaborators to continue their research work in his chosen field. Through his efforts, the Council of Scientific and Industrial Research (CSIR) established the Regional Research Laboratory at Jammu and he guided the work of this Institution for many years as long as his physical powers permitted, never flagging in his zeal and devotion to work.

#### *Reminiscences of Private Life*

Chopra left behind him his wife (Parameshwari Devi), five children (three sons and two daughters), several grand-children and great-grand-children. He was essentially a kind-hearted man, soft-spoken, gentle in manners but with a dignity and decorum which is a great personal trait of his character. In his dealings with his junior students he was always compassionate, helpful and often gracious. He was never known to have spoken harshly to anybody even when irritated. He was a thorough gentleman in every aspect of his dealings and personal behaviour. When he died at the ripe old age of 91 years in his own home at Srinagar, Kashmir, a great luminary disappeared from the firmament of medical education and medical research in India. Professor Chopra will be long remembered as the 'Father





of Indian Pharmacology', a founder of a School of Indian Pharmacologists, and an outstanding figure in the quality control and drug reform movement in India in the thirties of this century. Those with whom he came into intimate contact in Calcutta (1921-41) and later in Jammu-Srinagar, Kashmir (1941-71) will never forget his magnetic and yet simple personality, his high idealism, his unbounded enthusiasm and unflinching devotion to laboratory and clinical work, and above all, his remarkable capacity to bring about a 'team spirit', and promote collaborative effort amongst different groups of scientists in extending the bounds of medical and scientific knowledge. During his long, unbroken career in his chosen field of study (drug research), Professor Chopra raised himself almost to the status of an 'Institution' rather than an 'individual', a glorious career seldom to be achieved by most medical scientists in India.

A worker in his very core, endowed with a rich and creative mind, Chopra's many pupils, friends, and acquaintances cannot help but feel the loss of his genial and lovable company and inspiring leadership. He lived long enough (91 years) to see his pioneering work and objectives fulfilled. During the last years (1971-73), his alertness and memory began to fail somewhat and he too could not maintain his regular correspondence with everybody. The writer had been associated with him from his early days and to him the loss is all the more poignant. May his Soul rest in peace!

B. MUKERJI

#### BIBLIOGRAPHY

1922. Therapeutics of digitalis. *Indian med. Gaz.*, **57**, 422.  
 — (With GHOSH, B. N.) The therapeutics of emetine. *Indian med. Gaz.*, **57**, 248.  
 — (With ACTON, H. W.) The production and pharmacological action of Khesari amine. *Indian med. Gaz.*, **57**, 412.  
 — The therapeutics of the Cinchona alkaloids, Part I. *Indian med. Gaz.*, **57**, 401.  
 — The therapeutics of the Cinchona alkaloids, Part II. *Indian Med. Gaz.*, **57**, 441.  
 1923. (With H. W. ACTON) The causation of asthma and its treatment. *Indian med. Gaz.*, **58**, 363.  
 — (With KNOWLES, R. *et al.*) Notes on some case of framboesia. *Indian med. Gaz.*, **58**, 401.  
 — (With ACTON, H. W., and BOYD, T. C.) The reduction of amino-acids into simpler natural bases (amines) by the B. dysenteriae (Shiga). *Indian J. med. Res.*, **10**, 837.  
 — (With McVAIL, J. B.) Carbon tetrachloride in pharmacology and therapeutics. *Indian med. Gaz.*, **58**, 605.  
 — The field for research in Indian indigenous drugs. *Indian med. Gaz.*, **58**, 99.  
 — (With GHOSH, S. *et al.*) The pharmacology and therapeutics of *Boerhaavia diffusa* (*Punarnava*). *Indian med. Gaz.*, **58**, 203.  
 — (With NAPIER, L. E.) The therapeutics of antimony. *Indian med. Gaz.*, **58**, 1.  
 1924. (With GHOSH, B. N., and DE, P.) Some observations on the toxicity of emetine. *Indian med. Gaz.*, **59**, 338.  
 — (With ACTON, H. W.) The nature and pharmacological action of cholera toxin. *Indian J. med. Res.*, **12**, 235.  
 — (With DE, P.) A preliminary note on the pharmacological action and therapeutic properties of Kuth root *Saussurea lappa*. *Indian med. Gaz.*, **59**, 540.  
 — (With CHANDLER, A. C.) Indian santonin. *Indian med. Gaz.*, **59**, 537.  
 — (With KNOWLES, R., and GUPTA, J. C.) On the failure of *Vitex peduncularis* in the treatment of malaria. *Indian med. Gaz.*, **59**, 133.  
 — (With ACTON, H. W.) Some factors in individual susceptibility. *Ind. med. Gaz.*, **59**, 278.  
 1925. (With BOSE, J. P.) Observations on the anti-diabetic properties of *Cephalandra Indica* (*Talakucha*). *Indian med. Gaz.*, **60**, 201.  
 — (With BOSE, J. P.) *Cephalandra Indica* (*Talakucha*) in diabetes. *Indian J. med. Res.*, **20**, 255.





- (With BOSE, S. C., and DE, P.) Variations in the potency of digitalis preparations in the tropics. *Indian med. Gaz.*, **60**, 93.
- (With GHOSH, S.) A buffered solution for perfusion isolated organs. *Indian J. med. Res.*, **13**, 7.
- (With DE, P.) Biological assay of digitalis preparations in the tropics. *Indian J. med. Res.*, **13**, 781.
- (With ACTON, H. W.) The treatment of asthma. *Indian med. Gaz.*, **60**, 101.
- (With BOSE, J. P.) Observations on the anti-diabetic properties of *Cephalandra Indica* (*Telakucha*). *Indian med. Gaz.*, **60**, 201.
- (With BOSE, J. P.) *Cephalandra Indica* (*Telakucha*) in diabetes. *Indian J. med. Res.*, **13**, 11.
- (With ACTON, H. W.) The problem of epidemic dropsy and beriberi. *Indian med. Gaz.*, **60**, 1.
- (With GHOSH, S.) A preliminary note on the pharmacology and therapeutics of *Adhatoda vasica* (*Basak*). *Indian med. Gaz.*, **60**, 354.
- (With GHOSH, S.) Some observations on the pharmacological action and therapeutic properties of *Adhatoda vasica* (*Basak*). *Indian J. med. Res.*, **13**, 205.
- (With ACTON, H. W.) The concentration of quinine in the circulating blood. *Indian J. med. Res.*, **13**, 197.
- (With ACTON H. W.) The influence of the hydrogen-ion concentration on the activity of pressor bases. *Indian J. med. Res.*, **12**, 443.
1926. (With DE, P.) Variations in the potency of digitalis preparations in the tropics (II). *Indian med. Gaz.*, **61**, 212.
- (With BOSE, J. P., and GHOSH, N. N.) Chemical composition and anti-diabetic properties of silajit. *Indian J. med. Res.*, **15**, 145.
- (With GHOSH, N. N.) Some medicinal plants growing in the Himalayas. *Indian J. med. Res.*, **13**, 533.
- (With DE, P.) *Indian digitalis*. *Indian med. Gaz.*, **61**, 117.
- A preliminary note on the pharmacological action of some organic antimony derivatives. *Indian med. Gaz.*, **61**, 162.
1927. (With DAVID, J. C.) The pharmacological action of quinamine. *Indian J. med. Res.*, **15**, 343.
- Observations on the toxicity of mature and immature genuine spirits and imitation on fictitious spirits. *Indian J. med. Res.*, **14**, 1005.
- The deleteriousness of potable spirits on the Indian market. *Indian med. Gaz.*, **62**, 195.
- (With GREWAL, K. S.) The opium habit in India. Analysis of 100 cases amongst the Sikh population of Calcutta. *Indian J. med. Res.*, **15**, 57.
- (With ACTON H. W.) Further investigations into the actiology of epidemic dropsy. *Indian med. Gaz.*, **62**, 359.
- Some aspects of therapeutics in India. *Indian med. Gaz.*, **62**, 151.
- (With GUPTA, J. C. *et al.*) Observations on the pharmacological action of conessine, the alkaloid of *Holarrhena antidysenterica*. *Indian med. Gaz.*, **62**, 132.
- (With CHATTERJEE, N. R.) *Psoralea corylifolia* (*babchi*), its constituents, their pharmacological action and therapeutic properties. *Indian J. med. Res.*, **15**, 49.
- An experimental investigation into the action of organic compounds of antimony. *Indian J. med. Res.*, **15**, 41.
- (With GUPTA, J. C., and DAVID, J. C.) A preliminary note on the action of antimony compounds on the blood serum. A new serum tests of Kala-azar. *Indian med. Gaz.*, **62**, 434.
- (With GUPTA, J. C., and BASU, N. K.) Further observations on the serum test for Kala-azar with organic antimony compounds. A simple blood test for Kala-azar. *Indian med. Gaz.*, **62**, 434.
- (With GUPTA, J. C., and BASU, N. K.) The antimony test in the diagnosis of Kala-azar. *Indian med. Gaz.*, **62**, 688.
1928. (With DAVID, J. C., and DIKSHIT, B. B.) A comparative study of the action of cinchona alkaloids on the uterus. *Indian J. med. Res.*, **15**, 571.
- (With CHANDLER A. C.) *Anthelmintics and their actions and uses in medical and veterinary practice*. William Wilkins and Co., Baltimore.
- (With CHAUDHURY, S. G.) Studies in the physical properties of different blood sera, Part I. *Indian J. med. Res.*, **15**, 895.
- (With GUPTA, J. C., and PILLAI, K. V.) Observations on the action of emetine on the gastrointestinal tract. *Indian J. med. Res.*, **15**, 883.
- (With GUPTA, J. C., and MULLICK, M. N.) A new organic aromatic compound of bismuth suitable for intravenous injection in the treatment of framboesia. *Indian med. Gaz.*, **63**, 361.
- (With DIKSHIT, B. B., and DAVID, J. C.) A comparative study of the action of cinchonidine and cinchonine on the heart. *Indian J. med. Res.*, **16**, 125.
- (With DE, P.) The therapeutic activity of the liquid preparations of ergot on the Calcutta market. *Indian med. Gaz.*, **63**, 519.
- (With GUPTA, J. C., and CHAUDHURY, S. G.) The actions of antimony compounds on the adrenalis. *Indian J. med. Res.*, **16**, 441.
- (With CHAUDHURY, S. G.) Studies on physical properties of different blood sera, Part II. Surface tension, *Indian J. med. Res.*, **15**, 447.





- (With BOSE, J. P., and CHATTERJI, N. N.) *Gymnema sylvestra* in diabetes mellitus. *Indian J. med. Res.*, **16**, 115.
- The present position of opium habit in India. *Indian J. med. Res.*, **16**, 389.
- (With GHOSH, N. N., and GUPTA, J. C.) Indian varieties of aconite; their chemical composition and biochemical assay. *Indian J. med. Res.*, **15**, 873.
- (With DUTT, A. T., and GHOSH, S.) Ephedrine from the Indian varieties of ephedra. *Indian J. med. Res.*, **15**, 889.
- Treatment of bronchial asthma with *Saussurea lappa*. *Indian med. Gaz.*, **63**, 186.
- The field for research in Indian indigenous drugs. *Patna J. Med.*, **3**, 125.
- (With DAS GUPTA, C. R.) The provocative action of organic compounds of antimony in leishmaniasis. *Indian J. med. Res.*, **15**, 565.
- (With CHAUDHURI, S. G.) Studies in the physical properties of different blood sera, Part I. Isoelectric points of blood sera and their significances in the antimony test for Kala-azar. *Indian J. med. Res.*, **15**, 895.
- (With GUPTA, J. C. *et al.*) Urea-stibol in the treatment of Kala-azar. *Indian med. Gaz.*, **63**, 252.
- (With GHOSH, S., and CHATTERJI, N. R.) Urea-stibamine, its preparation and composition. *Indian J. med. Res.*, **16**, 461.
1929. (With DIKSHIT, B. B., and PILLAI, K. V.) The action of cinchonine and cinchonidine on the vasomotor system. *Indian J. med. Res.*, **17**, 222.
- (With CHOUDHURY, S. G.) Studies in physical properties of different blood sera, Part III. Viscosity. *Indian J. med. Res.*, **16**, 939.
- (With CHOUDHURY, S. G.) The role of surface tension on the activity of cinchona alkaloids. *Indian J. med. Res.*, **17**, 360.
- (With GREWAL, K. S.) The opium habit in India. *Trans. Far-East. Ass. trop. Med.*, 7th Congress, **3**, 568.
- (With ACTON, H. W.) Kurchi bismuthous iodide: its value in the treatment of chronic amoebic infections of the bowel. *Indian med. Gaz.*, **64**, 481.
- (With RAO, S. S.) Studies in the treatment of Filariasis. *Indian med. Gaz.*, **64**, 130.
- (With DIKSHIT, B. B., and PILLAI, K. V.) A preliminary note on the action and uses of pseudoephedrine. *Indian med. Gaz.*, **64**, 1.
- (With DIKSHIT, B. S., and PILLAI, K. V.) The comparative action of ephedrine and pseudoephedrine from Indian varieties of ephedra on the heart. *Indian J. med. Res.*, **16**, 780.
- (With DIKSHIT, B. S., and PILLAI, K. V.) Pharmacological action of pseudo-ephedrine from the Indian varieties of ephedra. *Indian J. med. Res.*, **17**, 366.
- (With GHOSH, N. N., and RATNAGIRISWARAN, A. N.) Some medicinal plants growing in the Himalayas. II. *Indian J. med. Res.*, **16**, 770.
- (With GHOSH, S.) *Terminalia arjuna*: its chemistry, pharmacology and therapeutic action. *Indian med. Gaz.*, **64**, 70.
- (With GHOSH, S.) Observations on certain medicinal plants used in the indigenous medicine. *Indian J. Med. Res.*, **17**, 377.
- (With DE, P.) Observations on the potency of Indian digitalis. *Indian med. Gaz.*, **64**, 312.
- (With DE, P.) *Saussurea lappa* (Kut root) in Pharmacy and therapeutics. *Indian J. med. Res.*, **17**, 351.
- A retrospect of 6 years research work on the Indian indigenous drugs. *Trans. Far-East. Ass. prop. Med.*, 7th Congress, **3**, 543.
- (With ACTON, H. W.) The action of the pentavalent compounds of antimony on the Leishmania donovani parasites. *Trans. Far-East. Ass. prop. Med.* 7th Congress. **3**, 36.
- (With CHOUDHURY, S. G.) On the causation of formolgel reaction in Kala-azar, Part I. *Indian J. med. Res.*, **16**, 925.
- (With DE, N. N.) The significance of the antimony test in the diagnosis of Kala-azar. *Indian med. Gaz.*, **64**, 661.
- (With GUPTA, J. C., and BASU, N. K.) The diagnostic value of the antimony test in Kala-azar. *Trans. Far-East. Ass. prop. Med.*, 7th Congress, **3**, 89.
- (With ACTON, H. W.) The causation of Lathyrism in man. *Trans. Far-East. Ass. prop. Med.*, 7th Congress, **3**, 444.
- The action of quinine on the malarial parasites. *Trans. Far-East. Ass. Trop. Med.*, 7th Congress. **3**, 814.
1930. (With BOSE, J. P.) The action of opium in diabetes. *Indian J. med. Res.*, **18**, 15.
- A preliminary note on addition to "post" (unlanced capsules of *Papaver somniferum*). *Indian med. Gaz.*, **65**, 361.
- (With GREWAL, K. S. *et al.*) Addition to "post" (unlanced capsules of *Papaver somniferum*) in India. *Indian J. med. Res.*, **18**, 985.
- (With MUKHERJEE, B., and DIKSHIT, B. B.) Narcotine. Its pharmacological action and therapeutic uses. *Indian J. med. Res.*, **18**, 35.
- (With KNOWLES, R.) The action of opium and narcotine in malaria. *Indian J. med. Res.*, **18**, 5.
- (With BASU, U. P.) Cardiovascular manifestations of epidemic dropsy and their treatment. *Indian med. Gaz.*, **65**, 546.





- (With CHAUDHURY, S. G., and RAO, S. S.) Studies in the physical properties of different blood sera. Part IV. Filariasis. *Indian J. med. Res.*, **18**, 27.
- (With DUTT, A. T.) Seasonal variations in the alkaloidal content of the Indian Ephedra. *Indian J. med. Res.*, **17**, 647.
- (With DE, P.) The action of a sympathomimetic alkaloid in *Sida cordifolia*. *Indian J. med. Res.*, **18**, 467.
- (With DE, N.) The failure of the alkaloids of *Holarrhena anti-dysenterica* (Kurchi) in the treatment of amoebic hepatitis. *Indian med. Gaz.*, **65**, 391.
- *Plantago ovata* (isapghul) in chronic diarrhocas and dysenteries. *Indian med. Gaz.*, **65**, 428.
- (With MUKHERJEE, B. P.) The value of the antimony test in the diagnosis of Kala-azar, Part II. The finger prick blood test. *Indian med. Gaz.*, **65**, 203.
- (With KNOWLES, R.) The action of opium and narcotine in malaria. *Indian J. med. Res.*, **18**, 5.
1931. (With CHOWHAN, J. S.) The action of the venom of the Indian Cobra (*N. naia vel tripudians*) on certain protozoa. *Indian J. med. Res.*, **18**, 1103.
- (With ISWARIAH, V.) An experimental investigation into the action of the venom of the Indian Cobra (*Naia naia vel tripudians*). *Indian J. med. Res.*, **18**, 1113.
- (With BOSE, J. P.) Further observations on the effect of opium on blood sugar. *Indian med. Gaz.*, **66**, 625.
- (With BOSE, J. P.) Opuom and albuminuria. *Indian med. Gaz.*, **66**, 299.
- (With BOSE, J. P.) Effect of opium on the blood sugar of non-diabetes. *Indian J. med. Res.*, **18**, 1087.
- (With CHOPRA, G. S.) The cocaine habit in India. *Indian J. med. Res.*, **18**, 1013.
- (With GHOSH, N. N.) Addiction to "post" (unlanced capsules of *Papaver somniferum*) Part II. *Indian J. med. Res.*, **19**, 415.
- (With BOSE, J. P.) Psychological aspects of opium addiction. *Indian med. Gaz.*, **66**, 663.
- (With KRISHNA, S.) Indian ephedras; their chemistry and pharmacology. *Indian J. med. Res.*, **19**, 177.
- (With MUKHERJEE, B.) Indian species of Artemesia. *Indian med. Gaz.*, **66**, 622.
- (With MUKHERJEE, B.) Indian squills. *Indian med. Gaz.*, **66**, 666.
- (With CHAUDHURY, S. G., and GHOSH, N. N.) Changes in the physical properties of Kala-azar serum with treatment and its relation to the formolgel reaction. *Indian J. med. Res.*, **19**, 423.
1932. (With CHOWHAN, J. S.) Action of venom of the Indian daboia (*Vipera russellii cel Vipera elegans*) on certain protozoa. *Indian J. med. Res.*, **20**, 107.
- (With CHOWHAN, J. S.) Snake venoms in medicine. *Indian med. Gaz.*, **67**, 574.
- (With CHAUDHURY, S. G.) On the electric charge of erythrocytes, Part I. Effect of pH and quinine bihydrochloride. *Indian J. med. Res.*, **19**, 1115.
- (With BOSE, J. P.) A case of congenital single kidney with dilated ureter. *Indian med. Gaz.*, **67**, 679.
- (With CHOPRA, G. S.) Chloral hydrate and paraldehyde as drugs of addiction. *Indian med. Gaz.*, **68**, 481.
- (With CHOPRA, G. S., and GREWAL, K. S.) The opium habit in the Punjab, Part I. *Indian J. med. Res.*, **20**, 545.
- (With CHOPRA, G. S.) The morphine habit in India. *Indian med. Gaz.*, **68**, 368.
- (With CHOPRA, G. S.) Some country beers of India. *Indian med. Gaz.*, **68**, 665.
- (With MUKHERJEE, B.) Indian chenopodium. *Indian med. Gaz.*, **67**, 5.
- (With MUKHERJEE, B.) Indian ipecacuanha. *Indian med. Gaz.*, **67**, 88.
- (With MUKHERJEE, B.) Musk; its pharmacological action and therapeutic uses. *Indian med. Gaz.*, **67**, 321.
- (With MUKHERJEE, B.) Thymol, menthol and camphor from Indian sources. *Indian med. Gaz.*, **67**, 361.
- (With MUKHERJEE, B.) A preliminary note on the absorption of 'Makaradhwaja' (sulphide of mercury). *Indian med. Gaz.*, **67**, 448.
- (With DE, P.) A preliminary note on the action of the alkaloid of *Morigan pterygosperma* (*N.O. Moringae*). *Indian med. Gaz.*, **67**, 128.
- (With DIKSHIT, B. B., and CHOWHAN, J. S.) Berberine and berberine-containing plants in pharmacology and therapeutics. *Indian med. Gaz.*, **67**, 194.
- (With DIKSHIT, B. B., and CHOWHAN, J. S.) Pharmacological action of berberine. *Indian J. med. Res.*, **19**, 1193.
- (With CHAUDHURY, S. G.) The prognostic value of the aldehyde reaction in Kala-azar. *Indian med. Gaz.*, **67**, 260.
- (With DAS GUPTA, B. M., and SEN, B.) A fatal case of malignant tertian malaria. *Indian med. Gaz.*, **67**, 680.
1933. (With ROY, A. C.) A proteolytic enzyme in cucumber (*Cucumis sativus*). *Indian J. med. Res.*, **21**, 17.
- (With CHAUDHURY, S. G.) Studies on the physical properties of different blood sera. Part V, Buffer action. *Indian J. med. Res.*, **2**, 25.





- (With CHAUDHURI, R. N., and SEN, B.) A case of endocarditis treated with polyvalent anti-streptococcus serum. *Indian med. Gaz.*, **68**, 527.
- *Indigenous drugs of India: their medical and economic aspects*. The Art Press, Calcutta.
- (With ACTON, H. W.) The treatment of chronic intestinal amoebiasis with the alkaloids of *Holarrhena antidysenterica* (*Kurchi*). *Indian med. Gaz.*, **68**, 6.
- (With SEN, B., and SEN, S.) The treatment of chronic intestinal amoebiasis with carbarsone. *Indian med. Gaz.*, **68**, 315.
- (With BASU, S. C.) Cardiovascular and other manifestation of epidemic dropsy. *Indian med. Gaz.*, **68**, 605.
- (With MUKHERJEE, B.) The pharmacological action of 'thevetin' a glucoside occurring in *Thevetia neruifolia* (yellow oleander). *Indian J. med. Res.*, **20**, 903.
- (With CHOWHAN, J. S.) Biological assay of digitalis preparations in the tropics. Part III. *Indian J. med. Res.*, **20**, 1189.
- (With MUKHERJEE, B.) Toxic effects of ephedrine—A warning. *Indian med. Gaz.*, **68**, 622.
- (With GUPTA, J. C., and MUKHERJEE, B.) The pharmacological action of an alkaloid obtained from *Rauwolfia serpentina*, Benth. A preliminary note. *Indian J. med. Res.*, **21**, 261.
- (With GUPTA, J. C., and CHOPRA, G. S.) Pharmacological action of Kurchicine (an alkaloid of *Holarrhena anti-dysenterica*). *Indian J. med. Res.*, **21**, 277.
- (With DAS GUPTA, B. M., and SEN, B.) Atebrin in the treatment of Indian strains of malaria. *Indian med. Gaz.*, **67**, 680.
- (With DAS GUPTA, B. M.) Studies on the action of atebrin in plasmodium infection of monkeys. *Indian med. Gaz.*, **68**, 493.
- (With GUPTA, J. C., and GANGULI, S. K.) The action of some synthetic antimalarial remedies on the uterus. *Indian med. Gaz.*, **68**, 558.
- (With MUKHERJEE, B., and CAMPBELL, H. G. M.) The pharmacological action and anti-malarial properties of anhydrocotarmine-re-sorcinol hydrochloride (a derivative of narcotine). *Indian J. med. Res.*, **21**, 225.
- (With CHAUDHURY, S. G.) On the electric charge of erythrocytes. Part II. Malaria. *Indian J. med. Res.*, **21**, 273.
- (With SEN, B.) Cyanosis after plasmochin. *Indian med. Gaz.*, **68**, 26.
1934. (With ROY, A. C., and DAS GUPTA, B. M.) On the concentration of quinine in the blood after intravenous and intramuscular injections. *Indian med. Gaz.*, **69**, 560.
- (With SEN, B.) Toxic effects of emetine on the cardiovascular system. *Indian med. Gaz.*, **69**, 262.
- The toxic effects of emetine. *Indian med. Gaz.*, **69**, 309.
- (With CHOWHAN, J. S.) Action of the Indian Duboia (*Vipern Russellu*) venom on the circulatory system. *Indian J. med. Res.*, **21**, 493.
- (With CHAUDHURI, S. G., and GUPTA, J. C.) On electrocardiograms, Part I. Blood pressure and electrocardiographic changes with muscle extract. *Indian J. med. Res.*, **21**, 483.
- (With MUKHERJI, S. N., and RAO, S. S.) Studies on the protein fractions of blood sera, Part I. Normal and filarial blood sera. *Indian J. med. Res.*, **22**, 171.
- (With CHOPRA, G. S.) Administration of opium to infants in India. *Indian med. Gaz.*, **69**, 489.
- (With MUKHERJI, S. N.) A note on the changes in the physical and chemical characteristics of the blood sera of opium addicts. *Curr. Sci.*, **3**, 201.
- (With CHAUDHURI, R. N.) Dysentery produced by bacterium pseudo carolinus. *Indian med. Gaz.*, **69**, 251.
- (With SEN, S.) Carbarsone in intestinal amoebiasis. Part II. *Indian med. Gaz.*, **69**, 375.
- (With SEN, S., and SEN B.) Treatment of chronic intestinal amoebiasis with gavans, a derivative of *ipecacunhha*. *Indian med. Gaz.*, **69**, 130.
- (With DAS GUPTA, B. M.) Some observations on *balautidium coli* and *entamoeba histolytica* of Macaques. *Indian med. Gaz.*, **69**, 390.
- Conjunctivity produced by a ground beetle. *Indian med. Gaz.*, **69**, 23.
- (With GHOSH, N. N., and MUKHERJI, A. K.) Anthelmintic of *Vernomia Anthelmintica* Willd. (Syn. *Serratula Anthelmintica*). *Indian J. med. Res.*, **22**, 183.
- (With CHOWHAN, J. S.) *Alangium lamarku*: Its chemistry and pharmacological action. *Indian J. med. Res.*, **21**, 507.
- (With CHOWHAN, J. S., and DE, N.) Biological assay of digitalis preparations in the Tropics, Part IV. *Indian J. med. Res.*, **22**, 271.
- (With CHOWHAN, J. S., and LAL, S.) Biological assay of digitalis preparations in the Tropics, Part V. Potency of Lanadigin (Glucoside of *D. Lanata*) and its relation to the standard digitalis powder (B.P. 1932). *Indian J. med. Res.*, **22**, 279.
- (With DE, P.) A preliminary note on the pharmacological action of *atiaristoxicaria*. *Indian J. med. Res.*, **21**, 513.
- (With GHOSH, S.) Some common indigenous remedies. *Indian J. med. Res.*, **22**, 263.
- (With GHOSH, S., and DUTT, A. T.) Some inorganic preparations of Indian indigenous medicine, Part I. *Abhara Bhasma*. *Indian J. med. Res.*, **22**, 285.
- (With ABDUL WAHEED, A. K. M.) Toxic effects produced by combined treatment with atebrin and plasmochin. *Indian med. Gaz.*, **69**, 213.





- (With DAS GUPTA, B. M.) Studies on the action of quinine in monkey malaria. *Indian med. Gaz.*, **69**, 195.
- (With SEN, B.) Atebrin in heavy infection with *P. falciparum*. *Indian med. Gaz.*, **69**, 392.
- (With SEN, B., and GANGULY, S. K.) Malarcan in the treatment of Indian strains of malaria. *Indian med. Gaz.*, **69**, 421.
- (With CHAUDHURI, R. N.) A fatal case of chronic interstitial nephritis with very high blood sera. *Indian med. Gaz.*, **69**, 144.
1935. Drug adulteration and spurious drugs in India. *Indian med. Gaz.*, **70**, 693.
- (With CHOWHAN, J. S.) Snake bites and their treatment in India. *Calcutta med. J.*, **29**, 459.
- (With CHOWHAN, J. S.) Snake venoms in pharmacology and therapeutics. *Indian med. Gaz.*, **70**, 445.
- (With CHOWHAN, J. S., and DE, N. N.) An experimental investigation into the action of the venom of *Echis carinata*. *Indian J. med. Res.*, **23**, 391.
- (With DAS, N. N.) An improved method of recording amplified electrical changes in tissues for pharmacological work. *Indian J. med. Res.*, **22**, 777.
- (With DE, N. N., and CHAKRAVARTY, M.) The pharmacological action of tylophorine: the alkaloid occurring in *Tylophora asthmaticus*. *Indian J. med. Res.*, **23**, 263.
- (With GUPTA, J. C., and ROY, A. C.) Action of emetine on the activity of the adrenal and thyroid glands. *Indian J. med. Res.*, **22**, 771.
- (With KRISHNAN, K. N., and MUKHERJEE, S. N.) Contribution to protozoal immunity. Part III. *Indian J. med. Res.*, **23**, 253.
- (BOSE, J. P.) *Calcinosis cutis*. *Indian med. Gaz.*, **70**, 375.
- (With SEN, B., and BHATTACHARYYA, S. N.) A case of quinine haemoglobinuria. *Indian med. Gaz.*, **70**, 453.
- (With ROY, A. C.) On the estimation of minute quantities of atebrin in the blood. *Indian med. Gaz.*, **70**, 504.
- (With MUKHERJI, S. N., and CHOPRA, G. S.) Studies on the protein fraction of blood sera. Part II. Blood sera of opium addicts. *Indian J. med. Res.*, **22**, 561.
- Drug addiction in India and its treatment. *Indian med. Gaz.*, **70**, 188.
- (With CHOPRA, G. S.) Habitual use of barbituric acid derivatives in India. *Indian med. Gaz.*, **70**, 188.
- (With CHOPRA, G. S.) Opium habit in India. *Indian J. med. Res.*, **23**, 359.
- (With SEN, B., and SEN, G.) Amibiarsen in the treatment of chronic intestinal amoebiasis. *Indian med. Gaz.*, **70**, 324.
- (With BHATTACHARYYA, S. N.) Observations on epidemic dropsy, cases admitted into the Tropical Diseases Hospital from 1922-23. *Indian med. Gaz.*, **70**, 498.
- (With CHAUDHURI, R. N.) A preliminary report on an epidemic dropsy outbreak in Purulia. *Indian med. Gaz.*, **70**, 481.
- (CHAUDHURI, R. N.) Cutaneous manifestations of epidemic dropsy, Part II. *Indian med. Gaz.*, **70**, 496.
- (With CHAUDHURI, R. N., and PANJA, D.) Cutaneous manifestations of epidemic dropsy, Part II. *Indian med. Gaz.*, **70**, 496.
- (With MUKHERJI, S. N., and GUPTA, J. C.) Studies on the protein fractions of blood sera. Part IV, epidemic dropsy. *Indian J. med. Res.*, **23**, 35.
- (With GHOSH, S., and DUTT, A. T.) Chemical examination of the bark of *Moringa pterygosperma*. *Indian J. med. Res.*, **22**, 785.
- (With CHAUDHURI, R. N.) Some observations on the toxicity of synthetic antimalarial remedies. *Indian med. Gaz.*, **70**, 1.
- (With GANGULI, S. K.) Chemotherapeutic studies on plasmodium infection in monkeys. *Indian med. Gaz.*, **70**, 313.
- (With GANGULI, S. K., and ROY, A. S.) On the relationship between the quinine concentration in the circulating blood and parasite count in monkey malaria. *Indian med. Gaz.*, **70**, 62.
- (With MUKHERJEE, S. N., and KRISHNAN, K. V.) The role of electric charge in phagocytosis of red cells in malaria. *Trans. natn. Inst. Sci. India*, **1**, 35.
- (With MUKHERJEE, S. N., and SEN, B.) Studies on the protein fractions of blood sera, Part III. Malarial sera during and after the rigor state. *Indian J. med. Res.*, **22**, 571.
- (With SEN, B., and GANGULI, S. K.) Tebetren in Indian strains of malaria. *Indian med. Gaz.*, **70**, 362.
1936. (With CHOWHAN, J. S., and DE, N.) Pharmacological action of camphor and its derivatives. *Indian J. med. Res.*, **24**, 249.
- (With DAS, N. N., and MUKHERJEE, S. N.) A study on the activation of tissue growth (*in vitro*) with cobra venom. *Indian J. med. Res.*, **24**, 267.
- (With ROY, A. C.) Some observations on the haemolysis caused by snake venom. (A preliminary note). *Indian med. Gaz.*, **71**, 21.
- (With ROY, A. C.) Some observations on the indophenol (2:6 dichloro-phenol-indo-phenol) reducing properties of urine. *Indian J. med. Res.*, **24**, 239.
- (With DAS GUPTA, B. M.) A preliminary note on the treatment of neuro-syphilis with monkey malaria. *Indian med. Gaz.*, **71**, 187.





- (With MUKERJI, B., and CHOPRA, I. C.) *A Hand book of Tropical therapeutics*. The Art Press, Calcutta.
- (With ROY, A. C.) On the colorimetric determination of lipid phosphorus (lecithin) in the blood. *Indian J. med. Res.*, **24**, 479.
- (With ROY, A. C.) On the determination of small quantities of atebtrin in the blood. *Indian J. med. Res.*, **25**, 487.
- (With BANERJI, L. M., and ROY, P. N.) Amoebiasis and appendicitis. *Indian med. Gaz.*, **71**, 693.
- (With CHOWHAN, J. S., and GUPTA, J. C.) Biological assay of *digitalis* preparations in the tropics, Part VI. Comparative effects of *Digitalis Lanata* Ehrh. from Austria and Kashmir and standard digitalis powder (B.P. 1932) on the mammalian heart. *Indian J. med. Res.*, **24**, 509.
- (With GHOSH, S., and DUTT, A. T.) Some inorganic preparations of the Indian indigenous medicine, Part II, *Banga Bhasma* (calcined Tin.) *Indian J. med. Res.*, **24**, 257.
- (With GHOSH, S., and DUTT, A. T.) Some inorganic preparations of Indian indigenous medicine, Part III, *Lauha Bhasma* (calcined Iron). *Indian J. med. Res.*, **24**, 517.
- (With DAS GUPTA, B. M., and ROY A. C.) On the mode of action of atebtrin on Plasmodium knowlesi. A preliminary note. *Indian med. Gaz.*, **71**, 710.
- (With GANGULI, S. K., and ROY, A. C.) Studies on the action of antimalarial remedies on monkey malaria. *Indian med. Gaz.*, **71**, 443.
- (With GUPTA, J. C., and SEN, B.) A comparative study of the action of atebtrin and atebtrin-plasmochin combination on Indian strains of malaria. *Indian med. Gaz.*, **71**, 309.
- (With MUKHERJEE, S. N.) The trend of immunity studies in malaria. *Indian med. Gaz.*, **71**, 34.
- (With CHAUDHURI, R. N.) The so-called mystery disease of Calcutta (*jhinjhinia* or *tharthria*). *Indian med. Gaz.*, **71**, 205.
1937. (With CHOWHAN, J. S.) Cobra venom in therapeutics. *Indian med. Gaz.*, **72**, 339.
- (With DAS, N. N., and MUKHERJEE, S. N.) The action of ajmaline on nerve impulses. *Indian med. Res.*, **24**, 1125.
- (With MUKHERJEE, S. N., and CHOWHAN, J. S.) Physical changes in blood *in vivo* after injection of venom from Indian cobra (*Naia naia vel tripudians*) into monkeys. *Indian J. med. Res.*, **25** 137.
- (With ROY, A. C.) On the estimation of atebtrin in tissue. *Indian J. med. Res.*, **25**, 455.
- (With HAYLER, R. T. M., and BHATTACHARYYA, S. N.) Radiological and laboratory investigations of chronic gastro-intestinal disturbances in the tropics. *Indian med. Gaz.*, **72**, 129.
- (With CHOPRA, G. S.) The treatment of opium habit with lecithin and glucose. *Indian med. Gaz.*, **72**, 265.
- (With ROY, A. C.) Observations on the blood lipid changes in the opium addicts. *Indian J. med. Res.*, **25**, 105.
- (With SEN, B., and GUPTA, J. C.) Yatren in infection with Indian strains of *E. histolytica* (chronic intestinal amoebiasis). *Indian med. Gaz.*, **72**, 348.
- Epidemic dropsy. *Br. Encycl. med. Prac.*, **4**, 220.
- (With CHAUDHURI, R. N., and DE, N.) Electrocardiographic changes in epidemic dropsy. *Indian med. Gaz.*, **72**, 1.
- (With CHAUDHURI, R. N., and SEN GUPTA, P. C.) Telerontgenography of the heart in epidemic dropsy. *Indian med. Gaz.*, **72**, 393.
- (With DAS, N. N., and MUKHERJE, S. N.) Studies on the aetiology of epidemic dropsy. Effect of plasma on tissue culture and chorio-allantoic membrane of the chick. *Indian J. med. Res.*, **25**, 261.
- (With DE, N. N.) A preliminary note on the presence of a histamine like body in the aqueous, humour in glaucoma associated with epidemic dropsy. *Indian J. med. Res.*, **25**, 101.
- (With GHOSH, S., and DUTTA, A. T.) Some inorganic preparations of the Indian indigenous medicine, Part IV, *Raupya Bhasma* (Reduced Silver). *Indian J. med. Res.*, **24**, 1137.
- (With GHOSH, S., and DUTTA, A. T.) Some inorganic preparations of the Indian indigenous medicine, Part V, *Swarna Bhasma* (Reduced Gold) and gold kusth. *Indian J. med. Res.*, **24**, 1141.
- (With DUTT, A. T. *et al.*) *Chemische und pharmakologische Untersuchung von Periploca aphylla*. *Arch. Pharm. Berl.*, **275**, 192.
- (With GHOSH, N. N. *et al.*) *Chemische und parmakologische Untersuchung von Tylophora asthmatica*. *Arch. Pharm. Berl.*, **275**, 236.
- (With BASU, B. C.) A preliminary report on the effect of anti-malarial drugs upon the infectivity of the patients to the mosquitoes. *Indian J. med. Res.*, **25**, 459.
- (With HAYTER, R. T. M., and SEN, B.) A comparative study of the action of atebtrin and atebtrin-plasmochin combination on Indian strains of malaria, Part II. *Indian med. Gaz.*, **72**, 458.
- (With SEN, B., and ROY, A. C.) Individual variations in the effectiveness of synthetic anti-malarial drugs (a preliminary note). *Indian med. Gaz.*, **72**, 131.
1938. (With DAS, N. N., and MUKHERJI, B.) The action of certain cardiac drugs on embryonic heart explants. *Indian J. med. Res.*, **26**, 271.





- (With MUKHERJI, B., and CHAKRAVARTY, M.) Studies on some dextro-rotatory hydrocupreidine derivatives. Part I. Comparative haemolytic activity. *Indian J. med. Res.*, **26**, 279.
- The physiology of the Individual in the tropics. Part I. *Indian med. Gaz.*, **73**, 40.
- The physiology of the individual in the tropics, Part II. Effects on the digestive system. *Indian med. Gaz.*, **73**, 102.
- Physiology of the individual in the tropics. *Twenty-fifth Indian Science Congress.*, Part II, 329.
- (With ROY, A. C.) The effect of Scitz filtration on haemolysins and the components of a haemolytic system. *Indian J. med. Res.*, **26**, 303.
- (With ROY, A. C.) Some biochemical characteristics of snake venom. *Indian J. med. Res.*, **26**, 241.
- (With Chopra, G. S.) The opium smoking habit in India. Part I. General Survey. *Indian med. Gaz.*, **73**, 81.
- (With GHOSH, G. S.) Present position of the opium smoking habit in India. Part II. Preparations of opium used for smoking and mode of indulgence. *Indian med. Gaz.*, **73**, 132.
- (With CHOPRA, G. S.) Present position of opium smoking habit in India. Part III. Studies on the physical and mental effects produced by opium smoking. (An analytical review of 300 opium smokers examined in the field). *Indian med. Gaz.*, **73**, 193.
- (With RAO, S. S., and MUKHERJI, S.) The relative composition of blood and lymph in filarial infection. *Proc. 25th sp Sci. Congr.*, 291.
- (With CHATTERJI, R. G. *et al.*) A preliminary note on the chemistry and pharmacology of the leaves of *Skimmia laureola*, Hook, F. *Indian J. med. Res.*, **26**, 481.
- (With GHOSH, S., and DUTT, A. T.) Some inorganic preparations of Indian indigenous medicine, Part VI. *Samudra Phena. Indian J. med. Res.*, **26**, 485.
- (With BADHWAR, R. L.) A note on collection and cultivation of medicinal plants. *Agriculture Live-stk India.*, **8**, 222.
- (With CHATTERJI, N. R., and GHOSH, S.) Studies on the enzymes of the seeds of *Butea frondosa*, Part I, Proteolytic enzyme. *J. Indian chem. Soc.*, **15**, 101.
- (With CHATTERJI, N. R., and GHOSH, S.) Studies on the enzymes of the seeds of *Butes frondosa*, Part II. Lipolytic enzyme. *J. Indian chem. Soc.*, **15**, 107.
- (With DUTT, A. T., and GHOSH, S.) *Chemische Untersuchung der Wurzeln von Hemidesmu. Indicus. Teil I. Arch. Pharm. Berl.*, **276**, 333.
- (With GHOSH, N. N.) *Chemische und pharmakologische untersuchung der Blatter von Erythronylon monogynum* (Eng.: Bastard Sandal). *Arch. Pharm. Berl.*, **276**, 340.
- (With DUTT, A. T. *et al.*) *Chemische untersuchung der Wurzeln von Paris polyphylla. Teil I. Arch. Pharm. Berl.*, **276**, 343.
- (With LAHIRI, J. K., and GHOSH S.) *Herstellung von reinem Thevetin ans dem Samen von Thevetia nerifolia*, Tuss. *Arch. Pharm. Berl.*, **276**, 345.
- (With GHOSH, N. N.) *Chemische untersuchung der indischen Aloerten Aloe vera, Aloe Indica*, Boyle. *Arch. Pharm. Berl.*, **276**, 348.
- (With GHOSH, N. N., and GHOSH S.) *Die Chemische und Pharmokilogische prufung der jurgen Sprossen von Bamkusa arundinacea. Arch. Pharm. Berl.*, **276**, 351.
- Lathyrism. *Br. Encycl. med. Pract.* **7**, 651.
- Present position of anti-malarial drug. Therapy in India. *Indian med. Gaz.*, **73**, 418.
- Present position of anti-malarial drug therapy in India. *Proc. nat. Inst. Sci. India*, **4**, 145.
- Anti-malarial remedies: Natural and synthetic. *Calcutta med. J.*, **34**, 183.
- (With DAS GUPTA, B. M.) A note on the Therapeutic efficiency of Soluseptasine in simian malaria (P. Knowlesi). *Indian med. Gaz.*, **73**, 395.
- (With DAS GUPTA, B. M., and SEN, B.) Experimental studies on Ape malaria with reference to its use in malaria therapy for nervous conditions. *Proc. natn. Inst. Sci. India*, **4**, 165.
- (With DAS GUPTA, B. M.) Studies on the action of Synthetic drugs on Simian malaria. Sulphonamide derivatives. *Indian med. Gaz.*, **73**, 665.
- (With DAS GUPTA, B. M., and SEN, B.) Studies on the action of synthetic anti-malarial drugs on Indian strains of malaria. Cilional in the treatment of 'Crescent Carriers'. *Indian med. Gaz.*, **73**, 667.
- (With BASU, B. C.) Studies on the effect of antimalarial drugs upon the infectivity of patients to mosquitoes, Part II, "Cilional". *J. Malar. Inst. India*, **1**, 351.
- The incurables. *Indian med. Gaz.*, **73**, 747.
1939. (With GANGULY, S. C.) Abstinence Symptoms in Opium Addiction and the Role of Glucose in their treatment. *Indian J. med. Res.*, **26**, 699.
- (With CHOPRA, G. S.) The present position of Hemp drug addiction in India. *Indian med. Res. Mem. No. 31*, Thacker's Press and Directories. Ltd., Calcutta.
- (With ROY, P. N.) Chronic ulcerative colitis. *Indian med. Gaz.*, **74**, 65.
- (With PASRICHA, C. L. *et al.*) The experimental production of syndrome of epidemic dropsy in man. *Indian med. Gaz.*, **74**, 193.
- (With BASU, B. C.) Studies on the effect of anti-malarial drugs upon the infectivity of patients to mosquitoes, Part III, 'Prontosil'. *J. Malar. Inst. India*, **2**, 153.
- (With DAS GUPTA, B. M. *et al.*) Prontosil in Indian strains of malaria. *Indian med. Gaz.*, **74**, 321.





- (With CHOWHAN, J. S.) Snake Bites and their treatment in India. Part II. The management of sequelae and complications. *Indian med. Gaz.*, **74**, 422.
- The drug industry in India and its difficulties. *Indian med. Gaz.*, **74**, 230.
- (With BOSE, I. B., and MUKHERJI, B.) Quality of quinine preparations in Indian Hospitals and Dispensaries. *Indian med. Gaz.*, **74**, 609.
- (With DAS GUPTA, B. M. *et al.*) Infection with *Giardia Lamblia*—its pathogenicity and treatment. *Indian med. Gaz.*, **74**, 458.
- (With PASRICHA, C. L., and LAL, S.) Hydrated disease of the lungs: A case report. *Indian med. Gaz.*, **74**, 621.
- (With BASU, B. C., and SEN, S.) Rat bite fever in Calcutta. *Indian med. Gaz.*, **74**, 449.
- The problem of opium addiction in India and its treatment. *Curr. Sci.*, **8**, 503.
- (With BASU, B. C.) Failure of 'M<sub>2</sub>' in prophylaxis of Indian strains of malaria. *Malar. Inst. India*, **2**, 153.
- (With DAS, N. N., and GUPTA, J. C.) Effects of morphine, atropine, nicotine and pilocarpine on the muscular activity of alimentary tract. *Indian Sci. Congr.*, 251.
- (With DAS, N. N., and MUKHERJI, B.) Effect of certain growth promoting hormone on the tissue explants. *Proc. Indian Sci. Congr.*, 251.
- (With HAYTER, R. T. M., and SEN, B.) M and B 693 in Indian strains of malaria. *Indian med. Gaz.*, **74**, 658.
- (With RAO, S. S.) Chemotherapy of filarial infection. *Indian J. med. Res.*, **27**, 549.
1940. (With MAZUMDAR, D. C., and ROY, A. C.) Some observations on the lipid contents of the blood in Epidemic dropsy.
- (With ROY, A. C., and BISWAS, H. K.) On the composition of sweat of the Indians.
- Hospital organisation with special reference to conditions in India. *Indian med. Gaz.*, **75**, 170.
- Drug manufacture in India during peace and war. *Indian med. Gaz.*, **75**, 233.
- Use of hemp drugs in India. *Indian med. Gaz.*, **75**, 356.
- (With CHAKRAVARTY, B.) Respiratory dyspnoea following administration of Barium Meal. *Indian med. Gaz.*, **75**, 330.
- (With CHATTERJI, N. R., and GHOSH, S.) A comparative study of *Boerhaavia Diffusa* Linn, and the white and red flowered "varieties" of *Trianthema Portulacastrum* Linn. *Indian J. med. Res.*, **28**, 475.
- (With CHOPRA, G. S.) The present position of hemp drug addiction in India. *Br. J. Inebr.*, **38**, 225.
- (With CHOPRA, G. S.) Treatment of opium addiction with Lecithin and Glucose and its effects on abstinence symptoms. *Indian med. Gaz.*, **75**, 388.
- (With CHOWHAN, J. S.) The venom of Indian cobra (*Naja Naja*) in certain painful conditions. *Indian med. Gaz.*, **75**, 69.
- (With DEMONTI, A. J. H. *et al.*) Chemotherapeutic studies in the treatment of Meningococcal and Pneumococcal Meningitis. *Indian med. Gaz.*, **75**, 1.
- (With GUPTA, J. C. *et al.*) A note on the chemistry and pharmacological action of *Entada pursaetha* DC. (*E. Scandens* Benth) *Indian J. med. Res.*, **28**, 469.
- (With HAYTER, R. T. M., and SEN, B.) Haffkine (Acriquine) an atebriane-like compound prepared in India, in Indian strains of malaria. *Indian med. Gaz.*, **75**, 200.
- (With HAYTER, R. T. M. *et al.*) *Crinodora* (Palusan) in India strains of malaria. *Indian med. Gaz.*, **75**, 202.
- (With MUKHERJI, B., and CHATTERJI, M. L.) The influence of Calcium salts on procain convulsions of guinea pigs. *Proc. Indian Sci. Congr.*, Part III, Madras, 251.
- (With PASRICHA, C. L., and BANERJEE, K.) An outbreak of Epidemic dropsy. *Indian med. Gaz.*, **75**, 261.
1940. (With ROY, D. N., and GHOSH, S. M.) Insecticidal and larvicidal action of *Tephrosia Vogilii*. *J. Malar. Inst. India*, **3**, 185.
- (With ROY, D. N., and GHOSH, S. N.) Action of Pyrethrum on mosquito larvae. *J. Malar. Inst. India*, **3**, 457.
- (With ROY, D. N., and GHOSH, S. N.) *Blumea densiflora* and *Artemisia vulgaris* Their insecticidal and larvicidal properties. *J. Malar. Inst. India*, **3**, 495.
- (With ROY, D. N. *et al.*) M<sub>3</sub>, A new drug in the treatment of malaria. *Indian med. Gaz.*, **75**, 19.
1941. (With SESHAN, P. K., and DEMONTE, A. J. H.) Spectrophotometric examination of blood in the treatment of Meningitis with Diarimo-Diphenyl-Sulphone Glucoside.
- Organisation of Public Health and Medical Services in India. *Indian med. Gaz.*, **76**, 54.
- Organisation of Public Health and Medical Services in India. *Calcutta med. J.*, **38**, 91.
- (With BADHWAR, B. L., and NAYER, S. L.) Insecticidal and Pesticidal Plants of India. *J. Bombay nat. Hist. Soc.*, **42**, 854.
- (With CHAKRAVARTI, M.) A preliminary note on the pharmacological action of the alkaloids of *Rauwolfia serpentina*. *Indian J. med. Res.*, **29**, 763.
- (With CHOPRA, G. S., and ROY, A. C.) Urinary excretion of Morphine in opium addicts with and without Lecithin-Glucose treatment. *Indian J. med. Res.*, **29**, 195.
- (With DEMONTE, A. J. H. *et al.*) Sulphanilylguanidine in cholera. *Indian med. Gaz.*, **76**, 712.





- (With GANGULY, S. C., and RAO, S. S.) Protein fractions and other physical properties of hydrocele fluid. *Indian J. med. Res.*, **29**, 253.
- (With GUPTA, J. C., and CHOPRA, G. S.) Pharmacological action of the essential oil of *Curcuma longa*. *Indian J. med. Res.*, **29**, 769.
- (With ROY, D. N., and GHOSH, S. M.) The insecticidal and Larvididal action of the essential oils of *Ocunmm basilicum* (Linn) and *Ocumum sanctum* (Linn). *J. Malar. Inst. India*, **4**, 109.
- (With SEN, B., and GUPTA, J. C.) Induced malaria with heavy malignant tertian infection. *Indian med. Gaz.*, **76**, 148.
1942. (With BOSE, B. C. *et al.*) A preliminary study of the pharmacological action of the glucoside of *Cerebra odollam*. *Indian J. med. Res.*, **30**, 319.
- (With CHAKRAVARTY, B.) Gastric acidity in chronic ulcerative colitis. *Indian med. Gaz.*, **77**, 68.
- (With CHOPRA, G. S., and CHOPRA, I. C.) A study of the normal blood pressure of the Indians;
- A note on Mucodal Habit in India. *Indian med. Gaz.*, **77**, 21;
- Minor Drug Habits of India. Part I. *Indian med. Gaz.*, **77**, 34;
- Minor Drug Habits of India. Part II. *Indian med. Gaz.*, **77**, 107;
- Alcoholic Beverages in India. Part I. *Indian med. Gaz.*, **77**, 224;
- Alcoholic Beverages in India. Part II. *Indian med. Gaz.*, **77**, 290;
- Alcoholic Beverages in India. Part III. *Indian med. Gaz.*, **77**, 361; and
- *Canabis sativa* in relation to mental diseases and crimes in India. *Indian J. med. Res.*, **30**, 155.
- (With CHOPRA, I. C.) Treatment of chronic Intestinal Amoebiasis. Use and abuse of emetine. *Indian med. Gaz.*, **77**, 65.
- (With CHOWHAN, J. S., and CHOPRA, I. C.) Sterilisation of snake venom preparations. *Indian med. Gaz.*, **77**, 23.
- (With Gupta, J. C. *et al.*) A preliminary note on the pharmacological action of the glucosides from *Paris polyphylla* SM. *Indian J. med. Res.*, **30**, 103.
1949. (With BHADWAR, R. L., and GHOSH, S.) Medicinal and Poisonous Plants of India. Vol. I.
1953. (With BHADWAR, R. L., and GHOSH, S.) Medicinal and poisonous plants of India, Vol. II.
1954. (With NAYAR, S. L. *et al.*) *Glossary of Indian Medicinal plants*, C.S.I.R. Publication.
1956. (With CHOPRA, S. C., and CHOPRA, I. C.) *Drug addition in India*. C.S.I.R. Publication.

