

## **RAM NATH CHOPRA (1882-1973) – A VISSIONARY IN PHARMACEUTICAL SCIENCE\***

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Brevet Colonel Sir Ram Nath Chopra (1882-1973) is remembered as the parent of pharmacology, pioneer of systematic studies of indigenous drugs, promoter of Indian systems of medicine, and patron of pharmacy. Chopra joined the Calcutta School of Tropical Medicine in 1921 as the first professor of pharmacology. During his work at the School for two decades he established the first centre of studies and research in pharmacology. The major fields of his interest remained the general pharmacology, chemotherapy, indigenous drugs, drug addiction and drug assays. He was instrumental in changing the traditional descriptive materia medica teaching to modern pharmacology, with strong experimentation base. He got to be looked up to as father of pharmacology in the country. Even after superannuation from the Calcutta School, Sir Ram Nath Chopra maintained his interest in the indigenous drugs and the Indian medical systems, the promotion of which had become the mission of his life. He presided over the Drugs Enquiry Committee (1930-31), and its history-making report made cogent recommendations, which paved the way for the drugs and pharmacy legislations, pharmacopoeial publications and development of the pharmacy profession.

**Key words:** Biochemical Standardisation Laboratory at Calcutta, Building of pharmacology discipline, Calcutta School of Tropical Medicine, Drug addiction, Drug Research Laboratory at Jammu, Drugs and pharmacy legislations, Drugs Enquiry Committee, Indian pharmacopoeial publications, Indian systems of medicine, Indigenous drugs.

### **INTRODUCTION**

Brevet Colonel Sir Ram Nath Chopra had a multifaceted personality. He left a deep impact on several medico-pharmaceutical developments in

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our country. He raised himself to the status of an institution rather than an individual. He had a glorious career seldom to be achieved by most medical scientists in India. He is remembered as the parent of pharmacology, pioneer of systematic studies of indigenous drugs, promoter of the Indian systems of medicine, and patron of pharmacy.

His life history and contributions are covered here under the sections: Early Life, Studies in England and Entry to the Indian Medical Service; Building of the First Centre of Study and Research in Pharmacology, split into subsections — General Pharmacology and Chemotherapy etc., Indigenous Drugs, Drug Addiction, Drug Assays, and Ranks, Positions and Recognitions; Drugs Enquiry Committee; Promotion of Professional Pharmacy and Other Pharmaceutical Activities; Medicinal Plants and Indian Systems of Medicine: A Lifelong Mission; and The Legacy.



**Fig. 1.** Ram Nath Chopra (1882-1973)

[Photo: Courtesy of the Indian Institute of Integrative Medicine, CSIR, Jammu]

### EARLY LIFE, STUDIES IN ENGLAND AND ENTRY TO THE INDIAN MEDICAL SERVICE

Ram Nath Chopra belonged to the Jammu and Kashmir State.<sup>1</sup> His ancestors had migrated to the State from Rawalpindi area. He was the eldest son of Raghu Nath Chopra, who was a government official. Ram Nath was born at Gujranwala, Punjab, on 17 August 1882.<sup>2</sup> He had his early studies at Jammu and Srinagar. He completed his schooling at Lahore. For collegiate education he studied at the Government College, Lahore. He had a brilliant academic record. His father was advised to send his son for higher studies in England. Ram Nath left for overseas in early 1903 and enrolled himself in the Downing College, Cambridge. In 1905 he qualified for Natural Sciences Tripos and 'was admitted B.A. on 20 June. He was subsequently admitted B.Chir. (5 December 1908); and M.A. (27 February 1909).'<sup>3</sup>



**Fig. 2.** Ram Nath Chopra during his years at Cambridge.  
[Photo: Courtesy of IIM, Jammu]

It is of interest to note that the time when Chopra joined Cambridge, lot of changes were taking place from traditional *materia medica* to pharmacology.<sup>4</sup> In 1904 or 1905, independent post of reader in pharmacology at the university was created, and Dr Walter E. Dixon was appointed to the position, and soon after, possibly in 1907, he was appointed the first professor of pharmacology in the University of Cambridge. Professor Dixon was a keen experimental pharmacologist and from his very first class Chopra attended his course of lectures, as well as experimental demonstrations. By his contacts with Professor Dixon, Chopra became more and more interested in experimental pharmacology. The professor encouraged him to perform independent experiments. He suggested to Chopra to work out the action of various drugs on the ciliary movements. Chopra contributed this work for the degree of Doctor of Medicine of the Cambridge University, which was awarded to him in 1908.<sup>5</sup> It has been said (by Dr H. H. Dale) about Professor Dixon, a brilliant and stimulating lecturer, that 'Pharmacological teaching in England, when Dixon began, presented an unappetising mixture of half obsolete *materia medica* with empirical therapeutics. In Dixon's hands it became a lively adventure in experimental science.'<sup>6</sup> No wonder Chopra was greatly inspired by Dixon in creating in him a deep interest in experimental pharmacology.

While studying medicine at St. Bartholomew's Hospital in London, Chopra successfully competed for the Indian Medical Service (IMS) examination, standing third in order of merit,<sup>1</sup> in 1908.<sup>7</sup> 'That year he obtained the Cambridge M.B. and in the shortest possible time the Cambridge M.D. and the London M.R.C.P.'<sup>7</sup> He returned to India, early in 1909, to take up a medical service career.<sup>4</sup> During the first world war he was called to serve on the East African front and was D.A.D.M.S. during the Afghan war of 1919.<sup>7</sup>

#### **BUILDING OF THE FIRST CENTRE OF STUDY AND RESEARCH IN PHARMACOLOGY**

The professional and academic career of R. N. Chopra started in 1921 when in August he joined the Calcutta School of Tropical Medicine. Though over a decade had elapsed in between since his return from studies in England, but he was still anxious for academic pursuits in pharmacology.

This is what he himself recorded,

‘On returning to India, I carried with me the enthusiasm instilled in me by the personality and scientific stature of Professor Dixon and was more eager than ever to take up an early opportunity of establishing myself as a teacher and researcher in modern pharmacology. Unfortunately, the climate of medical teaching in Indian universities was not then ready for the introduction of pharmacology as a distinct discipline in the medical curriculum. No suitable placement, therefore could be found for a young specialist in pharmacology, such as I. As an officer of the Indian Medical Service, I was placed on general medical duty in eastern Africa and in several military outposts in northern India. After nearly a decade, an opportunity came my way, and I was appointed Professor of Pharmacology in the newly established Calcutta School of Tropical Medicine. I was also appointed to the Chair of Pharmacology at the Calcutta Medical College.’<sup>4</sup>

Thus Chopra started out as the first professor to give lectures in pharmacology as distinguished from the traditional materia medica. At the School he got to lecture and hold demonstrations for the postgraduate students and undergraduate teaching in the subject at the Medical College.

The School of Tropical Medicine was formally opened in November 1921 but it was not fully equipped till the end of 1922 for the pharmacological work. In a few years more additions were made and the laboratory became as well equipped as some of the best pharmacological laboratories in the United Kingdom.<sup>9</sup> The charge of the Out-patient Department in general tropical diseases and a number of beds in the Carmichael Hospital of Tropical Diseases was of great help in keeping the Pharmacology Department in direct contact with clinical work.

Major Chopra was able to collect around him a team of gifted young researchers and trainees who came from different provinces to work under him. He was appreciative of the help he got from his colleagues Major H. W. Acton, Professor of Pathology, Bacteriology and Helminthology, who had earlier associated with Sir Henry Dale at the National Institute for Medical Research in London, a skilled voluntary worker Dr B. N. Ghosh from another medical school in Calcutta, who had temporarily associated with Professor Arthur Cushney, the celebrated pharmacology professor of Edinburgh and London, and Dr Sudhamoy Ghosh, Professor of Chemistry at the School who was a well known chemist.<sup>4,10</sup>

It is evident that Professor R. N. Chopra started building the pharmacological study and research centre from a scratch. He projected a new face of the subject, changing from traditional *materia medica* to modern pharmacology. The major strength of his work was experimental pharmacology.

The two decades of Professor Chopra spent at the Calcutta School of Tropical Medicine was the most significant span of his career. Varied kinds of studies were carried out falling, under the broad head of general pharmacology and chemotherapy. The indigenous drugs constituted an important segment of his work plan. He also engaged in meaningful surveys on drug addiction. Drug analysis was the other activity which engaged attention. During the period at the School, he headed Drugs Enquiry Committee which made history-making recommendations in pharmaceuticals and also contributed greatly to the development of pharmaceutical profession.

Before proceeding to give outlines of the work he carried out, I may mention that to collect material for my research on science history in general and source information on Ram Nath Chopra in particular, I visited Calcutta School of Tropical Medicine several times. The Annual Reports of the School for the period 1921-41 became handy in obtaining authentic information. There I also got a consolidated list of publications of his times at the School, running to 322 papers and 4 books. Later I came across the bibliographic list which was appended to INSA memoirs of Chopra.<sup>1</sup> In this write-up selective use has been made as citations of some of his original articles and the information from the annual reports.

#### **General Pharmacology and Chemotherapy etc.**

In the Annual Reports, different kinds of studies carried out were put under the general pharmacology head. Among the topics explored were study of pharmacological actions, chemotherapeutic agents used in the treatment of tropical diseases, antimony test for the diagnosis of *kālā-zar*, physical properties of pathological and normal sera, snake venoms, etc.

Chopra's earliest research papers published from the School included studies related to therapeutics of emetine<sup>11</sup> and cinchona alkaloids.<sup>12,13</sup> According to him, 'These hardly represented any significant contributions to pharmacological science, but such publications, based on studies on

experimental animals, demonstrated, for the first time in India, the dangers involved in employing heroic doses of alkaloidal drugs in the treatment of all types of dysentery and malaria. Through such applied and broad based activities in the early days, the cause of pharmacology was advanced, its essentiality as a cog in the wheel of medical education was proved, and it could secure for itself an honourable place in the medical curriculum of Indian universities.<sup>74</sup> This spelled out his philosophy of building the pharmacology discipline in India; the importance of experimental pharmacology stood emphasised.

To a good extent the pharmacological studies by Chopra centred around tropical diseases and prospective remedies. The oxytocic action of quinine was noted to be marked when uterus was nearly full but in early pregnancy there was hardly any appreciable effect. Cinchonine and cinchonidine given in ordinary doses produced a fall in blood pressure by depression of vasomotor centre and vasomotor nerve endings. Emetine stimulated the tone and movements of the gut by direct effect on the musculature. The effects of emetine on activity of adrenal and thyroid glands were studied.

A considerable time was spent on examining the physical properties of pathological blood sera in comparison with normal sera. The changes in physical properties like viscosity, surface tension and buffer action were considered. It was observed that viscosity of pathological sera was generally greater than of normal sera. The highest values were obtained with sera from the blood of *kālā-zar* patients. The physical properties of the sera from the blood of filariasis patients differed only slightly from those of normal patients.

There were published a number of papers on investigation of the action of antimony and bismuth compounds. It was shown that increase in the volume of spleen and liver, after intravenous injections of antimony compounds, known to occur in animals, probably also occurred in the human subject.

Chemotherapeutic studies were carried out in connection with diseases as malaria, amoebic dysentery, *kālā-zar*, filariasis, etc. The work on antimalarial drugs was done both from experimental and clinical points of view.

Studies were taken in hand on snake venoms as there had been made claims on their use as therapeutic agents in the indigenous medicine. Work

was carried out on cobra venom and the venoms of Indian daboia (*Vipera russellii*) and *Echis carinata*. In general there appeared to be no justification for use of venoms as remedies in different diseases. However, the investigations into pharmacological actions of the snake venoms and their practical application in therapeutics for relief of pain in case of cobra venom and increasing the coagulability of blood in case of Russell's viper venom gave satisfactory results.<sup>14</sup> The value of cobra venom in relieving pains of indefinite nature in a large number of patients was confirmed.<sup>15</sup>

The charge of beds in the Carmichael Hospital for Tropical Diseases enabled Chopra to carry out a large amount of clinical work both with testing the effectiveness of various remedies and also in studying various conditions peculiar to tropical climates. The studies were made on the known remedies and/or new drug candidates for the treatment of malaria, amoebic dysentery, Giardia and filarial infections, ulcerative colitis, ascites, epidemic dropsy, asthma, etc. A mention has been made above about the clinical study on cobra venom.

Lastly, a mention may be made here of books on anthelmintics<sup>16</sup> and tropical therapeutics<sup>17</sup> which were published during Col. Chopra's service with the School.

### **Indigenous Drugs**

In the original constitution of the Calcutta School, it was laid down that Professor of Pharmacology would have one of his duties to carry out research work on the Indian indigenous drugs.<sup>18</sup> In fact, the chair was titled as Professor of Pharmacology including Indigenous Drugs.

Col. Chopra used the term 'Indigenous Drugs' in its widest sense including within its scope not merely those drugs which were originally native of India but also those which were introduced from outside and had become completely naturalized.<sup>18</sup> For him the drugs cultivated in India, whether used in the indigenous systems of medicine or were in the pharmacopoeias of various western countries came under the purview of that expression.

When Chopra initiated his work on indigenous drugs at the School in 1921, he had the following main objectives in view:<sup>18</sup>



- (1) To make India self-supporting by enabling her to utilize the drugs produced in the country, and by manufacturing them in a form suitable for administration.
- (2) To discover remedies from the claims of Āyurvedic, Tibbi and other indigenous systems, suitable to be employed by the exponents of modern system.
- (3) To discover the means of affecting economy, so that these remedies might fall within the means of the great masses in India whose economic condition is very low.
- (4) Eventually to prepare an Indian Pharmacopoeia.

In addition to his other work Chopra continued with the investigations on indigenous drugs. In later years he again expressed, 'I never deviated far from my central interest and first love in the development of pharmacological researches on Indian indigenous drugs. The aim and scope of the work, as envisaged by me around 1924, was (a) to make Indian pharmacology self-supporting by enabling her to utilize the locally produced drugs economically, under standardized laboratory conditions, and (b) to discover remedies, from the claims of Āyurvedic, Tibbi, and other indigenous sources, suitable to be employed by exponents of western medicine. Such programme necessarily demanded a multipronged attack by a team of workers from botany, pharmacy, chemistry, pharmacology and clinical medicine. In full realization of this, I initiated collaborative enterprise with the Botanical Survey of India, located in Calcutta, and with Professor S. Ghosh.'<sup>4</sup>

Chopra and associates investigated scores of medicinal plants. Out of the long list of indigenous drugs examined a mention may be made of the following: *Alangium lamarckii*, *Holarrhena antidysenterica* (Kurchi), Indian aconites, Indian artemesia, Indian chenopodium, Indian ephedra, Indian squills, *Plantago ovata* (Ispaghula), *Picrorhizza kurooa* (Katki), *Psoralia corylifolia* (Babchi), *Rauwolfia serpentina* (Sarpagandhā), *Sarca indica*, *Saussuria lapa* (Kuth), *Sida oordifolia*, *Terminalia arjuna* (Arjun), *Thevetia nerifolia* (yellow oleander), *Veronia anthelmintica*, etc. The quality of *Digitalis lanata* and *Digitalis purpurea* grown in India was studied. Inorganic preparations of indigenous medicines like *Banga Bhasma* (calcined tin), *Lauha Bhasma* (calcined iron) and *Swarna Bhasma* (calcined gold) also received attention.

From the investigations made on indigenous drugs it was viewed that *Halorrhena antidysenterica*, *Plantago ovata*, *Psoralia corylifolia* and *Rauwolfia serpentina* and cobra venom could be worthy of pharmacopoeial recognition.<sup>19</sup>

Chopra and associates carried out a pioneering work on *Rauwolfia serpentina*, a plant which gained prominence two decades later as a source of reserpine. In 1933 it was reported that an alkaloid obtained from the plant, on experimental studies in animals showed central depressant properties and lowered the blood pressure.<sup>20</sup> It was recorded that 'it should prove to be a valuable sedative drug' and 'if administered in proper dosage form should be of value as a remedy for hyperpiesis.'

Before going further a reference may be made to the tome on indigenous drugs which Chopra authored.<sup>21</sup> It dealt with medical and economic aspects of Indian indigenous drugs and was considered to be a definite step forward in the progress of Indian medicine.

It was an extension of Chopra's work on indigenous drugs that led him to also collect and analyse information on poisonous plants of India. It was noted that the number of plants reputed to be poisonous to man, live stock, insects, fishes, etc. growing in the country was around 700. A beginning was made which was to later lead to a comprehensive monograph on the subject. A paper was contributed which provided information covering in brief the botanical aspects, constituents and activities of several hundred of the poisonous plants.<sup>22</sup>

It was very thoughtful of Col. Chopra to have organised preparation of herbarium of medicinal and poisonous plants.<sup>23</sup> He was well aware of the utility of such a collection for identification of the plants. The painstaking work continued for about a decade. It became possible to collect 6,000 specimens of about 1,600 species. This represented about two-thirds of the total species of known medicinal and poisonous plants occurring in India. The herbarium was prepared in triplicate. On leaving in 1941, he left one complete set at the School, took one set with him, and third was sent to the Forest Research Institute, Dehra Dun.

### **Drug Addiction**

Drug addiction was a neglected area and an unpromising subject for studies when Col. Chopra started the investigations in the field. The studies

were facilitated by support from the Indian Research Fund Association. The commonest addictions in India at the time were alcohol, opium, hemp and cocaine. The opium habit was the oldest of all drug habits in the country. It was very prevalent in certain parts and in certain populations. Work was carried out on opium habit, analysing cases in selected sections of population and regions of the country.<sup>24-26</sup> Say, in the Punjab, though the addiction was not wide spread but was confined to certain communities and areas.<sup>26</sup> The rise in opium consumption ran almost parallel in the percentage of Sikhs among the population. It was seen that in most parts of India, opium smoking was a very common method of consumption of opium.<sup>27-29</sup> In certain parts of the Punjab and Rajasthan States use was made of poppy capsules for addiction.<sup>30</sup> In later years a review was presented on quasi-medical use and effects of opium.<sup>31</sup>

The hemp-drug addiction also received considerable attention. The position was summed up in a memoir published as a supplement to the *Indian Journal of Medical Research*.<sup>32</sup> This detailed and illustrated presentation covered description of the cultivation of hemp, its active principles, different preparations made for the purposes of its use, and modes of their indulgence. The physical and mental effects produced by its addiction through the data collected on field studies lasting for many years were analysed. Studies were also carried out on the pharmacological action of hemp drugs and their role in habit formation. This painstaking study and compilation of the information on the hemp addiction is a useful reference work.

While on drug addiction, a reference may also be made to studies related to alcoholic beverages used in India, consumption of country spirits and beers and physiological action of alcohol.<sup>33</sup>

In an article Chopra expressed himself on the treatment of drug addiction due to opium, hemp drugs, cocaine etc.<sup>34</sup> The importance of psychological aspects of the treatment of drug addicts was stressed.

In later years the series of papers published by Chopra and associates on the topic from the Calcutta School were made use of in writing of a book on drug addiction.<sup>35</sup>

### **Drug Assays**

The Department performed a commendable function of analysing, particularly those requiring biological assays, the drug preparations available

in the market and thus contributed to quality consciousness.<sup>36</sup> The facilities for biological testing in manufacturing houses were lacking. Some large firms manufactured galenicals which were well up to the pharmacopoeial standards. However, the general quality of the medicinal drugs and preparations was unsatisfactory. The prevailing climatic conditions led to deterioration of even of standard preparations. The adulteration and tampering with quality and strength of drugs was a common occurrence. Even some European firms imported inferior products especially manufactured for Indian market. The State control on the manufacture, import and sale of drugs was emphasised.

Digressing from main theme of this section, reference may be made here to Col. Chopra's views on different aspects of public health and medical services which were relevant when those were expressed around 1940.<sup>37,38</sup> Establishment of ministries of health in various provinces and for co-ordination purposes formation of Federal Ministry of Health was advocated.

#### **Ranks, Positions and Recognitions**

While closing this section on Chopra's work and association with the Calcutta School of Tropical Medicine, during 1921-41, a note may be made of the ranks he held in the Indian Medical Service, the positions he occupied at the School, and honours and recognitions he got during the span of two decades.

When Dr R. N. Chopra joined as Professor at the School in 1921, he held the rank of a Major in the IMS. He got to be Lieutenant- Colonel in 1927.<sup>39</sup> It was his work on the Drugs Enquiry Committee and fine services to the School which brought to Colonel Chopra recognition in the New Year Honours list of January 1934 by the award of C.I.E.<sup>40</sup> In 1935 he was made Honorary Physician to His Majesty the King with the Brevet rank of Colonel.<sup>41</sup> He was elected a Fellow of the Asiatic Society of Bengal in 1933<sup>42</sup> and in 1939, he became Vice-President of the Society;<sup>43</sup> he also received Barclay medal of the Society.<sup>1</sup> He was elected President of the National Institute of Sciences of which he had been a Foundation Fellow.<sup>1</sup>

From the School and the University of Calcutta, Col. Chopra was awarded the Minto Medal, Mouatt Medal, Coatos Medal, etc.<sup>1</sup> He was awarded the Sc.D. degree of Cambridge University for his contributions to the science

of medicine.<sup>44</sup> The Royal College of Physicians of London elected him as a Fellow.<sup>45</sup>

Col. Chopra was elected to Honorary Membership of the American Society for Pharmacology and Experimental Therapeutics<sup>45</sup> and the Pharmaceutical Society of Great Britain (in 1940)<sup>46</sup> and a corresponding member of the Belgian Society of Tropical Medicine.<sup>45</sup>

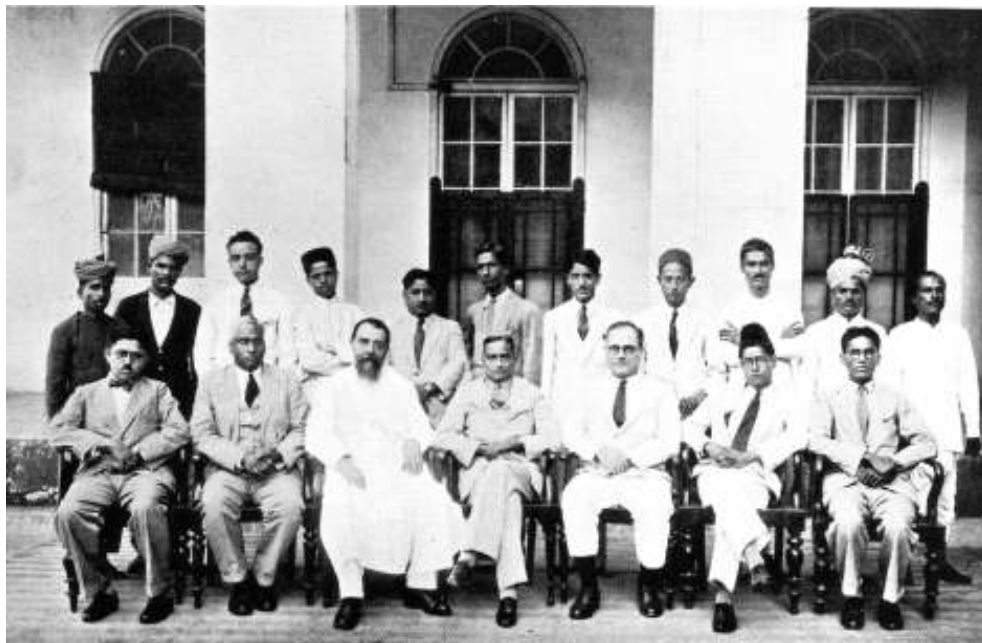
Col. Chopra was conferred the Knighthood in the 1941 New Year Honours list.<sup>47</sup>

After holding Directorship of the Calcutta School of Tropical Medium for seven years Sir Ram Nath Chopra relinquished his office in the middle of November 1941.<sup>48</sup> During the period he also held the charge of superintendent and senior physician of the Carmichael Hospital for Tropical Diseases. Col. Chopra retired from Indian Medical Service in August 1939, nearly after 32 years of service.<sup>49</sup> Thereafter, he continued to serve the School, possibly through reappointment by the Government of Bengal.

Col. Chopra's chairing the Drugs Enquiry Committee and consequent follow-up, and promotion of pharmacy and other pharmaceutical activities, largely of his Calcutta School days as Professor of Pharmacology, are covered next in separate sections.

#### **DRUGS ENQUIRY COMMITTEE: THE HARBINGER OF PHARMACEUTICAL DEVELOPMENTS**

During the colonial period for the requirement of drugs, the country largely depended on imports. There was honest trade and also fraudulent practice of dumping inferior drugs in India. The drug manufacture here was just beginning. There were malpractices in the sale of drugs. The tropical climate and storage for inordinate periods was also the factors contributing to deterioration of drugs and such substandard drugs continued to be peddled in the market. The overall situation was of grave concern. The absence of adequately qualified pharmaceutical personnel compounded the sad state of affairs. The issues had direct bearing on public health. At long last, in August 1930 the Government of India appointed a committee to study the issues and make appropriate recommendations.<sup>50</sup> Lt. Col. Chopra was chosen to chair this Drugs Enquiry Committee. The committee embarked on an extensive tour of the country to examine witnesses and to visit selected institutions.



**Fig. 3.** The Drugs Enquiry Committee and Others Seated (from left to right): Dr B. Mukherjee (Assistant Secretary), C. Govindan Nayar (Secretary), reverend Father J. F. Caius, Lt. Col. R. N. Chopra (Chairman), H. Cooper, Abdul Matin Chaudhury [From the *British and Colonial Druggist*, 84 (1931) 148

In December, Lt. Col. Chopra fell seriously ill but in spite of this illness he was again back at work before he was really convalescent and was able to complete the report in the time stipulated.<sup>51</sup> The report of the committee was submitted by the end of March 1931.<sup>52</sup> The Committee made several significant recommendations. It was recommended that there should be central legislation to control drugs and pharmacy. The legislation might consist of a combined drugs and pharmacy act, or a separate drugs act and separate pharmacy act. To advise in making rules to carry out the objects of the act, creation of an advisory board was recommended. A central laboratory was required to be established. Compilation of Indian Pharmacopoeia was recommended.

The Government of India kept silent on recommendations of the Drugs Enquiry Committee. Colonel Chopra continued to draw attention to the menace of drug adulteration and sale of spurious drugs.<sup>53,54</sup> The institution

of the drug control legislation was delayed. It took nine years after pertinent recommendations of the Committee, for the Drugs Act 1940 to come forth, and per provisions of the Act the Drugs Technical Advisory Board could be constituted in 1941.<sup>55</sup>

As prelude to these developments, the Government of India established Biochemical Standardisation Laboratory at Calcutta in January 1937 with Col. Chopra as the Director in honorary capacity.<sup>56</sup> It was a nucleus for the central laboratory recommended by the Drugs Enquiry Committee. To begin with the Laboratory was located at the All-India Institute of Hygiene and Public Health. It may be recalled that since 1925, Col. Chopra at the Calcutta School of Tropical Medicine had been engaged in the biological standardisation of drugs of particular interest to India.<sup>56</sup> Col. Chopra remained in charge of the Laboratory till 15 November 1941, and was succeeded by Dr B. M. Mukerji.<sup>57</sup> The Laboratory continued with its activities as a nucleus organisation primarily concerned with survey of quality of drugs in the Indian market, drug research, training of analysts and war work. The name of the Bio-chemical Standardisation Laboratory was changed to the Central Drugs Laboratory which got statutory status according to the Drugs Act 1940 and the Rules thereunder brought into operations from 1 April, 1947.<sup>58</sup>

As the result the necessary statutory framework was provided for the control on the import, manufacture, sale and distribution of drugs. During the twilight years of the British rule, for work on regulation of pharmacy profession a beginning was made around 1945 but the Pharmacy Act 1948 became a reality seventeen years after the Committee's recommendations had reached the Government of India.

The recommendation of the Drugs Enquiry Committee for compilation of Indian Pharmacopoeia did not receive serious consideration of the Government. Instead a committee was constituted, with Sir R. N. Chopra as the chairman, to prepare an official pharmacopoeial list.<sup>59</sup>

The *Indian Pharmacopoeial List* got ready and was published in 1946.<sup>60</sup> It was intended to serve as an Indian Supplement to the British Pharmacopoeia 1932. The List included vegetable drugs growing in India and their galenicals, some substitutes of B.P. drugs occurring in India, and also a few synthetic substances.

The compilation of regular pharmacopoeia had to wait till independence of the country. The first Indian Pharmacopoeia Committee was constituted in 1948.<sup>61</sup> It was reconstituted from time to time. Sir Ram Nath Chopra continued on the Committees involved in the preparation of the *Pharmacopoeia of India (Indian Pharmacopoeia)* (1955) and its 1960 supplement, and the new edition of the pharmacopoeia which followed in 1966. For the 1955 edition Sir Ram Nath Chopra chaired the 'Co-ordination Sub-committee' and for the 1960 supplement and the 1966 edition he headed the Indian Medicinal Plants Sub-committees.

The above brings out the monumental work which Col. Chopra carried out through the Drugs Enquiry Committee, in making a serious study of the situation as it existed with regard to drugs and pharmacy, and formulating cogent recommendations for consideration of the Government.<sup>62</sup> He also kept impressing for early action on the same, and extended his help and accepted duties through the respective bodies which he was called upon to undertake.

#### **PROMOTION OF PROFESSIONAL PHARMACY AND OTHER PHARMACEUTICAL ACTIVITIES**

Here an account is given of Col. Chopra's working for improving the lot of professional pharmacy, and his involvement in promotion of various pharmaceutical activities like education, industry, and advising on CSIR supported projects.

Whereas Col. Chopra worked at higher levels in the governmental circles, he also made himself available for interacting with members of the pharmacy community who were at the grass roots level. It is commendable that a person of his status as an eminent medical man and scientist had no reservation in mixing with lowly stratum of working pharmacists of the time.

In general, in the pre-independence India the situation about pharmacy practice was pitiable. The dispensing was mostly left in the hands of ill-prepared compounders. A ferment among compounders' of Bengal in the late 1920s led to the formation of the All-Bengal Compounders Association (ABCA). It shows his magnanimity, humility and commitment to a cause that Col. Chopra had no inhibition in intermingling with compounders. He accepted to preside over the annual meeting of the ABCA in January 1934.<sup>63</sup> In his presidential address, he said, 'The busy physician dealing with diagnosis



and treatment of disease has no time at his disposal to dispense his own medicine as he used to do in old days. Pharmacy has developed enormously along with medicine and the wider scope of the two sciences makes it impossible for the medical practitioner to devote himself systematically to the study of pharmacy.’ He drew attention to state of the profession of pharmacy as it existed and its neglect, and the remedy to correct the sad state of affairs through the recommendations made by the Drugs Enquiry Committee. It was on the advice of Col. Chopra that name of the ABCA was changed to Bengal Pharmaceutical Association (BPA). The new name brought with it a significant change in the activities of the Association.<sup>64</sup> He continued to head the BPA for some years. At a meeting of the BPA Council in July 1938, with Col. Chopra presiding, a move was initiated to examine the possibility of formation of ‘Indian Pharmaceutical Association,’<sup>65</sup> but it seems that the proposal for having this national body did not succeed. If it had, the history of pharmaceutical organisational structuring in the country might have been different.

During Col. Chopra’s tenure as the BPA president another important development was the *Indian and Eastern Chemist* becoming official organ of the Association from April, 1938.<sup>66</sup> President Chopra himself headed the Editorial Advisory Board.<sup>67</sup> He held this position till July 1940.

The Bengal Pharmaceutical Association was interested in starting of a pharmaceutical education centre. A situation arose and the Government of Bengal in October 1938 constituted a high powered committee, with Col. Chopra as the chairman, to examine the proposal and also offer of financial support made in this context by a philanthropist Dr D. E. Anklesaria. The report which the Committee submitted a year later impressed upon establishment of college of pharmacy at Calcutta and also recommended for enacting legislation to control the profession of pharmacy in Bengal.<sup>68</sup>

The BPA could not change to a national body, but the United Provinces’ Pharmaceutical Association renamed itself into Indian Pharmaceutical Association (IPA) which became a stable and representative All-India organization. In recognition of his very valuable services to science and pharmacy profession, the IPA elected Sir R. N. Chopra as an honorary member.<sup>69</sup> Later, the IPA awarded him the first Dr E. R. Squibb award, for his outstanding contributions.<sup>70</sup>

As regards the drug industry, for its development certain recommendations had been made by the Drugs Enquiry Committee, which were relevant at the time.<sup>52</sup> As recommended, the import duty on manufactured drugs was required to be increased and manufacture at the Government Medical Stores Depots was to be reduced so that supplies from local manufacturers could be obtained as far as possible. The need for registration of patent and proprietary medicines, manufactured in India or imported, was emphasized and no false, misleading or exaggerated claims were to be permitted.



**Fig. 4.** Sir R. N. Chopra receiving the Dr E. R. Squibb Award of the Indian Pharmaceutical Association from Mr Homi Taleyarkhan, the Health Minister of Maharashtra<sup>70</sup>

Col. Chopra maintained his interest in the development of pharmaceutical industry and expressed his views from different platforms.<sup>71,72</sup> He reviewed India's position about supply of drugs and examined the difficulties experienced by the drug manufacturers at the time.

Immediately after World War II, the Government of India formed a panel, with Col. Chopra as the chairman, to make recommendations regarding development of fine chemicals, drugs and pharmaceutical industries. The Panel made recommendations for facilitating the productions and laid targets for manufacture of different drugs, fine chemicals, solvents and photographic materials.<sup>73</sup>

As regards Chopra advising on CSIR supported projects, it needs to be noted that Col. Chopra was a member of the Drugs & Pharmaceuticals

Committee, first constituted in July 1940.<sup>74-75</sup> Col. Chopra remained on the advisory committee for the compilation of the Dictionary of Economic Products and editorial committee for Dictionary of Economic Products and Industrial Resources of India.<sup>76</sup> In later years he chaired the Pharmaceuticals and Drugs Committee of the CSIR.

For the purpose of record it may be mentioned that Col. Chopra had submitted a memorandum on Medical Research in India to the Health Survey and Development Committee,<sup>77</sup> the details of which are not available.

#### **MEDICINAL PLANTS AND INDIAN SYSTEMS OF MEDICINE – A LIFELONG MISSION**

Col. Chopra as he moved on after two decades of very fruitful work at the Calcutta School of Tropical Medicine, his abiding interest in indigenous drugs and the Indian systems of medicine kept him busy in their promotion for next couple of decades.

He was called upon to take up duties of the Director of Medical Services and Drug Research in the Jammu and Kashmir State.<sup>1</sup> He headed the Drug Research Laboratory as the Director till 1957. It was through his efforts that research wing of this Laboratory at Jammu in the year became the Regional Research Laboratory, now designated as Indian Institute of Integrative Medicine, of the Council of Scientific and Industrial Research (CSIR). Sir Ram Nath Chopra remained Honorary Scientific Adviser of the RRL.

The Drug Research Laboratory was set up in 1941 by the Government of Jammu and Kashmir to exploit the plant resources of the State and to establish a national drug industry. Under the guidance of Col. Chopra, the Laboratory made significant contributions.<sup>78-80</sup> The survey of medicinal and poisonous plants originally started at the School of Tropical Medicine was continued. Additional collections of Kashmir flora were added to the herbarium brought from the Calcutta School. Plants used in the indigenous systems were investigated for their constituents. Optimum conditions for cultivation, collection and storage of important drugs were determined. Essential oil plants were also studied. Besides these activities the Laboratory also served as control laboratory for the industry.

Col. Chopra continued to project the indigenous drugs through his several compilations related to the subject in association with his colleagues at the Jammu Laboratory. The scope for the cultivation of medicinal plants in India,<sup>81</sup> the utility of research in the field<sup>82</sup> and general aspects<sup>83</sup> were brought out.

While at the Calcutta School, Col. Chopra received significant support from the Indian Research Fund Association, which included inquiry into the indigenous drugs. The IRFA in 1938 had asked him to write a review on the work done on indigenous drugs till then by his team, which was published as a pamphlet in 1939. In later years also he continued to receive funding for the work on the indigenous drugs from the Association which in 1949 changed into Indian Council of Medical Research. In 1953, the ICMR requested him to write a composite review on indigenous drugs, concerning also the work by other independent investigators. This review with a complete bibliography formed a special report which was published in 1955.<sup>84</sup> The preparation of this compendium on Indian medicinal plants became possible after a thorough study of whole of the pertinent literature. The updated survey of literature which was carried out enabled the Chopra group to bring out a useful glossary of Indian medicinal plants.<sup>85,86</sup> The pioneering work carried out by Chopra and co-workers on indigenous drugs received laudatory mentions<sup>87,88</sup>. When his book on indigenous drugs, first published in 1933,<sup>21</sup> was revised a quarter of a century later, the much awaited second edition was very welcome.<sup>89</sup> A reviewer noted 'that the readers of this volume will derive not only immense information on indigenous drugs of India, but also pleasure from the thought that they are going through what is essentially the work of a great pioneer, savant and missionary.'<sup>89</sup>

The monumental work which had been taken in hand on the Indian poisonous plants while at the Calcutta School of Tropical Medicine was now completed and a compendium on the subject was published in two volumes.<sup>90</sup> The monograph was prepared with the object of providing a complete outline of the botanical, chemical, pharmacological, and economic aspects of poisonous plants, especially from the point of view of their practical importance. The compendium is meant to primarily serve the botanists, chemists, medical practitioners, veterinarians, agriculturists and foresters. This is a work of its own kind on poisonous plants of India.

Next, a note is made to emphasize that ever since R. N. Chopra joined the School of Tropical Medicine in 1921, the indigenous drugs and the Indian systems of medicine became inseparable part of his professional career. His engagement with systematic studies of the drugs of Indian origin was in fact endorsement of the validity of the Indian medical systems which were the only mode of treatment before the western system entered the country with the colonizers. As Professor of Pharmacology, in addition to ordinary duties Chopra had to work as Secretary of Ayurvedic Committee and Member of the Tibbi Committee, the positions to which he was appointed by the Government of Bengal.<sup>91</sup>

The Drugs Enquiry Committee (1930-31), which Col. Chopra chaired, while reporting on indigenous drugs also recommended introduction of a uniform curriculum for the instruction and training of indigenous practitioners and restricting the practice of Indian medicine to properly trained, qualified and registered practitioners.<sup>92</sup> It was recommended that the crude single drugs as well as compounded indigenous medicines should be brought under control, keeping the control for the present entirely separate from the western drugs and preparations.

Chopra viewed that the cost of drugs came in the way of the medical care reaching the vast part of the population who because of their low economic condition could not afford it.<sup>93</sup> He stated that,

‘The only way in which the drugs can be cheapened and brought within the means of the masses is to utilize the local resources and use indigenous products instead of expensive imported preparations. This can be done by encouraging the production, cultivation and manufacture of local drugs in a systematic manner. By the local production of potent drugs of Indian origin, the cost of treatment of ordinary ailments which form the majority, can be considerably reduced’.

Col. Chopra became the general president of the Indian Science Congress, having earlier been twice sectional President in Physiology and Medical Sciences of the Congress.<sup>1</sup> In his presidential address at the Patna session in January 1948, he reviewed the development of the indigenous system of medicine and the causes for its decay and described the prevalent position from the utilitarian and scientific aspects.<sup>94</sup> He stressed the need for proper training of practitioners of indigenous medicine and elimination of unauthorized practices.

An important contribution which Sir Ram Nath Chopra made for the cause was through the Committee on Indigenous Systems of Medicine which had been set up by the Government of India in 1946 with him as the Chairman. The Committee submitted the report in July 1948.<sup>95</sup> There was made an elaborate study on education and medical institutions, organization of medical relief, state control, research, drugs and medicinal preparations, and finance as related to indigenous systems of medicine.<sup>95,96</sup> The Committee was of the opinion that the integration of Indian and Western Systems of medicine leading to synthesis was not only possible but practicable and recommended that immediate steps should be taken in this direction. The Committee noted,

‘There is urgent necessity for inaugurating research in Indian medicine so that it may in an abundant measure contribute to the corpus of medical science and art. By research, Indian medicine, which has been static for many centuries, will once again make its contribution to the welfare of the people of this country and of the world.’

The Committee also mooted the idea for ultimately having a proper Pharmacopoeia of Indian Medicine. As years passed and the views crystallized, the Government of India on recommendation of the Central Council of Ayurvedic Research constituted the first Ayurvedic Pharmacopoeia Committee in September 1962, and in March 1964, formed the Unani Pharmacopoeia Committee on recommendation of the Unani Advisory Committee.<sup>97</sup> Col. Chopra was the chairman of both the Committees.

A news item appeared in 1967 about recommendation of the committee which had been set up by the Union Ministry of Health, headed by Colonel Chopra for preparing a scheme to establish a postgraduate research centre for Āyurvedic and Unani systems of medicine at the Unani Tibbia College in Delhi.<sup>98</sup> The committee deplored the overemphasis on research on a few isolated drugs in Āyurveda and Unani systems and called for a scientific assessment of the highly advanced psychosomatic concepts of the two systems.

This section sums up the deep involvement of Col. Chopra in activities pertaining to the medicinal plants and indigenous systems of medicine with which he was largely associated subsequent to his leaving Calcutta.

#### THE LEGACY

Colonel Sir Ram Nath Chopra passed away on 13 June 1973 at his own home at Srinagar, Kashmir.<sup>99</sup> With this a doyen of science and medicine

was gone. 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.<sup>99</sup> Chopra was equally well-known for his humility, courtesy and kindness.<sup>99,100</sup> Those who came in contact with him could never forget his magnetic and simple personality, his high idealism, his unbounded enthusiasm, unflinching devotion to laboratory and clinical work, and above all his remarkable capacity to bring about a ‘team spirit.’<sup>99</sup>

The Indian Pharmacological Society, of which Col. Chopra had been the founder president (1969), instituted ‘Chopra Memorial Oration’ in 1976.<sup>101</sup> In Chopra’s honour the Indian Posts and Telegraphs Department issued a commemorative stamp on 17 August 1983.<sup>102</sup>



**Fig. 5.** Commemorative Stamp in Honour of Sir Ram Nath Chopra issued by the Indian Posts and Telegraphs Department <sup>102</sup>

Professor Chopra was the first to establish a centre of study and research in pharmacology in India, at the Calcutta School of Tropical Medicine. Within a few years of his joining the School his laboratory became as well equipped as some of the best laboratories in the United Kingdom. The Department of Pharmacology earned prominence for the researches in various aspects of tropical medicine, therapeutics, chemotherapy, experimental pharmacology, toxicology, clinical evaluation of drugs, drug addiction, indigenous drugs, drug standardization and biological assays, pharmaceutical problems and problems pertaining to clinical medicine, and diagnostic services.<sup>4</sup>

When Sir Ram Nath Chopra left in 1941 after two decades of his meritorious work at the Calcutta School, this is what his successor as the Director, Dr L. E. Napier, recorded in the annual report: 'The pharmacological department was an important one, but few people visualized the possibilities of this department which grew and grew under Sir Ramnath's guidance that brought this institution more fame, both inside and outside this country, than any department in the School.'<sup>48</sup>

There is no doubt that Chopra parented pharmacology in India. Dr B. Mukerji paid rich tributes to him in a write-up when Sir Ram Nath Chopra was leaving the Calcutta School after unmatched accomplishments.<sup>103</sup> It was stated that "Professor Chopra will be long remembered as the 'Father of Indian Pharmacology' and a founder of a school of pharmacologists..... Chopra unconsciously served to build up a school of Indian pharmacology in the comparatively short space of 20 years from almost nothing but descriptive materia medica and non-scientific teaching of older days. If Chopra did not do anything else but this, his name would remain to posterity. As 'Father of Indian Pharmacology' in India, Chopra's position may be compared to those of Oswald Schmiedeberg of Germany and John Jacob Abel of America."<sup>104</sup>

In a recent account of history of pharmacology in the Indian scenario, it is noted, 'The history of pharmacology in India must always begin with Col. Sir Ram Nath Chopra. Before the arrival of Col. Chopra on the scene, materia medica was taught in medical schools and the concept of pharmacology as a separate discipline did not exist ..... Chopra was privileged to see the establishment of independent chairs in pharmacology in most medical schools of the country. His students, colleagues and co-workers occupied at one time or another forty teaching and research positions in pharmacology and allied subjects in various medical institutions.'<sup>105</sup>

The following note in Sir Ram Nath Chopra's own words may provide an insight into the background of the move which led to establishment of Central Drug Research Institute: 'During the post-war period and following the declaration of Indian independence, there was a general scientific upsurge in India, and, along with this, pharmacology was given a big boost through the establishment, largely through the efforts of Dr B. Mukerji and me of the first National Drug Research Institute of India. In this institute, located in



Lucknow, collaborative teamwork between several scientific disciplines related to pharmacology was ably initiated and built up, under the able guidance of Dr B. Mukerji, on the same lines as were originally proposed by me, but which could not be made to operate because of difficulties in obtaining trained pharmacologic personnel.<sup>74</sup>

Coming to Chopra's pet discipline of systematic studies of indigenous drugs, it is well accepted that the credit for opening up this largely neglected field goes to him. It is his work which gave an impetus to research on Indian medicinal plants at different institutions. Chopra noted in 1938 annual report of the School: 'Investigations have been started in various universities and colleges in centres such as Calcutta, Bombay, Dacca, Patna, Allahabad, Lahore, Madras, Trivendrum, etc.'<sup>106</sup>

At Calcutta, Chopra group carried out extensive studies on indigenous drugs. The enquiries employing modern methods of chemical, pharmacological and therapeutic research, showed that certain drugs deserved pharmacopoeial recognitions, and the examples cited included ispaghula, kurchi, rauwolfia, psoralea, cobra venom, etc.<sup>107</sup> These and several other indigenous drugs became official in the Indian Pharmacopoeial List (1946) and Pharmacopoeia of India (1955). The promotion of medicinal plants and indigenous systems of medicine remained his mission of life.

It is interesting to note what was expressed in a review of second edition of the book on indigenous drugs about Chopra's researches on the subject: 'To this work be brought to bear not only the talents of a scientist, but also the zeal of a missionary and crusader. He succeeded in infusing enthusiasm and a sense of devotion not only into his colleagues and collaborators in the institutes whose destinies he has guided in the role of director, but also into scientists situated far away in different parts of the country. The pages of the present volume provide ample testimony to the phenomenal increase in the attention given to Indian indigenous drugs in the numerous laboratories scattered through the length and breadth of India, and it should surely be a matter of great satisfaction to Sir Ram Nath Chopra to witness all this growth.'<sup>108</sup> Elsewhere, it has been said that he "sowed the seeds of self-reliance and triggered the movement of scientific research on traditional 'Indian medicine.'<sup>109</sup>

The books by Chopra and associates entitled, *Indigenous Drugs of India*, *Glossary of Medicinal Plants of India*, and *Poisonous Plants of India* became the most enduring and popular encyclopedia on Indian medicinal plants.<sup>110</sup>

Col. Chopra's contributions towards promotion of Indian systems of medicine were also significant. The recommendations of the Committee on Indigenous Systems of Medicine at which he presided brought focus on the Indian systems and the process for their consolidation started. The recommendation for integration of Indian and Western systems still remains a far cry. A beginning was made for preparing the Ayurvedic and Unani pharmacopoeias through the respective committees chaired by him.

When in 1930 the Government of India constituted the Drugs Enquiry Committee, it was fortunate that a person of Colonel Chopra's vision was chosen to chair it. The recommendations of the committee greatly helped in several of the much needed pharmaceutical developments in the country. The Drugs Act 1940 was enacted, which later changed to Drugs and Cosmetics Act 1940 in 1962. The scope of the statute was further widened through the 1964 amendment; the provisions were expanded to bring Ayurvedic (including Siddha) and Unani drugs under its purview. The Indian Pharmacopoeial List 1946 was published as an Indian supplement to the British Pharmacopoeia 1932. The Pharmacopoeia of India publications started with the 1955 edition. The Pharmacy Act 1948 was legislated for control of pharmacy. All these and formation of ancillary bodies directly resulted largely from the recommendations of the Chopra Committee. It is no overstatement to record that in the twentieth century pharmaceutical annals of India, the establishment of the Drugs Enquiry Committee proved to be the most significant event.<sup>62</sup>

In several other ways also Col. Chopra influenced the development of pharmaceutical areas as the industry and education. He was directly involved in the shaping of the pharmaceutical profession. He showed a spirit of friendly good-fellowship with lowly compounders. His advice helped the All Bengal Compounders' Association to change into Bengal Pharmaceutical Association. He made himself available to preside over these bodies and direct the course of professional activities. The change to the Indian Pharmaceutical Association did not come through, possibly due to lukewarm response from the BPA membership.

It has been appropriately noted that, ‘With remarkable foresight, Chopra saw the vision of India’s pharmacy development of today at time when most members of the medical profession remained in utter ignorance of the aim, scope and the province of the modern pharmacy. In fact he had to face considerable opposition from certain sections of the medical and chemical professions when he launched his pharmacy reform movement in the thirties. However, the forces of progress for a good cause could not be halted by critics with a negative attitude of mind. To Chopra must go the credit for blazing a new trail in putting modern pharmacy on the scientific map of India. The tremendous development of ethical drug manufacture and the very healthy growth of pharmaceutical profession in India owes not a little to the forward-looking pioneering faith and dream of Chopra in the virility and potentiality of Indian Pharmacy. He lived long enough to see his dream well-fulfilled.’<sup>111</sup>

Sir Ram Nath Chopra’s was a multifaceted personality. In any sphere of the scientific and professional domain he chose to involve himself, he did it with devotion and sense of commitment. He left behind a rich legacy and impact on several fields.

As of now and so the coming generations of the medico-pharmaceutical professions will continue to remember Brevet Colonel Sir Ram Nath Chopra as the parent of pharmacology in India, pioneer of systematic studies of indigenous drugs, promoter of Indian systems of medicine, and patron of pharmacy, with respect and gratitude.

#### ACKNOWLEDGEMENT

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#### REFERENCES AND NOTES

1. B. Mukerji, “Sir Ram Nath Chopra,” *Biographical Memoirs of Fellows of the Indian National Science Academy*, 4 (1976) 171-185.
2. G. Wolstenholme (editor), *Lives of the Fellows of the Royal College of Physicians of London*, IRL Press Limited, Oxford and Washington DC, 1982. pp 102-103.
3. University Archives, University of Cambridge, through letter of 16 November 1994 from E. S. Leedham-Green, Deputy Keeper of Manuscripts and University Archives.

4. R. N. Chopra, "Problems and Prospects of a Pharmacological Career in India," *Annual Review of Pharmacology*, 5 (1965) 1-8.
5. In reference 4, the year of his getting the M.D. is mentioned as 1908, whereas in reference 1 the year 1912 is indicated.
6. A. J. C., in an obituary notice, "Walter Earnest Dixon – 1871-1931," *Proceedings of the Royal Society of London, Series B*, 110 (1932) xxix-xxxi.
7. In an obituary notice, *British Medical Journal*, 3 (1973) 547.
8. *Annual Reports of the Calcutta School of Tropical Medicine, Institute of Hygiene and the Carmichael Hospital for Tropical Diseases*.
9. Ref. 8, 1926. This annual report also included a brief history of the School and a report for the years 1920-25.
10. Ref. 8, 1922.
11. R. N. Chopra and B. N. Ghosh, "The Therapeutics of Emetine," *Indian Medical Gazette*, 57 (1922) 248-253.
12. R. N. Chopra, "The Therapeutics of the Cinchona Alkaloids, Part I," *Indian Medical Gazette*, 57 (1922) 401-406.
13. R. N. Chopra, "The Therapeutics of Cinchona Alkaloids, Part II," *Indian Medical Gazette*, 57 (1922) 441-446.
14. Ref. 8, 1937, pp 19, 69-70.
15. Ref. 8, 1940, pp 76-77.
16. R. N. Chopra and A. C. Chandler, *Anthelmintics and Their Actions and Uses in Medical and Veterinary Practice*, William Wilkins and Co., Baltimore/Balliere, Tindall and Cox, London, 1928.
17. R. N. Chopra, *A Handbook of Tropical Therapeutics*, The Art Press, Calcutta, 1936; Second Edition by R. N. Chopra, B. Mukerji and I. C. Chopra, U. N. Dhur & Sons Ltd, Calcutta, 1950, pp xi+705 [The second edition reviewed in *Pharmaceutical Journal*, 166 ((1951) 221].
18. Ref. 8, 1938, pp 23-27.
19. Ref. 8, 1938, p 26.
20. R. N. Chopra, J. C. Gupta and B. Mukherjee, "The Pharmacological Action of an Alkaloid obtained from *Rauwolfia serpentina* Benth. – A Preliminary Note," *Indian Journal of Medical Research*, 21 (1933) 261-271.
21. R. N. Chopra, *Indigenous Drugs of India: Their Medical and Economic Aspects*, The Art Press Calcutta, 1933, pp 655. Reviewed in the *Indian Medical Gazette*, 68 (1933) 51.

22. R. N. Chopra and R. L. Badhwar, "Poisonous Plants in India," *Indian Journal of Agricultural Science*, 10 (Part I) (1940) 1-44.
23. Ref. 8, 1938, p 25; 1939, p 75; 1940, p 76; 1941, p 9.
24. R. N. Chopra and K. S. Grewal, "Opium Habit in India. An Analysis of 100 Cases amongst the Sikh Population in Calcutta," *Indian Journal of Medical Research*, 15 (1927-28) 57-65.
25. R. N. Chopra, "The Present Position of the Opium Habit in India," *Indian Journal of Medical Research*, 16 (1928-29) 389-439.
26. R. N. Chopra, G. S. Chopra and K. S. Grewal, "Opium Habit in the Punjab," *Indian Journal of Medical Research*, 20 (1932-33) 545-564.
27. R. N. Chopra and G. S. Chopra, "The Opium Smoking Habit in India Part I. General Survey," *Indian Medical Gazette*, 73 (1938) 81-89.
28. R. N. Chopra and G. S. Chopra, "Present Position of the Opium Smoking Habit in India II. Preparations of Opium Used for Smoking and Mode of Indulgence," *Indian Medical Gazette*, 73 (1938) 132-138.
29. R. N. Chopra and G. S. Chopra, "Present Position of the Opium Smoking Habit in India III. Studies on the Physical and Mental Effects Produced by Opium Smoking (An Analytical Review of 300 Opium Smokers Examined in the Field)," *Indian Medical Gazette*, 73 (1938) 193-203.
30. R. N. Chopra, K. S. Grewal, J. S. Chowhan and G. S. Chopra, "Addiction to 'Post' (Unlanced Capsules of *Papaver somniferum*)," *Indian Journal of Medical Research*, 17 (1929-30) 985-1007.
31. R. N. Chopra and I. C. Chopra, "Quasi-medical Use of Opium in India and its Effects," *Bulletin on Narcotics*, 7 (3-4) (1955) 1-24.
32. R. N. Chopra and G. S. Chopra, "The Present Position of Hemp-Drug Addiction in India," *Indian Medical Research Memoir* No.31, July 1939, pp 119. (Published by Thacker, Spink & Co., Calcutta)
33. R. N. Chopra, G. S. Chopra and I. C. Chopra, "Alcoholic Beverages in India," *Indian Medical Gazette*, 77 (1942) 224, 290, 361.
34. R. N. Chopra, "Drug Addiction in India and its Treatment," *Indian Medical Gazette*, 70 (1935), 121.
35. R. N. Chopra and I. C. Chopra, *Drug Addiction with Special Reference to India*, Council of Scientific & Industrial Research, New Delhi, 1965. pp x+264.
36. Ref. 8, 1926, pp 58-59; 1930, p 64; 1931, p 72; 1932, pp 77-78; etc.
37. R. N. Chopra, "Hospital Organisation with Special Reference to Conditions in India," *Indian Medical Gazette*, 75 (1940) 170-175.

38. R. N. Chopra, "Organisation of Public Health and Medical Services in India," *Indian Medical Gazette*, 76 (1941) 54-58. Abstract of the Presidential Address, National Institute of Sciences of India.
39. Ref. 8, 1927.
40. Ref. 8, 1933, p 13.
41. Ref. 8, 1936, p 12.
42. Ref. 8, 1933, p 14.
43. Ref. 8, 1939, p 12.
44. Ref. 8, 1937, p 11.
45. Ref. 8, 1938, p 11.
46. *The Pharmaceutical Society of Great Britain Calender*, 1954-55.  
p 9.
47. Ref. 8, 1940, p 14; *Indian and Eastern Chemist*, 22 (1941) 36.
48. Ref. 8, 1941, p 8.
49. Ref. 8, 1939, p 11. This source mentions reappointment by the Government of Bengal for a period of six months.
50. Department of Education, Health and Lands, Government of India, Health B, October 1930, Nos. 153-214, National Archives of India, New Delhi.
51. Ref. 8, 1931, p 12.
52. *Report of the Drugs Enquiry Committee 1930-31*, Government of India Central Publication Branch, Calcutta, 1931. pp vi+ 436. With Lt.-Col. R. N. Chopra as the Chairman, the other members of the Committee were Reverend Father J. F. Caius (Haffkine Institute, Bombay), H. Cooper (Smith Stanistreet & Co. Ltd, Calcutta) and Maulvi Abdul Matin Chaudhury, M.L.A. H. Govindan Nayar worked as the Secretary and Dr B. Mukherjee as Assistant Secretary of the Committee
53. R. N. Chopra, "Drug Adulteration and Spurious Drugs in India," *Indian Medical Gazette*, 70 (1935) 693-696.
54. R. N. Chopra, "Drug Adulteration and the Sale of Spurious Drugs in India," *Indian and Eastern Druggist*, 17 (1936) 138-139, 166-168.
55. H. Singh, "History of Drugs and Pharmacy Statutes," *Eastern Pharmacist*, 42 (November) (1999) 31-37.
56. R. N. Chopra, *Report of the Bio-chemical Standardisation Laboratory 1937-1940*, Government of India Press, Calcutta, 1941. pp 1-2, 22, 55.

57. B. Mukerji, *Report of the Bio-chemical Standardisation Laboratory, 1940-1943*, Government of India Press, Calcutta, 1950. p 1.
58. B. Mukerji, *Report of the Bio-chemical Standardisation Laboratory (1946-1947) and the Central Drugs Laboratory (1947-1949)*, Government of India Press, Calcutta, 1952. pp 1-2.
59. "The Indian Pharmacopoeial List Committee," *Indian Pharmacist*, 1 (1945-46) 68-72 (78).
60. *The Indian Pharmacopoeial List 1946*, Department of Health, Government of India Press, Calcutta, 1946.
61. "The Indian Pharmacopoeia Committee," *Indian Journal of Pharmacy*, 10 (1948) 117-118.
62. H. Singh, "Drugs Enquiry Committee 1930-31," *Eastern Pharmacist*, 44 (November) (2001), 21-25.
63. R. N. Chopra, "All-Bengal Compounders Association," *Indian Medical Gazette*, 69 (1934) 273-275; "Pharmacy in India," *Indian and Eastern Druggist*, 15 (1934) 130-132.
64. R. N. Chopra, "Presidential Address to the Bengal Pharmaceutical Association," *Indian Medical Gazette*, 72 (1937) 101-103; *Indian and Eastern Chemist*, 19 (1938) 313-317.
65. *Indian and Eastern Chemist*, 19 (1938) 278-279.
66. H. Singh, "The Indian and Eastern Druggist/Chemist," *Eastern Pharmacist*, 39 (November) (1996) 45-48. *Indian and Eastern Druggist* started publication from London in April 1920. In April 1937 its name was changed to the *Indian and Eastern Chemist*. In September 1937, the latter began publication from Calcutta.
67. Editorial, "The Bengal Pharmaceutical Association," *Indian and Eastern Chemist*, 19 (1938) 117; R. N. Chopra, A Message to the members from the President, *ibid.*, 19 (1938) 118-119.
68. *Report of the College of Pharmacy Committee 1938-39*, Government of Bengal, Department of Public Health and Local Self Government, Bengal Government Press, Alipore, 1941.
69. *Proceedings of the Meeting of the IPA Council*, 24 August 1945, item 7; *Indian Journal of Pharmacy*, 7 (1945) 80.
70. Editorial, *Indian Journal of Pharmacy*, 23 (1961) 325-326.
71. R. N. Chopra, "The Drug Industry in India and its Difficulties," *Indian Medical Gazette*, 74 (1939) 230-231. Address delivered at the opening of an Exhibition at the Campbell Medical School.

72. R. N. Chopra, "Drug Manufacture in India During Peace and War," *Indian Medical Gazette*, 75 (1940) 233-236. Address delivered at the All-India Conference of Chemical and Pharmaceutical Manufacturers.
73. *Report of the Panel on Fine Chemicals, Drugs and Pharmaceuticals*, Department of Industries and Supplies, Government of India, Government of India Press, Simla, 1947. pp 94.
74. *Council of Scientific and Industrial Research, A Review by Director*, Scientific & Industrial Research, January 1948. The Board of Scientific and Industrial Research came into existence in 1940, which preceded the setting up of the Council of Scientific and Industrial Research in 1942.
75. Ref. 74, p 70.
76. Ref. 74, pp 152 – and corresponding appendixes.
77. *Report of the Health Survey and Development Committee, Vol. III*, Government of India Press, Simla, 1946. p 341.
78. R. N. Chopra, "The Drug Research Laboratory, Jammu Tawi, 1941-1951," *Journal Scientific & Industrial Research*, 11A (1952) 239-244.
79. R. N. Chopra "Presidential Address, Symposium on Production & Utilization of Medicinal & Aromatic Plants of India," *RRL Bulletin*, 1(1) (1962) 18-23.
  
80. "Books, Brochures and Research Papers Published by the Staff of the Regional Research Laboratory, Jammu, 1940-1962," *RRL Bulletin*, 1 (2) (1963) 240-256. 4 Books, 4 brochures and 270 research papers listed.
81. R. N. Chopra, L. D. Kapoor, K. L. Handa, I. C. Chopra and S. L. Nayar. "Scope for the Cultivation of Medicinal Plants in India," *Journal of Scientific and Industrial Research*, 7 (1948) 527-534; *ibid.*, 8 (1949) 14-21; reproduced later, *ibid.*, 50 (1991), 563-578.
82. I. C. Chopra, K. L. Handa and R. N. Chopra, "Utility of Research in Indian Indigenous Drugs," *Haffkine Institute Diamond Jubilee (1899-1959) Souvenir*. pp 25-30.
83. R. N. Chopra, "Medicinal and Allied Plants of India – A Brief General Review," *Indian Journal of Pharmacy*, 23 (1961) 341-345. Address delivered after receiving the Dr E. R. Squibb Award.
84. R. N. Chopra and I. C. Chopra, *A Review of Work on Indian Medicinal Plants (including Indigenous Drugs & Poisonous Plants)*, Indian Council of Medical Research, Special Report Series No. 30, 1955. pp ii+263 + 58 (index).
85. R. N. Chopra, S. L. Nayar and I. C. Chopra, *Glossary of Indian Medicinal Plants*, Council of Scientific & Industrial Research, New Delhi, 1956. pp xx+330; reviewed in the *Indian Journal of Pharmacy*, 19 (1957) 126.



86. R. N. Chopra, I. C. Chopra and B. S. Varma, *Supplement to Glossary of Indian Medicinal Plants*, Publications & Information Directorate, New Delhi, 1969 pp xii+119; reviewed in the *Indian Journal of Pharmacy*, 31 (1969) 161.
87. *Report of the Pharmaceutical Enquiry Committee*, Ministry of Commerce & Industry, Government of India, 1954. pp 174, 175. The CSIR research schemes handled by R. N. Chopra are listed on p 371.
88. C. G. Pandit and K. Someswara Rao, *Indian Research Fund Association and Indian Council of Medical Research 1911-1961: Fifty Years of Progress*. pp 73-77, 93, 94.
89. R. N. Chopra, I. C. Chopra, K. L. Handa and L. D. Kapoor, *Chopra's Indigenous Drugs*, Second Edition, U. N. Dhur and Sons (Private) Limited, Calcutta, 1958. pp xxxii+816; reviewed by S. R., *Indian Journal of Pharmacy*, 21 (1959) 122-123.
90. R. N. Chopra, R. L. Bhadwar and S. Ghosh, *Prisonous Plants of India, Volumes I & II*, Indian Council of Agricultural Research, New Delhi, 1965.
91. Ref. 8, 1921, p 27; 1923, p 71.
92. Ref. 52, p 169.
93. R. N. Chopra, "Some Problems of Medical and General Interest," *Indian Medical Gazette*, 81 (1946) 143-147. Inaugural address to the 22<sup>nd</sup> All-India Medical Conference, Amritsar, December 1945.
94. R. N. Chopra, in "Rationalisation of Medicine in India," *Indian Pharmacist*, 3 (1947-48) 54-59. Only a part of the text of the address became available.
95. *Report of the Committee on Indigenous Systems of Medicines*, Vol. I: Recommendations; Vol.II, Appendices, Ministry of Health, Government of India, 1948.
96. "Need for Research in Indian Medical Science: Proposed Integration of Indigenous and Western Systems," Chopra Committee's Recommendations, *Indian Medical Gazette*, 84 (1949) 107-110.
97. Noted from the respective formularies and pharmacopoeias.
98. *Indian Journal of Pharmacy*, 29 (1967) 51.
99. B. Mukerji, "Obituary Note," *Pharma Times*, 5 (7) (1973), 12-14.
100. This I humbly corroborate on the basis of what I saw during my stay at the Drug Research Laboratory, Jammu, for a couple of months as a trainee after my graduation in pharmacy (1950). Col. Chopra was Director at the time. I was personally touched by his affectionate and fatherly characteristic of dealing with youngsters.
101. *Directory of Members, Indian Pharmacological Society, 1993*, compiled by P. V. Dewan. A copy made available by Professor R. K. Goyal, L. M. College of Pharmacy, Ahmedabad.

102. "Information Sheet." Received from the Fellow Archivist, Downing College, Cambridge, and also from the Indian Institute of Integrative Medicine, CSIR, Jammu. The stamp shows image of Ram Nath Chopra, with the Calcutta School of Tropical Medicine building in the background. The Sheet contains a citation, by courtesy of the Indian Council of Medical Research.
103. B. Mukerji, "Professor Sir Ram Nath Chopra and Growth of Pharmacology in India," *Indian Medical Gazette*, 77 (1942) 368-370.
104. *Topics in the History of Pharmacology*, Editors: P. N. Patil, O. D. Gulati and R. Balaraman; Publication Editor: R. K. Goyal, B. S. Shah Prakashan, Ahmedabad, 2004.
105. O. D. Gulati and R. Balaraman, reference 104, pp 133-136.
106. Ref. 8, 1938, p 27.
107. Ref. 8, 1938, p 26.
108. Ref. 89, p 123.
109. V. Ramalingaswami and G. V. Satyavati, "Editorial," *Indian Journal of Medical Research*, 76 (Supplement) (1982) v-vi.
110. G. V. Satyavati, reference 104, p 23.
111. B. Mukerji, "Col. Sir Ram Nath Chopra's Contribution to the Development of Pharmacy in India," *Pharma Times*, 5(8) (1973) 10-14.

Brevet Colonel Sir Ram Nath Chopra (1882-1973) is remembered as the parent of pharmacology, pioneer of systematic studies of indigenous drugs, promoter of Indian systems of medicine, and patron of pharmacy. Chopra joined the Calcutta School of Tropical Medicine in 1921 as the first professor of pharmacology. Key words: Biochemical Standardisation Laboratory at Calcutta, Building of pharmacology discipline, Calcutta School of Tropical Medicine, Drug addiction, Drug Research Laboratory at Jammu, Drugs and pharmacy legislations, Drugs Enquiry Committee, Indian pharmacopoeial publications, Indian systems of medicine, Indigenous drugs.

INTRODUCTION Brevet Colonel Sir Ram Nath Chopra had a multifaceted personality. Singh, Harkishan. 2008. Ram Nath Chopra (1882-1973) "A Visionary in Pharmaceutical Science. Indian Journal of History of Science 43 (2): 231-264. Google Scholar. Sinha, Debotosh. Newspaper. Yusuf, Suhail. 2013. Salimuzzaman Siddiqui "A Visionary of Science. The Dawn October 18. Google Scholar. Copyright information. stamps released. 4. 1882-1973 postal. 4. released sir. 4. chopra 1882-1973. 4. chopra india. 4. sarpagandha india--1997. 4. nath. Follow us on Twitter to stay on top of the latest in scientific research. Press proceed to send the authors a message. Follow PubFacts. Proceed. Load Form. Thank You. We have submitted your request - we will update you on status within the next 48 hours.