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१५६१

ANNUAL REPORT

HAFFKINE INSTITUTE

GOVERNMENT OF BOMBAY



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THE HAFFKINE INSTITUTE, BOMBAY

MEMBERS OF THE STAFF

(As on 31st December 1959)

Director

Dr. H. I. Jhala, M.D. (Bom.), F.C.P.S. (Bom.), D.T.M. (Cal.).

Assistant Directors

Dr. A. K. Hazra, M.B.B.S. (Bom.), D.T.M. (Cal.), Assistant Director in-charge, Department of Antitoxins and Sera.

Dr. K. Ganapathi, D.Sc., F.N.I. F.A.Sc., Assistant Director in charge, Administration.

Dr. N. K. Dutta, M.B. (Cal.), D.Phil. (Oxon), Assistant Director in-charge, Department of Pharmacology.

Dr. P. J. Deoras, M.Sc. (Nagpur), Ph.D. (Durham), F.E.S.I., Assistant Director in-charge, Department of Entomology.

Dr. M. V. Sant, M.D. (Bom.), F.C.P.S. (Bom.), Assistant Director in-charge, Department of Clinical Pathology and Diagnostic Reagents.

Dr. C. V. Deliwala, M.Sc. (Bom.), Ph.D. (Bom.), Assistant Director in-charge, Department of Chemotherapy.

Dr. A. N. D. Nanavati, M.D., Assistant Director in-charge, Department of Virus Diseases including Rabies.

Assistant Director in-charge, Department of Vaccines (Post vacant)—charge held by Dr. H. I. Jhala, M.D. (Bom.), F.C.P.S. (Bom.), D.T.M. (Cal.) (from 6th November 1958).

Heads of Sections

Dr. (Smt.) Alamela Venkatraman, B.A. (Madras), M.Sc. (Madras), Ph.D. (Madras), Senior Biochemist, Biochemistry Section.

Dr. S. S. Sabnis, M.B.B.S. (Bom.), Medical Officer, Blood Bank Section.

Dr. A. E. Kulkarni, G.B.V.C. (Bom.), Senior Veterinary Surgeon, Animal Laboratory.

Administrative and Auxilliary Sections

Shri P. K. Sholapurwalla, B.Sc. (Bom.), LL.B. (Bom.), Business Manager.

Shri B. O. Shah, B.Com. (Bom.), Cost Accounts Officer.

Shri S. C. Merh, B.Sc., Stores Officer.

Shri Shankar Rao, Personal Assistant to the Director.

Shri T. V. Ranganathan, B.A. (Madras), Office Superintendent.

Shri A. R. Dhavlikar, Accounts Superintendent.

Shri N. Lakshminarayana, L.M.E. (Mysore), L.E.E. (Mysore), Maintenance Engineer.

Library

Shri K. N. Pai, B.Sc. (Bom.), B.T. (Bom.), S.T.C. (Bom.), Dip. Lib. (Bom.), Librarian.

REPORT OF THE HAFFKINE INSTITUTE FOR THE YEAR 1959.

I. GENERAL REVIEW.

The year 1959 is the year of Diamond Jubilee of the present premises of the Haffkine Institute. The occasion was celebrated on 10th January 1959. The President of the Indian Union Dr. Rajendra Prasad graced the occasion as the Chief Guest. The inauguration ceremony was held under the Presidentship of Governor of Bombay, Shri Sri Prakasa. The inauguration of the 4 Day Session programme of celebrations was done by the Chief Guest. The occasion was a great success. 29 foreign delegates from various parts of the world participated and over a 100 Indian delegates from various parts of the country had also gathered, in addition to a large gathering of local scientists. The occasion was a remarkable success and had attracted all-India attention as well as publicity abroad. A large number of Goodwill messages were received from the country and abroad. A three-day scientific Session was held and symposia were arranged on the subject of Plague, Cholera, Neurotropic Viruses, Influenza, Insect-resistance to insecticides and Snakes and Venoms. Elaborate arrangements for conduct of scientific meetings, social occasions, entertainment programmes, scientific trips, popular lectures etc. had been made. Thanks to the untiring efforts of Dr. Jivraj N. Mehta, Minister for Finance who acted as the Chairman of the Executive Committee and Shri M. S. Kannamwar, Minister for Health, who acted Chairman of the Reception Committee, and Dr. N. N. Kailas our Deputy Minister for Health who gave enormous personal assistance for the success of the occasion.

The Institute is also grateful to the large number of donors and well-wishers who contributed generously to the appeals of the non-official committee which carried out this task. The success was in large measure due to spontaneous response of appreciation from a number of prominent citizens, social organizations and the press to whom the Institute is grateful.

The Advisory Committee of the Haffkine Institute continued to give guidance and a number of useful recommendations have received consideration of the government. During the Diamond Jubilee the government created HAFFKINE INSTITUTE RESEARCH AND DEVELOPMENT FUND for promoting research and development at the Haffkine Institute. A Committee of scientists consisting of Dr. Jivraj N. Mehta (Chairman), Dr. V. R. Khanolkar, Dr. B. B. Yodh, Dr. J. C. Patel, Dr. V. Gharpure, Dr. (Smt.) Kamla Sohoni, Secretary, Local Self-Government and Public Health Department, Surgeon General to Government and the Director, is in overall charge of the administration of the Fund. The creation of the fund is an important milestone in the history of the Haffkine Institute.

The Institute is grateful to the Government of India for making a grant of Rs. 3 lakhs to the Haffkine Institute Diamond Jubilee Celebrations Committee.

The Royal Western India Turf Club was also generous enough granting a Special Race Day Meeting on the 19th April 1959, the proceeds of which were donated to the Funds of the Committee. The Committee also received donations

for starting of Scholarships from Unichem laboratories and Dumex (India) Private Limited. From the proceeds of the Funds of the Committee a large number of Endowments to promote Research and Development of Haffkine Institute are being constituted as perpetual charity of endowments. It is only because of the unique popularity of the Institute that such endowment have been possible, and this in itself is a glowing tribute to our continued existence of last 60 years. The Institute would do its utmost to be deserving of the appreciation that it has received on this unique occasion.

Government of Bombay started the State Medical Research Fund and have constituted a Board for administration of the same. The Director has been appointed the Secretary of this Board. Director delivered a series of two University Extension lectures at the University of Agra, in February 1959. The Officers of the Institute continued in the advisory capacity of the Indian Council of Medical Research, Council of Scientific and Industrial Research, and Indian Council of Agricultural Research, and other committees. The Institute also participated in the several conferences and symposia held in the country during the year.

Repairs to the buildings continued after the Diamond Jubilee. The space in the Vaccine Department has been converted into several self-contained cubicles, and new cold storage building is under construction. The existing Tetanus Toxin Block has been extended, the Snake House and Frog Room has been built on premises.

The difficulty for obtaining well qualified staff for manning of posts has continued. Many of the posts have now been thrown open both to medical and non-medical scientists. In spite of this and in spite of continued search and alterations in terms of conditions of service, it has not been possible to find the full complement of staff for some of the vacant posts. Dr. (Mrs.) Alamela Venkataraman, Officer in-charge Biochemistry Section returned from U. S. A. after post-doctoral work on Enzymes. Dr. K. V. Kulkarni, Senior Bacteriologist and Shri Y. S. Nimbkar, Senior Physical Chemist, Department of Antitoxins and Sera have left for U. K. for training under Colombo Plan. Shri M. K. Habbu, represented the Institute at the International Congress of Biological Standardization at Jerusalem. Dr. P. J. Deoras, Assistant Director I/c Department of Entomology toured the world for seeing advanced work on Snakes, Rats and Insects of medical importance.

Dr. K. Ganapathi, rejoined as Assistant Director I/c Medical Administration with effect from 11th January 1959 on being relieved from the Hindustan Antibiotics Limited, Pimpri. Dr. P. C. Roy, Assistant Port Health Officer, attached to the Yellow Fever Section of the Institute was transferred to Calcutta and Dr. A. M. Vaidya took over charge. Dr. R. T. Sahani joined as Medical Officer, Blood Collecting Unit of Haffkine Institute. Dr. H. J. Mansharamani joined as Medical Officer under Kysanur Forest Disease Scheme in the Virus Department. The Polio Research Unit of the I. C. M. R. continued to function at the Haffkine Institute under supervision of Dr. P. V. Gharpure. The Technicians' Training Programme and other Short-term courses continued to function as in the previous year.

The Institute was recognised by the University of Poona, M. S. University, Baroda, Vallabh Vidyapeeth University, Anand, for the degrees of M.Sc., and Ph. D. in various subjects. Scientific Souvenir summarising research work done at the Institute during the last 60 years along with the general background of world research in those subjects was brought out as Library Volume on the occasion of Diamond Jubilee of the Institute.

A process for production of Tolbutamide was patented by the Chemotherapy Department. Commercial activities of the Institute moved in the normal way. The load of routine work of the testing and supplies has continued to be heavy. The Institute has had to switch over to direct import from abroad in matters of raw materials and scientific equipment. Shortage of space has been a great handicap in accommodating the present activities as well as in their expansion.

The Institute participated in "INDIA CAN MAKE IT" exhibition in the Bombay City. The Public Relations Department was heavily booked during the year. Security arrangements have been reinforced. Lack of space in the stores and shortage of personnel throughout the clerical staff has been continuous and there is a strain in maintenance of normal services. Productivity Drive and Training within Industries for supervisors was undertaken during the year.

The Co-operative Society of the Haffkine Institute will now be completing 25 years of its active service to workers.

During the year Dr. Peter Reeves of the Wright Fleming Institute of Microbiology, London, joined the Haffkine Institute as Guest Worker to work on Cholera Genetics.

During the year the Institute switched on from Australian breed horses to the local breed of Indian horses from Amritsar for production of sera.

It is sad to record the demise of Sir John Taylor, who was Director of the Institute during 1931-32. Sir John Taylor has contributed considerably towards advancement of research at the Institute and in the country.

It is sad to record the untimely demise of Shri Ragho Bhawoo More, Laboratory Attendant, Media Section.

Director is thankful to all the members of the staff for their continued whole-hearted co-operation all the time. Several Committees of the Institute, such as Staff Committee, Sports Committee, Canteen Committee, Public Welfare Department Committee, Workers' Committee, Chawl Committee, Animal House Committee, Library Committee etc. have been very active in making consideration and in implementation of the policy. Valuable suggestions of economic importance were received from Shri K. A. Khambete, Stenographer in Business Manager's Office.

II. DEPARTMENT OF ANTITOXINS AND SERA.

GENERAL.

The Department has been experiencing for the last few years the pressing need for the expansion of its activities. During the year government has been very actively considering the development of Pimpri Farm into a full fledged Laboratory for the purpose of Sera production. An area adjacent to the existing farm measuring about 44 acres is under Government's active consideration for acquirement. In addition to new stables, some of which have already been erected and some are being constructed, it is also proposed to have in the near future a laboratory and a bleeding chamber for purposes of partial extension and expansion of the serum production activities of the department at Pimpri. Two Senior members Dr. K. V. Kulkarni and Shri Y. S. Nimbkar have been sent abroad under the Colombo Plan for necessary training in the serum production and other needs of the department.

The Department also participated in the general Technicians' Training Programme of the Institute and has also given "advanced training" in the production and standardization of various antitoxins to one student who showed interest in the work.

In spite of the peak production activities, it is heartening to note that the high standard of products and research activities have been maintained. The restriction on import of horses which created a problem regarding the availability of equine stock for production of antitoxins has to some extent been mitigated by utilizing available country breed horses for the production of antitoxins.

The demands for the various sera are progressively increasing—more particularly for Anti-tetanus and Antivenene. Foreign demands for the latter are progressively rising.

Training of Workers.—The Department has given training to 6 paying students.

RESEARCH ACTIVITIES.

1. *Antigenic Analysis of Cholera Vaccine.*—Attempt is directed to use Cholera vaccine as prepared in the Vaccine Department for the studies of antigenic composition. Vaccine is filtered bacteria-free and both the vaccines and the filtrate were tested for antigenicity and it was found by mouse protection tests that both the vaccine and the filtrate offered same degree of protection as prophylactics. Also, with high titre sera prepared with the vaccine, the various components of O and H antigens in Inaba and Ogawa strains are being studied by the use of Gel Diffusion Technique and also by precipitin and agglutination technique.

Attempts were made to extract the antigens from Ammonium Sulphate precipitates of the vaccine. For this the dry precipitate is subjected to extraction by different solvents and studied for the presence of various H and O

antigen components with the aid of Gel Diffusion Technique and precipitin tests. The idea is to identify and isolate the protective antigen or antigens of cholera.

2. *Use of submerged or shaken cultures for growing Diphtheria and Pertussis.*—In view of the encouraging reports in the literature on the use of these methods for better yields of Diphtheria toxins and Pertussis growths, attempts are made for utilization of the technique here. A fair amount of encouraging results have been obtained in case of Pertussis cultures by growing Pertussis using the Shake-culture method—using Kahn Shaker to give about 120 swings per minute. The growth obtained was found to improve further when modified Cohen-Wheeler medium was used. Thus, it has been possible to enhance the growth five-fold from 5,000 million organisms per cc. obtained in stationary culture, to 25,000 million organisms per cc.

Similar attempts in case of Diphtheria Cultures and toxin yield have not been quite successful so far. Diphtheria cultures were made both by using Shaken culture method and by using aerated culture method for the production of toxin. Some five lots of Diphtheria Cultures made with the Kahn Shaker yielded toxins with Lf ranging between 5 and 10. About four lots of Diphtheria cultures were obtained by aeration method, using packed sterile cotton column to pass sufficient sterile air to agitate and aerate the cultures without excessive frothing. The toxin obtained was no better than what was obtained by Shake Culture method. The use of Wadsworth-Wheeler media and Papain veal digested media gave better yield of toxins. The aim has been to obtain toxin of high antigenicity for use in the preparation of prophylactics and for purposes of immunization of horses to obtain antitoxins.

3. *Purification of Rabies Virus.*—Sheep brain infected with rabies virus was the material used. This infected sheep brain, after being suspended in 0.25 M sucrose solution was subjected to differential centrifugalization. The virus was found to sediment with mitochondria from which it could be separated by alternate freezing and thawing and finally precipitated with sodium sulphate.

4. *Measurement of combining power of Rabies Vaccine with its Antisera, on the model of the KBL test for Tetanus Toxoid.*—With 1/50 dilution of Hyperimmune Rabies horse serum the combining power of infected brain emulsion and vaccine was studied and found to differ.

5. *Assay of Diphtheria Toxin and Antitoxin by Cytotoxic effect in tissue Culture.*—Monkey kidney cell culture on testing with Diphtheria toxin were found to be very sensitive to the toxin. The same cytotoxic effect was not observed when in place of toxin either toxoid or heated toxin was used. The observations are being further continued to study the specific neutralization effects by this method for the assay of Diphtheria Antitoxins. The cytotoxic action was specifically neutralized by Antitoxin. This neutralization fairly corresponds to the neutralization observed by skin neutralization tests on rabbits.

6. *Neurotoxic Action of Venoms and Correlation with Electrophoretic Component or Enzyme Action.*—With the help of starch gel electrophoresis and staining, components of cobra venom were studied. Later the method was utilised to cut the strips to enable elution of different components observed. One component which was the first band on the negative side had neurotonic activity as mice injected died with symptoms of paralysis. This component is under study for its anzymic properties, if any.

7. *Enzyme Composition of Venoms.*—Venom is a wellknown source of enzymes using some histochemical staining methods, esterases such as cholinesterase phosphatase lipase etc., are identified after electrophoresis on starch gel.

8. *Purification of Anti-sera by 'Phenol' method.*—A new method of purification of anti-sera has been developed where higher concentrations of phenol was used. The method is simple and more economical and gives double the purity as compared with the routine method. The purify was about the same as that obtained by pepsin digestion and was even lighter in colour. When the phenol purified sera was digested with pepsin the purify was further increased to 3 times that obtained by the routine method. Large-scale processing and stability studies are in progress.

9. *Purification of Anticoagulant Factor of Cobra venom.*—Different methods of separation of anticoagulant factor of cobra venom were tried, including salt fractionation, organic solvent extraction and the use of ion-exchange resin. Chromatographic method using ion-exchange resin IRC 50 has given good separation of the anticoagulant and other components. The different components are under test for their homogeneity by gel diffusion and electrophoresis and for their enzyme activity and toxicity.

10. *Neutralization of Toxicity of Russell's viper venom by Heparin and EDTA.*—It had previously been found that heparin alone or EDTA alone when mixed with different amounts of Russell's viper venom and injected intravenously in mice could each protect mice upto 1.5 CLD of the venom. When both heparin and EDTA are mixed with venom, the mice survived with 2 CLD of venom.

11. *Purification of Antisera by Pepsin Digestion.*—No fresh experiments were carried out, but the stability studies on samples prepared in March were kept in incubator and in cold room in April. Samples taken out so far showed no deterioration for six months by flocculation test. The results of sensitization with the antisera were carried out in collaboration with Pharmacology Department. The results were not clearcut and will have to be repeated.

12. *Occurrence of Tetanus Organisms in Skin.*—In collaboration with Dr. J. C. Patel of K. E. M. Hospital, a study was undertaken to find out whether *C. tetani* could occur in skin. Skin swabs from persons attending O. P. D. of the hospital were examined. Only 3 positive isolations have so far been made out of 1,000 swabs examined.

13. *Production and Testing of Pertussis Vaccine.*—The Cohen-Wheeler liquid medium was modified using charcoal absorption of the casein hydrolysate and has given satisfactory results. Three experimental lots were produced in the period under review. From these, triple antigen containing diphtheria and tetanus toxoids were prepared. The potency of the lots were tested. The results of tests for the toxoid components were satisfactory. However, the results with pertussis components using intra-cerebral challenge method needs further standardization.

ROUTINE.

During the year 1476 litres of concentrated serum was produced. This was made up of 1017.3 litres of Tetanus antitoxin, 101.4 litres of Diphtheria antitoxin, 53.5 litres of Gas-gangrene antitoxin, 298.7 litres of Antivenene and 5 litres of antirabic serum.

The toxins and toxoids produced during the year are, 762 litres of Tetanus toxin, 447.5 litres of Diphtheria toxin and 12.3 litres Welchii toxin, 4.7 litres Odematiens toxins and 3.5 litres septique toxin. 229 litres of Tetanus toxin was converted into toxoid and 1.49 litres of Diphtheria toxin was converted into toxoid. In addition, 4.9 litres of pertussis vaccine and 5.7 litres of triple antigen were produced for experimental use.

During the year, the department supplied 1,072,421 ml of Tetanus antitoxin, 82,134 ml of Diphtheria antitoxin, 345,520 ml of Antivenene, 105,120 ml of Gas-gangrene antitoxin, and 2580 ml of normal horse serum. The volumes of Toxoids issued were 82,134 ml of Tetanus toxoid and 9900 ml of Diphtheria toxoid.

III. DEPARTMENT OF CHEMOTHERAPY.

GENERAL.

During the period under review 2 more students have registered for Post Graduate degree of M.Sc. in organic chemistry and also 4 students have registered for Ph.D. degree.

Two Unichem Research Scholarships continued to be operative in the department.

12 paid trainees have been given training at this department during the period under review.

Technicians Training Course.—The department participated in the technicians' training course conducted at the Institute during this year also.

Two C. S. I. R. fellows are working at this department on the scheme of Hormones and Glandular products. Two Government Research Scholars have been taken up to work on the synthesis of Organic compounds of possible therapeutic utility.

RESEARCH ACTIVITIES.

Synthesis of Compounds of possible Antitubercular Activity.

1. *1-Acyl-thiosemicarbazides and 1-acyl-4-alkyl-thiosemicarbazides*.—In further continuation of work on N¹-N⁴ disubstituted thiosemicarbazides two series have been prepared, viz. 1-acyl-thiosemicarbazides and 1-acyl-4-alkylthiosemicarbazides. Out of 35 compounds synthesised and screened *in vitro* against M. tuberculosis strain H₃₇Rv, few acyl-thiosemicarbazide derivatives having allyl radical in position 4 showed good activity. Based on this observation, allyl derivatives of some of the substituted benzoic acid hydrazides, isonicotinic acid hydrazide and nicotinic acid hydrazides were prepared. In all these cases, only diallyl derivatives could be obtained instead of desired monoallyl derivative. However, these were screened and were found to be inactive.

2. *Heterocyclic derivatives of thiourea*.—In view of the reported high antitubercular activities of some of the derivatives of phenyl-thiourea, a number of 1-para-alkoxyphenyl-3-pyrimidyl-thioureas have been synthesised. Few 1-para-alkoxyphenyl-3-(substituted) thiazolyl-thioureas have also been prepared, the substituents in the heterocyclic rings being methyl-chloro-methoxy-ethyl, ethoxy, etc.

3. *Heterocyclic derivatives of thiocarbanilides*.—Taking a lead from 4-ethoxy-4- α -pyridyl thiocarbanilide which has been reported to possess good antitubercular activity, synthesis of the following thiocarbanilides has been undertaken :—

(i) 4-Alkoxy-4'-(2, 4, and 5) thiazolyl-thiocarbanilides,

(ii) 4-alkoxy-4'-(2, 4, and 5)-pyrimidyl thiocarbanilides.

Intermediates required for these series have been prepared and the conversion to the desired products is in hand.

II. Chemotherapy of Bacterial Infections.

In order to study the relationship between chemical constitution and antibacterial activity, compounds having the p-nitrophenyl and/or the dichloroacetyl groups (groups present in chloramphenicol) attached to the pyrimidine, thiazole and pyrazole rings were synthesised.

In the pyrimidine series, the following new compounds were prepared. 2-Dichloroacetamido pyrimidine; 2-dichloroacetamido-4-phenyl-6-ethyl pyrimidine; 2-dichloroacetamido-4-p-methoxyphenyl-6-methyl pyrimidine and 2-dichloroacetamido-4-p-nitrophenyl-6-methylpyrimidine.

In pyrazole ring system, 1-dichloroacetyl-3-p-nitrophenyl-5-methylpyrazole and in the thiazole ring system, ethyl 2-dichloroacetamido-4-p-nitrophenyl thiazole-5-carboxylate; 2-dichloroacetamido-4-p-nitrophenyl thiazole and 2-dichloroacetamidothiazole were prepared.

These compounds were tested *in vitro* against *Salmonella typhosa*, *Sarcina lutea*, *Pasteurella pestis* and *Streptococcus haemolyticus* using the serial dilution method. 2-Amino-4-p-nitrophenyl-6-hydroxypyrimidine inhibited the growth of *Streptococcus haemolyticus* at a concentration of 200/r. c. c. and ethyl 2-dichloroacetamido-4-p-nitrophenylthiazole-5-carboxylate; 2-dichloroacetamido-4-p-nitrophenylthiazole 1-dichloroacetyl-3-p-nitrophenyl-5-methylpyrazole showed inhibition at 500/r. c. c. against *Salmonella typhosa*. The others did not show any activity.

III. Pyrazole and Pyrazolone derivatives as possible Anticonvulsant Agents.

Various new 5-methyl-pyrazole derivatives having different substituted aryl groups (e.g. p-methoxyphenyl, 3,4-dimethoxyphenyl, 3,4,5-trimethoxyphenyl, p-chlorophenyl, p-nitrophenyl and m-tolyl) in 3 position have been synthesised.

Similarly new pyrazolone derivatives having substituted aryl in position 3 and alkyl group in position 4 of the pyrazolone have been synthesised. These include 3-p methoxyphenyl-pyrazolone-5-one, 3-3'; 4'-dimethoxyphenyl-pyrazolone-5-one, 3-3':4'; 5-trimethoxyphenyl-pyrazolone-5-one, 3-p-chlorophenyl-pyrazolone-5-one, 3-p-nitrophenyl-pyrazolone-5-one, 3-p-methoxyphenyl-4alkyl (methyl, ethyl, propyl, butyl, allyl or amyl)-pyrazolone-5-one and 3-3':4':5'-trimethoxyphenyl-4-alkyl (methyl, ethyl, propyl, isopropyl, butyl, allyl or amyl) pyrazolone-5-one.

This synthetic work has further been extended to obtain various N-alkyl pyrazoles and pyrazolones.

A study of the anticonvulsant activity of these compounds is under way. A few representative compounds have been tested for their anticonvulsant activity against chemical and electrical seizures and have shown anticonvulsant properties.

IV. Compounds of possible oral diuretic activity.

A series of 2-substituted 4-amino-sym-triazine, which have not been reported so far in the literature, were synthesised as possible oral diuretics. All the synthesised compounds were screened for their diuretic action both in rats and dogs. Out of the 11 compounds tested, two have shown promising results; hence the toxicity and other studies are being undertaken.

V. Synthesis of compounds of possible antidiabetic activity.

A few interesting 1,3-disubstituted sulphonyl urea derivatives were prepared and submitted to department of pharmacology for testing as possible antidiabetic agents. Two compounds have shown good results and hence their detailed study is being done.

Various 1-substituted benzenesulphonyl-4-alkyl semicarbazide derivatives and substituted benzene disulphonylurea derivatives were prepared with a view to evaluate them as antidiabetic agents.

VI. Studies on the insulin contents of Pancreas available from the Bombay Slaughter House.

1. *Extraction of Insulin from Pancreas.*—The extraction of insulin from minced pancreas with alcohol containing different acids such as sulphuric, hydrochloric and tartaric acids at various temperature has been undertaken. Recovery percentage during these handlings by means of adding known amount of insulin in the minced pancreas has been followed to locate the possible factors that might affect the hormone isolation.

2. *Estimation of Insulin.*—Two methods for the assay of insulin, viz. (i) mouse convulsion method, and (ii) paper-chromatography have been standardised.

VII. Biological Testing in vitro testing against Tuberculosis.

1. *Further studies on the Liquid Medium Containing Egg-extract.*—(a) Effect of replacing Asparagine by glutamate or tryptone: In further continuation of the work on the study of the modified liquid media based on *Isac Yamanes* solid medium containing egg extract, it was attempted to see if the costly ingredient Asparagine could be replaced by either glutamate or tryptone. Media was prepared in which Asparagine was replaced by the equivalent amount of glutamate or tryptone and these media were compared with the medium containing Asparagine. All tubes were inoculated with H37Rv and observed after 21 days.

The result indicated that Asparagine cannot be replaced by either glutamate or tryptone without reducing the growth capacity of the medium.

(b) Effect of replacing tween-80 by glycerine or normal horse serum in the medium: Another experiment was carried out wherein tween-80 was replaced by either glycerine or normal horse serum and these media were compared with the standard medium containing tween-80. Replacement of tween-80 reduced the growth in all cases.

2. *In vitro Testing of Organic Compounds Against H37Rv in Liquid Egg-extract Media.*—During the period under review, about 80-compounds were tested for anti-tubercular activity by *in vitro* culture in liquid egg-extract medium containing graded concentrations of the compounds. Insoluble compounds were suspended in gum accacia. Out of these 80 compounds, only 6 compounds showed inhibition and these will have to be studied further in Youmans medium and with other strains of *M. tuberculosis*.

ROUTINE

The department continued to manufacture and supply Vitamin, Sulpha drugs and Quinine preparations to the Hospitals and dispensaries of Government and Municipalities and to Employees' State Insurance Scheme. All the demands were fully met. The table given below shows the products supplied during the period under review.

S. No.	Name of the Products.			No. of tablets Supplied.
1	Vitamin AD tablets	..	..	77,98,250
2	Vitamin AD (Spl.) tablets	..	..	1,21,000
3	Vitamin A Forte tablets	..	..	2,50,050
4	Vitamin AD Forte tablets	..	..	9,16,188
5	Vitamin BC tablets	..	..	126,27,318
6	Vitamin BC No. 3 tablets	..	..	6,23,600
7	Vitamin B1 tablets	..	..	11,90,378
8	Vitamin B2 tablets	..	..	1,87,470
9	Vitamin C tablets	..	..	18,25,044
10	Acid Nicotinic tablets	..	..	4,60,398
11	Nicotinamide tablets	..	..	80,650
12	Multivitamin tablets	..	..	116,33,081
13	Vitamin K tablets	..	..	64,200
Total				377,77,627
1	Sulphathiazole tablets	..	..	39,30,500
2	Sulphadiazine tablets	..	..	62,70,400
3	Sulphaguanidine tablets	..	..	45,20,125
4	Quinine sulphate tablets	..	..	3,50,275
5	Magnesium Trisilicate tablets	..	..	2,11,100
Total				152,82,400
1	Sulphanilamide paste	..	..	458 lbs.
2	Solapson strong B. P. C.	..	..	40,950 c.c
3	Pemon	..	..	16,946 lbs.

During the period under review 804.9 kg. of Sulphathiazole powder was manufactured and also intermediates equivalent to about 850 kg. of sulphathiazole were manufactured. 200 kg. of B. P. grade Quinine Sulphate was obtained from substandard Quinine Sulphate after purification.

The Analytical Section of the Department carried out nearly 1,200 analysis during the year under review. This includes the testing of raw materials, intermediates and finished products. Micro-analysis of 200 compounds synthesised by the department were also done.

IV. DEPARTMENT OF CLINICAL PATHOLOGY AND DIAGNOSTIC REAGENTS.

GENERAL.

Staff.—Kumari M. C. Patel and Kumari V. K. Gokhale joined the Department as Technicians from 1st June 1959 and 23th August 1959 respectively.

Academic Activities.—Kum. M. C. Patel continued and completed her post Graduate work for M. Sc. degree.

Training of Workers.—Different batches of Technicians of the Technicians' course completed their training course in the Department. In addition, nine students were admitted for short-term training of three month's duration.

RESEARCH ACTIVITIES.

A. Schemes in the Department.

1. *Final Identification of E. coli from urine by sero-type (preliminary) of 'O' antigen determination.*—Serological types of *E. coli* isolated from urine is continued. So far 128 cultures were collected from various hospitals. These were further studied in detail by biochemical reaction. 45 Typical *E. coli* cultures were isolated of these, 40 cultures were typed as follows :—

0126(8), 026(1), 086(4), 0102(2), 0124(3), 0119 (1), 044 (2), 0111 (2), 0112 (7), 0125 (2), 055(5), 0127(3). 15 cultures were inagglutinable.

2. *Phage-typing of S. typhi cultures routinely isolated.*—Vi-phage-typing was carried out on all routinely isolated *S. typhi* cultures with a view to know the epidemiological trend of typhoid infection. Out of 25 strains of *S. typhi*, typed, 14 were of A ; 8 of D ; 1 of E ; and 2 of 'O' phage types.

Typhoid has been endemic in the City of Bombay. However, during epidemic outbreaks it has been noted that wards D, F and G showed higher incidence than other wards.

With a view to find out possible factors which are responsible for such higher incidence, a systematic epidemiological investigations in these wards were undertaken. (see No. 5 below).

3. *Antibiotic Sensitivity Studies on Organisms Isolated from Cases of Smallpox.*—Arrangements are underway for commencing this study.

4. *Studies on the Antigenic Structure of typhoid-paratyphoid group under partial anaerobiosis for its possible application in the preparation of improved agglutinable suspensions.*—At present agglutinable suspensions of *S. typhi* 0901,

S. typhi H901, *S. para typhi* A H, and *S. para typhi* B-H are used for routine widal tests. These antigens are also present in the TAB vaccine used for prophylaxis, with the result that interpretation of Widal tests in inoculated individuals is difficult, and of little diagnostic value. An antigen which is not incorporated in the Vaccine, and which could give equal results of diagnostic value in the inoculated and uninoculated alike, would be of great value in Widal tests.

Ogawa (1953) had shown that when cultures of *S. typhi* are grown in lower O₂ pressure or in the presence of CO₂, developed a new type of antigen quite different and distinct from the known antigenic components of this organism. The 'O' antigenic component changed to a new type which Ogawa called as anaerobic antigen and prepared specific antiserum also for this antigen.

An agglutinable suspension of *S. typhi* 0901 grown in the presence of CO₂ was comparatively tested with the aerobically grown antigens routinely used in widal tests.

Out of a total of 613 Comparative widal tests carried out, the new anaerobic suspension gave 28 positive reactions while the routinely used antigens did not show any reaction. Further, in 194 positive widal tests the new antigen gave a higher titre in 68 cases. These preliminary tests indicate a higher specificity and sensitivity of the anaerobic antigen.

This study is being pursued in the following lines: (i) preparation of a higher titre (anaerobic) serum; (ii) standardization of the batches of anaerobic suspensions against this serum before using for widal test; (iii) possibility of preparation of a concentrated antigen for bed side slide agglutination test; and (vi) the presence and the degree of the anaerobic antigen in freshly isolated strains of *S. typhi*.

A. [(5) Epidemiological studies of Enteric infection in Wards D, F and G.

Since 1st June to 21st December 1959, 410 samples of blood were received from wards D, F and G of which 25 were culturally positive. Total number of water samples examined from Municipal taps since 1st June were 165, but none showed positive culture. Number of sera examined for V-agglutination, so far, were 20. Three of them were positive in titres of 1 in 10 and higher, 2 of these belonged to ward F, and 1 to Ward-D. Number of strains tested by phage typing were 22. The distribution was as follows: A-12 D-5, E-4 and one untypable.

Number of patients whose stool and urine were examined were 16 and one lot of urine and stool was positive. The strain isolated from this urine and stool belonged to phage type A. Number of contacts whose stool and urine were examined were 75, of which none showed positive result for *S. typhi* in stool or urine.

About 41 sewage samples (Average and spot sewage) were examined for TAB group of organisms, but none were found to be positive.]

B. Collaborative Schemes.

1. *Liver function tests to correlate with liver biopsy studies (in collaboration with Biochemistry Section).*—So far, six cases have been fully studied including two follow-up cases. A battery of liver function tests, in addition to other laboratory investigations, like biopsy, Rh-blood group, cultural examination of blood and liver biopsy tissue, prothrombin—time estimation, etc. were done on these cases. A notable feature was the introduction of serum glutamic exalactic and pyruvic transaminase estimation as one of the liver function tests. 50 normal cases were studied along with the above cases to check the method employed for transaminase determination. This study is being continued.

2. *Studies of the alimentary canal of the different rat-fleas with the reference to the growth-promoting factors to p. pestis and other bacteria (in collaboration with Entomology Department and Director's Laboratory).*—In a series of observations previously carried out, it has been observed that emulsions of the alimentary contents of starved fleas differed considerably in promoting plague growth; the emulsion of *X. cheopis* giving rise to a very considerable amount of growth and that of *X. brasilienses* the least.

To account for this difference, the aminoacid and other contents of the alimentary tracts of the fleas are being studied by paper chromatographic techniques, in the first instance. When alimentary canal emulsions of the different species were used, the bands were too diffuse. Hence starved fleas were used by crushing them directly on the paper. By this it is observed that there is a significant difference in the amino-acid content of the different species and in all the species the female fleas showed a higher content of these.

Further studies are in progress to find out the quantitative and qualitative difference in the amino-acid contents between the male and female fleas and between the different species and to correlate these findings with the plague growth promoting or inhibiting factor in the different species of rat-fleas.

Work on Existing Schemes in the Department.

1. *Antigenic Studies on Cholera Vaccine.*—Work on this problem is still in progress. The $(\text{NH}_4)_2\text{SO}_4$ precipitate was further extracted with different solvents like ethylene glycol, Di-ethylene-glycol, glycerine, HCL, trichloro acetic, NAOH, phenol, Urea etc., and are being studied by-gel diffusion techniques. Studies are also under way on the effect of heat on the Vaccine and the possible common antigenic components between Vi-cholera, and Br. abortus., *S-paratyphi*, A. B. and other organisms like *E. coli*, *Ps-aeruginosa*, *B-proteus* etc.

2. *The Survey of the State of Venereal Infection.*—Work amongst the industrial workers was continued. 311 samples of blood from Tata Industries, Mithapur and 226 from Swadeshi Mills, Kurla were received. V. D. R. L. tests were carried out on all the samples.

3. *Investigations on Otomycoses.*—Studies on this has been commenced on clinically proved cases selected by the Aural surgeon, of the K. E. M. Hospital. Ear swabs received from him were cultured and the causative fungus identified.

So far 12 cases have been studied and they are :—mucor sp. 8 cases *Asperigellis* sp.; 2 cases *Neurospora* Sp. and 1 cases, unidentified. From 5 cases, autovaccines have been prepared for skin tests and one case showed weakly positive reaction. The study is in progress.

The incidence rate declined sharply after the monsoons. Hence during the last quarter only very few cases came for treatment in the O. P. D. of K. E. M. Hospital. Even these cases when selected for further study did not turn up a second time.

It is proposed to renew attempts to investigate cases.

ROUTINE

Arrangements are being progressively effected for carrying out higher type of diagnostic work.

A circular inviting co-operation was sent to all the Clinical Pathologists attached to civil hospitals and teaching college hospitals in the State of Bombay. Most of them have agreed to participate in the general scheme of (1) sending materials for reference and standardization (2) mailing of standard methods and cross check-up of specimens, and (3) referring materials for higher type of investigation. Further arrangements are under way to implement this programme.

The Veneral Diseases Reference Laboratory has started to function in a small way. 865 samples of tested sera were received from hospitals in Bombay V. D. R. L. tests were carried out on these and the results will be compared with those obtained by the respective laboratories. This study is in progress and will be gradually extended to other laboratories also.

Mobile Unit.—A beginning has been made to organise a Mobile Unit for purposes of carrying out on-the-spot investigations of diseases of unknown origin in any locality within the State of Bombay. Two technicians and two Laboratory Attendants have been recruited and they are being intensively trained, in the Department. The necessary equipment for the proposed Unit is being collected. Very shortly a Medical Officer will also be taken up. The formation of this Unit is being expedited.

General Bacteriological Work.—The Department continued the general activities of conducting (1) bacteriological, serological and biological tests on all clinical materials received from Government hospitals and other institutions (ii) preparation and supply of various diagnostic reagents, stains and snake-venom solution; (iii) carrying out of histopathological examinations on biopsy materials and pathological tissues; (iv) preparation of autogenous vaccines, and (v) conducting special test like pregnancy test, Rideal-Walker Test, Frie's and Tuberculin tests etc. All essential tests in connection with infectious diseases like Diphtheria, Cerebrospinal fever, enteric group of fevers, typhus, plague, cholera and tuberculosis, were carried out free of cost.

Histopathological Section.—During the year under review, 3396 pathological specimens, received from different hospitals in the State of Bombay and few from outside the State were examined and reported upon. These included brain tissues from suspected rabid animals, neoplasms, gynaecological conditions and some rare and interesting pathological specimens.

The interesting specimens received during the year were as follows :—

- CP/H-124 Malignant Ovarian Teratoma.
- CP/H-307 Malignant Synovioma.
- CP/H-549 Benign Cystic Teratoma of ovary.
- CP/H-598 Scirrhus Carcinoma of gall bladder.
- CP/H-680 Teratoma of Sacrococcygeal Tumour.
- CP/-636 Squamous celled Carcinoma of Parotid.
- CP/H-898 and 1201 Ewing's Sarcoma.
- CP/H-999 Carcinoma simplex of the parotid glands.
- CP/H-1013 Dysgerminoma of the ovary.
- CP/H-1475 Embryoma of the Kindney (Wilm's tumour).
- CP/H-1537 Granuloma cell carcinoma.
- CP/H-1865 Hurthle cell tumour of the thyroid.
- CP/H-1935 Papilloma of the limbus.
- CP/H-1952 Sebaceous cyst undergoing malignancy.
- CP/H-2133 Thecoma ovary.
- CP/H-2338 Cylindroma of Skin (Turban tumour).
- CP/H-2409 Undifferentiated teratoma testis.
- CP/H-2590 Myogenic sarcoma.
- CP/H-2602 Epidermoid carcinoma uterus (Patient's age 20).
- CP/H-2730 Banti's splenomegaly.
- CP/H-3047 Lymphadeniod goitre (Hashimoto's disease).
- CP/H-3063 Muco-epidermoid tumor of parotid.

Special Examinations.—28 samples of earth surrounding pit latrines in Kaira District were examined for evidence of hook-work infection. From all samples, hook-work larvae could be isolated.

Typhoid Scheme.—Calls received from the various private medical practitioners in the City of Bombay were attended to. All the blood samples collected were, as usual, put up for clot culture and triple Widal tests. There were 364 calls for blood collection. 1618 widal and clot culture tests were carried out. Widal test was positive in 474 cases, 97 cultures were positive, of which 83 were of *S. typhi* and the remaining 14 were of *S. paratyphi A*. 34 cultures of *S. typhi* have been phage typed, the distribution of types being A-1, D-11, E-1; D6-1; I0-17 'O'-3. Vi-agglutination test carried out on 28 positive sera gave positive reaction of a titre of 1 : 10 or above in 7 samples

Antistreptolysin Titration.—As a higher and specialised test, it has been proposed to carry out serological tests for antistreptolysin 'O' titre in cases of streptococcal infections. The reagents and techniques for this are being standardised.

Routine Examinations.—During the period under review, the following tests were carried out :—

I. *Serological Examination*—

(i) Wasserman Test	1,002
(ii) Kahn Test and V. D. R. L. Tests	532
(iii) Triple Widal Test	1,618
(iv) Agglutination Test for—	
(a) Typhus	1,618
(b) Brucellosis	1,618
(c) Leptospirosis	43
(d) Paul-Bunnell Test.. .. .	9

II. *Bacteriological and Biological Tests*—

(i) Clot culture for enteric group	1,618
(ii) Urine culture for pathogenic organisms	80
(iii) Throat-swabs for Diphtheria	290
(iv) Stools and rectal swabs for culture	Nil.
(v) Sputum and body fluids for A. F. B. by smear, culture and animal inoculation test	558
(vi) Blood culture routine	114
(vii) Preparation of autogenous Vaccine	88

III.—

(viii) Bone Marrow	2
(ix) Material for smear and examination (Presence of pathogenic organisms like G. C. etc.)	10
(x) Stool	556
(xi) Urine	316

IV. Prothrombin Time Estimation 30

V. Pregnancy Text 1,023

VI. Rideal Walker Test 55

VII. Antibiotic Sensitivity Test 65

Diagnostic Reagents.—This section is proving useful, the demands for Group sera and Khan Antigen are increasing. Casonis antigen (Hydatid fluid) has been added as a fresh supply item, in view of several demands for this reagent.

The production and issue during the period under report are :—

(1) Killed suspensions for Widal and Weil Felix Test..	2,03,385 ml.
(2) Blood grouping sera	21,071 ml.

(3) High titre sera and Amboceptor	..	..	958 ml.
(4) Kahn Antigen	..	..	12,190 ml.
(5) W. R. Antigen	..	..	630 ml.
(6) Russell's Viper and Cobra Venom solutions	..	..	1,654 ml.
(7) Biological stains	..	..	3,73,300 ml.

V. DEPARTMENT OF ENTOMOLOGY.

Training of Research Workers.—Department took part in training of students in the technician's training course. One student was trained in the specialised training. Six students are being trained for M.Sc. and Ph.D. degree by research. Lectures have been taken for M.Sc. by papers in Zoology. Two thesis for M.Sc. degree have been accepted for students of this department by Bombay University.

RESEARCH ACTIVITIES.

Studies on *D. muris* was completed. The life history, morphology and the breeding of this mite on laboratory mice has been achieved. The work has been incorporated in a paper which is being published. The frequency and incidence of *X. cheopis* and *X. astis* in Kamatipura which is the crowded locality of Bombay has been compared with similar factors in Mahim and the suburbs of Bombay in Bhandup area. The results indicate that *X. cheopis* predominates on rats, particularly *Rattus rattus* and the other flea *X. astia* predominates on the field rat. The studies on the development of proventriculus in *X. cheopis* to show the number of teeth which may be responsible for transmission of plague are under progress. The development of the ring gland in the house-fly *Musca domestica* *nebulosa* is being studied histologically and it has been observed that the extirpation of this gland in the adult female house-fly affects the maturation of the eggs. The later starts maturing if the extirpated gland is replaced, showing that the gland is responsible for maturation also.

RATS.

The collection of rats in congested parts of Bombay Town and the Suburb have been started on a comparative basis. It is observed that *Bandicota bengalensis* is coming more in numbers in the town of Bombay than *Rattus rattus*. A scheme was therefore sponsored which has to be inaugurated when the postulation that *Bandicota bengalensis* is replacing *Rattus rattus* is to be proved. The frequency of the rat population in the crowded locality and the fringe limits of the Bombay town are to be observed to show that due to urbanisation the field rat is replacing the house rat. Preliminary Observations for the last 4 months have shown that on the fringe of Bombay Town that is in Bhandup residential locality the house rat takes predominance as compared with the predominance of field rat in the residential area of Bombay. The fauna of the rat burrows and the burrow pattern is under observation in the Mahim area. A new type of rat-trap has been designed in which only one rat can go at a time. This trap would be useful to collect firstly the field rat and secondly it will be useful to study the rat frequency, population for devising methods in rat control.

Bombay Municipal Rat Section.—Experiments on the susceptibility of Bombay City rats to plague infection by injecting a standard test infective dose showed results similar to last year.

During the year 15 dead rats, 73,023 live rats from the City and 5,990 live rats from the Bombay Port Trust area were examined for Plague. No Plague infection was detected.

Snakes.—Studies have been started on the morphological structure of the salivary glands of different non-poisonous snakes in comparison with the parotid glands of the poisonous snakes. Histological and cytological studies are later to be done and confirmed by experimentation to show whether there are any secretions in the non-poisonous glands which are toxic to human beings. Similarly collections of other poisonous snakes in India have been started apart from the 4 we use with the object of collecting their venom to see the broad spectrum of Haffikine Institute antivenin.

Scorpions.—Three species of scorpions have been collected and the total number of 3,000 scorpions are now available for venom extraction and later preparation of antivenin.

Routine.—During the last 2½ months 43 institutions sent their students to visit this Institute and 1,523 members including students, professors, teachers and trainees visited this Institute and were taken round. Twenty-five snakes, which have been received for identification from different sources have been identified and information about them, submitted. Identification of mosquitoes and other insects of medical importance was done. Four hundred and sixty-five snakes were purchased and 2,298 snakes were handled. The total amount of venom produced during the year (till 30th November 1959) is as follows in gms. :—

			Produced.	Supplied.
Cobra	..	..	62·9467	31·4965
Russell's Viper	..	..	19·9287	34·1643
Krait	..	..	13·2887	10·2217
Echis	..	..	2·8196	10·4170
			98·9837	86·2995

During this period, the Assistant Director was away for six months under deputation to different parts of the world for observing laboratories working on snakes, laboratory animals and insect resistance to insecticides.

VI. DEPARTMENT OF PHARMACOLOGY.

GENERAL.

Staff.—Four members of the staff viz. Shri C. J. Mehta, Shri M. L. Chainani, Shri S. A. Vengsarkar and Shri M. V. Panse registered themselves for post-graduate studies. Kumari Umashashi Tonse was admitted as a post-graduate student for M. Sc. (Biochemistry).

Dr. R. B. M. Colah, M. Sc., Ph. D., Senior Biochemist, returned from Switzerland after spending about four months in the analytical and research laboratories of F. Hoffmann-La-Roche and Co. Ltd., Basel. He also visited several laboratories in England and the continent.

Shri M. S. Madiwale, M. Sc., Assistant Chemist, left this Institute to take up the new appointment of Senior Toxicologist at the Forensic Science Laboratory, Bombay.

Shri M. B. Walawalkar, M. Sc., Technician and Dr. D. R. Kulkarni, M.B.B.S., Research Scholar, under the Unichem Scheme, resigned their posts.

The following members of the staff received post-graduate degrees (mentioned against their name) during the year. They are Shri C. J. Mehta, M.S. (California), Kumari L. S. Kadaba, M. Sc. (Bombay) and Shri B. M. Kishinchandani, M.Sc. (Bombay).

Training of Worker.—The training programme continued to be very popular. Quite a large number of applicants had to be refused due to shortage of space. Training was given in chemical, biochemical, microbiological and pharmacological methods of drug analysis. The usual period of training varied from 3 to 4 months. Individuals deputed by recognised pharmaceutical firms were given preference. Private individuals were also entertained. Shri M. R. Muley was deputed by Comteck Laboratory Ltd., Bombay, Shri P. V. Khale by Dr. Bhalchandra Laboratory Ltd., Bombay, Kumari Indira Shah by W. T. Suren & Co. (Pvt.) Ltd., Bombay; Shri B. G. Phadnis came from T. W. Iker. Pharmaceutical Laboratory, Poona, Shri M. M. Palnitkar from International Frenchises Ltd., Bombay, Shri K. Panchapakisan from Fine Pharmaceutical, Kumbakonam and Shri S. V. Subramaniam from Inspector of General Stores, Ministry of Defence (C. G. D. B.), Bombay.

Kumari Hilla R. Chinoy and Shri Malcolm Correa joined in a private capacity. In addition to these, three candidates for the Laboratory Technician Training Course were given advanced training in drug analysis. The remaining 16 technicians of the same course were given lectures, demonstrations and practical training.

RESEARCH ACTIVITIES.

I. *Studies on Cholera Endotoxin.*—Studies on the pharmacological actions of cholera endotoxin were continued. Biochemical and histopathological studies revealed that when the endotoxin was fed to infant rabbits it produced signs and symptoms of cholera which resembled those present in cases of human cholera.

Toxin prepared by Gallut's method was tested for its potency in mice weighing 16-18 gm. The Minimum Lethal Dose was found to lie between 0.2 to 0.3 ml. when administered intraperitoneally. Ether extract of this toxin resulted in the separation of three fractions viz. protein, lipid and poly-saccharide. The lipid portion was found to be the most toxic one. This toxin (Gallut's method) compared favourably with toxins prepared by Boivin's as well as

West-phall's methods, so far as the toxicity is concerned. However, the toxin prepared by the last two methods did not produce, on oral administration, signs and symptoms of experimental cholera, unlike that of toxin prepared by Gallut's method.

II. Studies on Indigenous Drugs.

(i) *Withania somnifera* (Dunal).—A systematic chemical and pharmacological study of the roots of *Withania somnifera* has been carried out. Chemically the following principles have been isolated.

(a) *From petroleum ether extract*.—Hentriacontane, and a phytosterol M. P. 134-136°C. (also reported by Power and Solway).

(b) *From ether Extract*.—An antibiotic principle which is active against gram positive organism (*S. aureus*) E₁, a Phytosterol E₂, 2 different brown amorphous principles termed as E₃ and E₄ have been isolated.

(c) *From chloroform extract*.—By employing column chromatographic technique, eight different fractions have been collected but they were neither alkaloids nor glycosides and gave negative test for sugars, tannin and sterol.

(d) *Alkaloids*.—The total alkaloid of the plant has been isolated. Paper chromatographic study showed the presence of at least five different alkaloids. The total alkaloids could be divided into three fractions depending on their solubility in the following order:—Benzene soluble (B), Chloroform soluble (C), and Alcohol Soluble (A).

(e) *Pharmacology*.—Pharmacological studies of these three fractions revealed interesting results. None of them had any appreciable sedative effect, thus confirming the finding of the Wellcome Physiological Research Laboratory.

The three fractions (A, B and C) did not show any analgesic properties on albino rats too.

All the three fractions had spasmolytic effects against acetylcholine contractions on the isolated guinea-pig ileum suspended in Tyrode Solution. Fraction C was most powerful and Fraction B, least of them. Fraction A showed also weak antihistaminic properties on guinea-pig ileum but was unable to relieve broncho constriction induced by histamine in intact guinea-pigs. This spasmolytic effect was also demonstrated on isolated rat uterus, when the latter was stimulated by pituitary extract. All the three fractions could reduce such contractions. Fraction C was the most powerful of them.

All the three fractions inhibited spontaneous contractions and brought about the relaxation of isolated pieces of the rabbit duodenum. Fraction C was again the most powerful, unlike other fractions which had not much effect. Fraction A produced marked depressor action when injected intravenously in a dose of 5 mg/kg. in cats and dogs. Recovery took a prolonged period of 35 to 45 minutes. Respiration was increased both in depth and rate.

Isolated rabbit heart perfused with modified Ringer Locke Solution, showed stimulation when 0.5 to 1 mg. of Fraction A was injected in to the perfused fluid. This stimulation gave way to depression with slowing of the heart when the dose was increased from 2 to 4 mg.

Fraction C only showed very slight depression when 2 to 4 mg. was injected. Fraction B had no significant action.

Attempts to fractionate the total alkaloids of *Withania somnifera* by column chromatographic and ion-exchange chromatographic methods were made. But no individual alkaloid could yet be obtained in pure crystalline form.

A pure crystalline principle has been obtained from the chloroform extract M. P. 295°C with decomposition.

The extracts from the roots of the plant were tested both *in vitro* for vibriocidal properties and *in vivo* against cholera in infant rabbits. In the *in vitro* experiments the aqueous extract showed some vibriocidal activity but in experimental cholera it had no action.

(ii) *Coleus aromaticus*, Benth.—The juice of the leaves of *Coleus aromaticus*, Benth and the volatile principles of the same were also tested *in vitro* for vibriocidal and *in vivo* in infant rabbits suffering from experimental cholera.

The beneficial effects of the plant in the treatment of cholera could not be confirmed either *in vitro* or *in vivo* experiments.

(iii) *Saussurea lappa*, Clark.—As an alkaloidal base isolated from the Indian medicinal plant, *Saussurea lappa* (Clarke) has been studied pharmacologically. The alkaloidal fraction was non-toxic and had little effect on the blood pressure and respiration of the cat and rabbit. It exhibited marked spasmolytic effect on the smooth (intestinal) and tracheal muscles of the guinea-pig when stimulated by histamine. The anti-spasmodic effect was also observed on the perfused isolated guinea-pig's lungs. It did not antagonise the actions of histamine and adrenaline on the rabbit's ear vessels nor did it have any action on the skeletal muscle (rat's diaphragm).

Results of the preliminary clinical trial in patients suggested that the alkaloidal fraction might be the active principle on which the reputation of the drug as an useful remedy against chronic bronchitis and asthma stands.

(iv) *Thevetia nerifolia*, Juss.—Chemical and pharmacological investigations on the seeds of *Thevetia nerifolia*, Juss have been carried out. A pure glycosidic substance "Thevetin" has been successfully isolated. Partition chromatographic separation of this on silica gel has led to the isolation of another glycosidic fraction.

IV. *Screening of Indigenous Drugs in Experimental Cholera.*—Athomin (an amine isolated from the root bark of *Moringa pterigospermia*, Gaertn.) has been claimed to be effective in the treatment of cholera. The drug when tested in experimental rabbit cholera proved to be ineffective.

The following drugs were screened for their vibriocidal properties against *Vibrio cholera* viz. (1) Fruits of *Capparis zeylenica*, Linn. (2) Thymol (3) Menthol (4) Camphor and (5) the volatile oils of (a) Cardammon (b) Cinamon (c) Peppermint (d) Clove (e) Cajuput (f) Juniper and (g) Lemon grass. The alcoholic extracts of *Capparis zeylenica* and Camphor failed to show any activity against cholera both *in vitro* as well as *in vivo*. Thymol, Menthol and all the above essential oils showed varying degrees of vibriocidal activity *in vitro* but failed to protect the infant rabbits infected intra-intestinally with *Vibrio cholera*.

V. *Studies on Antidiabetic Drugs*.—The antidiabetic properties of the synthetic compounds R94 and R86 were compared with that of Tolbutamide in normal rabbits. Both of these were able to reduce blood sugar in these animals, when administered orally.

Toxicity tests of the drugs were conducted and compared with Tolbutamide. The drug R94 has been found to be less toxic and more potent than Tolbutamide.

Screening of synthetic antidiabetic drugs has been continued in another species of laboratory animals, namely, ther at.

VI. *Development of Analytical Techniques*—(i) *Estimation of halogen derivatives of 8-hydroxyquinoline*.—A new colorimetric method for the determination of 5-chloro-7-iodo and 5-7-di-iodo-8-hydroxyquinoline has been evolved. The method proposed is based on the development of highly coloured derivatives by coupling these compounds with diazotized p-nitroaniline-O.Sulphonic acid under optimum conditions. It has been found that the colour produced shows a maximum absorption of 560 mμ. and the intensity of the colour is proportional to the concentration of the original compounds over a range of 25 to 100 mcg. The proposed method offers distinct advantages over the gravimetric method developed in our laboratory in respect of sensitivity and economy of time. Separation of the two drugs by paper partition chromatography and subsequent colorimetric estimation by the proposed method would enable a drug analyst to analyse complex preparations containing both the drugs in admixture.

(ii) *Estimation of m-amino phenol*.—Further modifications on the B. P. method for assessing the amount of m-amino phenol in p-amino salicylic acid and its salts have been attempted. The possibility of using other diazonium chlorides has been investigated. Out of several compounds 4-nitro-orthanilic acid (2-amino-5-nitro-benzene sulphonic acid) gave promising results. The diazonium salt of this base is very stable and couples almost immediately with a-amino phenol quantitatively in an alkaline solution to produce an amethyst-red colour having a maximum absorption at 530 mμ. The advantages of this method are that the colour obeys Beer's law over a wider range and that narrow PH adjustments are eliminated.

An application of the U. S. P. gravimetric method for the estimation of aminophenol in p-amino salicylic acid and its calcium and sodium salt brought to light defect in the U. S. P. procedure, viz. that the m-aminophenol when isolated gets oxidatively degraded. Investigations are under way to determine the nature of the decomposition products.

Although it has been reported that a-amino phenol is stable under atmospheric conditions our observations lead us to believe that to a certain extent it under goes photo-decomposition. It is likely that these degradation products are the cause of the dark colour of the m-amino phenol residue obtained by the U. S. P. procedure. Moreover as m-amino phenol forms anils by condensation with aldehydic compounds to give a final m-amino phenol assay residue which is never obtained in the pure state. This is primarily due to impurities in the solvent ether which is used for extracting the m-amino phenol. Efforts are being made to identify the coloured and other condensation compounds by paper partition chromatography.

(iii) *Estimation of "Novalgin".*—The methods for the estimation of "Novalgin" (1-phenyl-2-3-dimethyl-pyrazolon-4-methylamino-methane sulphate) lack specificity and suffer from serious limitations. A sensitive reaction (Sanchez and Bonino) in which the compound in very little dilute solutions is oxidized to a pink oxidation product with 1 per cent. iodic acid in presence of sulphuric acid is investigated. The reaction product is soluble in chloroform and may, therefore, be conveniently extracted for colorimetric estimations.

Sanchez and Boninos' reaction is affected by concentration of both the sulphuric and iodic acids used as well as by the temperature at which the reaction is carried out. Conditions are established to give reproducible results at different concentration levels. It has been observed that under suitable conditions the concentration is a linear function of the intensity of the colour developed. The possibilities of routine application of this method to pharmaceutical products containing Novalgin are being investigated.

(iv) *Estimation of "Avil".*—The estimation of the p-aminosalicylic acid part of prophenpyr damine-para-amino salicylate (Avil) by using N,Naphthyl-ethylene diamine dihydrochloride reagent has been worked out and satisfactory results were obtained.

A duel attack has been made on "Avil" on the one hand via the p-amino salicylic acid part and on the other via the prophenpyridamine part of the compound with promising results. The application of the "Konig CNB reagent" has been worked out in detail. The optimum colour development is obtained at pH 7.4 at the end of 2 minutes, measurements being made at 480 mu. the wave length of max. absorption. With the aid of a standard curve prepared from the pure compound it was possible to get an agreement of 1 ± 0.5 per cent. with the results obtained by the titrimetric procedure and by the Bratton-Marshall method used for assaying the same compound via the p-amino salicylic acid part of the compound.

(v) *Estimation of "Thymol"*.—Thymol is an important constituent of cough syrups, pain balms and similar complex pharmaceuticals. The presence of other ingredients like eugenol, salicylic acid, methyl salicylate, eucalyptus oil, cinnamon oil and cresols commonly incorporated in such preparations hampers its estimation. A colorimetric method for the estimation of thymol in presence of such interfering substances has been developed. This method is based on the formation of a stable purple colour formed by reacting the thymol with diazotised p-nitroaniline-c-sulphonic acid under suitable conditions. The colour system exhibits maximum absorption at 520 m μ and follows Beer-Lambert's Law over a range of 40 to 200 mcg. in a final dilution of 100 ml. Our studies show that the method does not suffer from any serious interference by the presence of most of these substances incorporated along with thymol.

(vi) *Estimation of Strychnine in Easton's Syrup*.—Previous work on the colorimetric estimation of strychnine in Easton's Syrup (Syrup of Ferrous phosphate, quinine and strychnine) revealed that low and undesirable results for the content of strychnine were due to the presence of quinotoxin. This substance is an isomeric oxidation product of quinine which has been shown by paper chromatography to be produced from quinine when Easton's syrup is stored for a month or more. Elimination of this interference by quinotoxine has been attempted by selectively reducing the castromyl group in quinotoxin with aluminium isopropoxide. The application of this method in the routine analysis of Easton's syrup is being verified.

(vii) *Estimation of Ephedrine*.—A colorimetric method for the estimation of ephedrine has already been developed. The optimum conditions of the underlying reaction of ephedrine with copper sulphate giving rise to a purple blue colour has been worked out. When this colorimetric assay was applied to determination of ephedrine in combination with other ingredients employed in cough syrups and similar preparations, a few cases of interference were noticed. Suitable modifications of the method are being devised for removal of interference.

(viii) *Estimation of Ascorbic Acid in Pharmaceutical Preparations containing Plant Extracts*.—The estimation of Vitamin C with silicomolybdic acid yielded higher results in the case of certain preparations containing herbal extracts. Investigations on the cause of this interference in presence of some of the extracts of plant origin are in progress.

Preliminary studies on about half a dozen plant extracts commonly used in such preparations led us to believe that the high values for Vitamin C obtained by this method in the case of such preparations were because of the Presence of glycosidic substances and reductones and not due to tannins and other colouring matter. Further experiments are in progress to find out the nature of the chemical entities encountered in these plant extracts which give false high Vitamin C values.

VII. Stability and Storage Studies of Pharmaceuticals.

(i) *Storage of Acetyl Salicylic Acid*.—The observation that a large number of samples of acetyl salicylic acid comply with the B. P. test for the limit of free

salicylic acid and that tablets of acetyl salicylic acid almost invariably fail to do so, led us to investigate the effect of storage on the free salicylic acid content of free acetyl salicylic acid remains unaffected even after a storage for one year.

(ii) *Stability of Calcium Pantothenate.*—The effect of substances like Vitamin C and B₁, betaine, choline, inorganic salts of iron and copper on the stability of calcium pantothenate in liquid preparations stored at room temperature has been studied. The results obtained so far indicate that iron and copper salts, betaine, choline, vitamin C and B₁, exert a deleterious effect on calcium pantothenate, niacin as well as its amide, vitamin B₆, taka diastase, pepsin, manganese and zinc salts are less deleterious.

It has been further observed that injections, tablets and capsules exhibited less deterioration of the vitamin than the liquid oral preparations.

VIII. *Miscellaneous Investigations.*

(i) *Identification of Aswagandha.*—With a view to establish the identity of Aswagandha root, its microscopic examination was undertaken. In the I. P. Monograph on Withania root, it is stated under the microscopic examination that crystals of calcium oxalate are present in the parenchymatous cells scattered in the cortex, phloem and xylem region of the root. Crystals are almost absent in very round roots with a diameter of 2.5 mm. and less, but are present in roots having a diameter of 6 to 12 mm. (I. P. Specification for diameter). The other feature which is also required to be incorporated in the Pharmacopoeia is the presence of interxylary phloem, found in patches which are associated with the groups of xylem vessels. Both calcium oxalate crystals and interxylary phloem are additional features for the identification of the root of *Withania somnifera* Dun.

(ii) *Pharmacological Study of Synthetic Analgesic Drugs.*—A series of compounds synthesized by the Department of Chemotherapy were screened for their analgesic properties. Out of the 17 compounds only two (R72 and R74) exhibited some appreciable analgesic properties when tested in the rat.

ROUTINE.

During the year 1959, 3980 samples were examined. These included a variety of drugs both pharmacopoeial and non-pharmacopoeial preparations like vitamins, hormones, galenicals, chemotherapeutic agents, antibiotics, complex preparations, insecticides. Occasionally drugs belonging to the Ayurvedic, Unani and other systems of medicine were received for analysis. Out of these, 27.8 per cent i.e. 1,107 were found to be of non-standard quality. This percentage of non-standard samples did not deviate much from the figures for the previous year. The samples were mainly received from Drug Inspectors attached to the Drug Control Organisation for the State of Bombay, as well as from the Police and the Prohibition and Excise Departments. The number of samples received from Drug Inspectors of States other than Bombay have been considerably reduced this year.

Out of the 2,118 samples that were tested under the Drugs Act, 704 were found to be not of standard quality. The percentage of failing samples amounted to about 33. This figure is considerably more than that of the last year which was 28 per cent. This does not suggest any significant improvement in the quality of drugs.

Some important observations, about which we came across during our routine work, are being recorded here for the benefit of those who are interested in the field of drug analysis. Space does not permit us to make a more detailed summary.

Pharmacological Section.—Fourteen samples of Digitalis, 2 samples of Tinct. Strophanthus, 6 samples of Tinct. Scillea and 2 samples Tinct. Urginea were tested biologically. One of the samples of Tinct. Digitalis was found to contain 0.48 units per ml. of the activity of Digitalis. Two samples of Tinct. Strophanthus examined showed higher potency to the extent of 133 per cent.

Nine hundred and seventy-eight samples were tested for their sterility. Out of the four samples of surgical sutures and catguts, two were found to be non-sterile.

Sixteen samples of Insulin were reported during the year. Two of these were not of standard quality. Uptill now the method employed in gauging the potency of insulin was by the rabbit blood sugar reduction method. This method is a lengthy and time-consuming one. Recently, the "Mice convulsion method" has been introduced. A special strain of Swiss mice is being employed as the test animal. The advantage of this method are that the time required to test any sample is considerably reduced and the method is less laborious.

Twenty-seven samples of adrenaline were tested. All of them were of standard quality.

Forty-five samples of Liver Extracts were tested for the presence of histamine or histamine like substances in them. In as many as 12 samples, the quantity of histamine base was more than 100 parts per million. It was noticed that seven samples of Liver Extract out of nine failed to pass the test for toxicity.

One preparation containing mercury salts in combination with plant products claimed to be useful in case of diphtheria, was tested for its efficacy against experimental diphtheria. It proved to be ineffective.

Two samples of snake-bite "cure" were tested in experimental animals (dogs). They were also found to be ineffective.

As many as 225 samples of antibiotics like penicillin, streptomycin, dihydrostreptomycin, chloramphenicol either individually or in admixture were tested for "safety" or undue toxicity or for the presence of "histamine like substances". It is gratifying to note that none of these samples were declared to be sub-standard. It was noticed that the level of histamine like substances

in the anti-biotics was much less than the pharmacopoeial limits. It is seen that this year more than double the number of anti-biotics samples were received than during the previous year.

The number of parenteral preparations tested for the absence of pyrogenic substances was 610. These included as many 17 samples of calcium lactobionate; all of these were of standard quality. Out of 610 only 5 failed to pass the test.

Biochemical Section.—The majority of the samples tested in this section were multivitamin preparations. The total number of samples analysed during this year was 873.

As many as 181 preparations containing Vitamin A were analysed. Forty-eight per cent. failed to conform to the labelled amount.

Out of 3 per cent. samples containing Vitamin B₁, about 32 per cent. were not of standard quality.

The percentage of failure of samples containing Vitamin C was about 24, out of a total of 201 examined.

About 44 per cent. of the samples containing Calcium Pantothenate could not come upto the claims made.

Out of 295 samples tested for vitamin B₁₂ activity, 146 were found to be of standard quality, the percentage of the failures being about 20. This is partly due to the fact that quite a large number of these samples were simple injections of vitamin B₁₂ which are usually more stable.

Eighty samples containing folic acid as one of the ingredients conformed to the claim made whereas 63 failed to do so, the percentage of failures being about 44.

Five samples containing vitamin B₂, 16 containing Niacin or its amide, 4 containing Methionine and 12 containing Vitamin B₆ were examined during the year, all of them were of standard quality. About 35 per cent. of the samples received for testing the proteolytic activity of pepsin, failed to comply with the claim made. Thus out of a total number of 873 samples as many as 396 i. e. about 45 per cent. were reported to be not of standard quality.

Our previous impression that vitamins are probably more stable in tablets and injectables than in oral liquid preparations have been confirmed.

In this year chemical as well as microbiological assays of Vitamin B₄ were introduced.

During the year 304 preparations containing antibiotics were examined. These included penicillin, streptomycin and dihydrostreptomycin and combinations thereof, chloramphenicol, chlorotetracycline and tetracycline. Out of these, 18 samples failed to come up to the desired standard. About 81 samples containing penicillin only were tested, the percentage of non-standard being about 6.1. Eleven samples of penicillin and streptomycin conformed to the

claim made, whereas 2 failed to do so, thus giving a percentage failure of 15·5. As many as 172 samples of dihydrostreptomycin and streptomycin were examined. All of them were of standard quality. Similarly all the 41 samples of chloramphenicol were of standard quality. Two out of 14 samples of tetracyclines could not come up to the required standard.

Three cases of misbranding of drugs were recorded this year. One sample of chlorotetracycline was found to contain tetracycline hydrochloride. Two products labelled as streptocidic in contained on the other hand procaine penicillin.

Chemical Section.—As many as 40 preparations of sulpha drugs were tested, the majority of them being tablets, the remaining were injections and mixtures with other drugs. About 45 per cent. of these were declared to be not of standard quality. One of the sample of tablets failed to comply with the test for time of disintegration, another in uniformity of weight. It was noticed that in some instances the tablets were misbranded. Suphanilamide being supplied in place of sulphathiazole and sulphadiazine. Adulterations of tablets of sulphadiazine and sulphathiazole with the cheaper drug like sulphanilamide was also noticed. This was detected with the help of paper partition chromatography.

Fairly large number of popular house hold remedies like castor oil, tincture iodine, “ague” mixtures, balamrit, pain balm etc. were received. Two out of the 27 samples of eucalyptus oil sent for examination turned out to be of non-standard quality, one containing less amount of cineole, the other none at all. Imitation of some of the well known brands of “Gripe water” by some unscrupulous persons still continues. In all 43 samples of gripe water were tested. Out of these three did not contain sodium bicarbonate or sugar. They contained saccharine instead. One sample contained potassium bromide even though it was not claimed.

Tincture of Iodine is one of the spirituous medicinal preparations commonly found to be of sub-standard quality. Eleven out of the seventeen samples of tincture iodine tested under Drugs Act were declared as non-standard.

A large number of galenicals were tested and 4·3 per cent. were found to be not of standard quality. Some of these were sub-standard while others were evidently spurious and contained alcohol, water and colouring matter. These included Ext. Rauwolfia Liquidum, Tinct. Cantharidine, Tinct. Benzoin, Tinct. Senega, Liq. Ext. of Vavding, Liq. Ext. of Gokhru, etc.

Instances were seen where insecticides and prickly heat powders did not contain any active agent like DDT or gammmaxane. Boric acid and salicylic acids were absent in the prickly heat powders which were tested. Adulteration in sandalwood oil still seems to continue. All the 14 samples tested were not of standard quality.

Six out of 14 samples of “ague” mixtures were found to be of sub-standard quality as the content of quinine and magnesium sulphate were low. One sample was infected with fungal growth. Two samples of magnesium carbonate B. P. were nothing but calcium carbonate while three samples of sublime sulphur turned out to be of precipitated sulphur. All the three samples of light kaolin failed to comply with the B. P. specifications for particle size.

A good number of so-called Ayurvedic and Unani preparations were tested ; one such pain reliever contained sodium benzoate and sodium salicylate.

Pharmacognosy Section.—During the year sixty-four samples of ganja were tested. Out of these, thirty were not of standard quality according to I. P. specifications. The majority of these yielded ash content higher than the I. P. limit. A few had been contaminated with insects, a condition not allowed in crude drugs.

Out of 75 samples of bhang analysed, 29 samples did not compare favourably with a “good” quality sample. No standards for bhang is available.

One sample of opium out of three, failed as it contained less amount of opium.

Twenty-eight samples of absorbent cotton wool, gauze, bandages and lint were examined. Nine out of nineteen samples of absorbent cotton wool failed to comply with the required standard mainly for lack of absorbency.

Two out of five samples of crude drugs like lobelia stramonium, cascara, and rhubarb were of substandard quality, lobelia being entirely a spurious one and the other contained less alkaloids.

VII. DEPARTMENT OF VACCINE.

Training of Workers.—Shri Mir Mohamad Hadi, W. H. O., fellow from Central Public Health Laboratory, Kabul ; a post graduate student from Andhra Medical College and the Assistant to the Superintendent of Laboratories, Public Health Institute, Bangalore received training in the preparation of Plague, Cholera and T. A. B. vaccines. A member of staff from M/s T. Walkers Laboratories, Poona was given training in sterility testing of biological products and general bacteriological techniques and a member of the staff from the Faculty of Science M. S. University of Baroda in bacteriological examination of water. Two trainees under the short term training scheme were also trained in the preparation of vaccines. This department also participated in Technicians' training course.

RESEARCH.

(1) *Liquid Medium for T. A. B. Vaccine.*—It was observed that the addition of yeast extract or yeast dialysate to casein hydrolysate promotes the growth of *Salm. typhi*, *Salm. paratyphi A* and *Salm. paratyphi B* to a high degree. As the yeast extract and yeast dialysate are good sources of vitamins of B complex group, some individual vitamins of the group were tried for their growth promoting activity. The following vitamins in concentrations given below were tried :—

Riboflavin	..	..	..	25 ug to 100 ug/100 cc.
Nicotinic acid	..	..	..	185 ug to 750 ug/100 cc.
Thiamine hydrochloride			..	65 ug to 250 ug/100 cc.
Calcium Pantothenate	..	..	..	25 ug to 100 ug/100 cc.

No increase in growth was observed at the concentrations used.

The effect of shaking on the growth of three strains, *Salm. typhi* Ty2, *Salm. paratyphi A.* and *Salm. paratyphi B* in casein hydrolysate (270 mg N/100 cc) was studied. 50 ml of the cultures in 250 ml flasks were shaken at 120 oscillations per minute at 37°C and were found to give very satisfactory growth as determined turbidimetrically. The incubation period required was 24 to 48 hours by this method. Vaccines prepared by this method have been found to be free from abnormal toxicity.

Production of Cholera vaccine by submerged culture method.—Experiments have been started to see the effect of shaking on the growth of *V. cholerae*. It has been observed that there is an increase in growth of the organism by shaking on a rotary shaking machine.

ROUTINE.

During the period under review 2,54,760 ml of plague vaccine, 10,424,675 ml of cholera vaccine and 301,977 ml of T. A. B. vaccine were issued while 117,31,710 ml of cholera vaccine and 304,738 ml of T. A. B. vaccine were produced. The total quantity of vaccines issued during the year is 10,981,412 ml. The demand for plague vaccine were mostly from Madras and Bengal. Those for Cholera vaccine were from Bombay State, Bihar, Madhya Pradesh, Rajasthan and Mysore, and those for T. A. B. vaccine were mostly from Bombay State.

The section of Public Health Chemistry and Bacteriology attached to this department examined 12 samples of water for their suitability for domestic and sanitary purposes.

MEDIA SECTION.

GENERAL.

1. *Academic Activities.*—Shri M. G. Nerurkar, Technician in the Department continued his work for post graduate degree.

2. *Training.*—The department participated in the technicians training course during the year.

Research activities.—This department lent its services for the research workers of the Institute in their requirements of special media and sterilization facilities were made available to them with required accuracy and precision. The following were the personnel and the departments who were given prompt services in their research work :—

(1) Serum Toxin Department was supplied with all the types of media with modification suiting our own conditions required for the production of triple vaccine.

(2) Pharmacology department was supplied with specially enriched Cholera-agar for the work on Cholera.

(3) Several media were supplied of special importance in research carried out in Clinical Pathology.

Efforts are being made to get the optimum growth with Casein Hydrolysate medium already in use by employing various techniques which are showing certain promising and remarkable results.

Synthetic medium for V. Cholera or Nutritional requirement of V. cholera.—It is proposed to study the present Casein hydrolysate fluid medium for V. Cholera in light of its actual composition. Chromatographic and Microbiological Assays are tried to fix up the concentration of the casein hydrolysate broth. At the same time synthetic medium of various essential amino acids vitamins and other necessary factors is prepared to obtain the optimum growth conditions for V. cholera.

Oxidation and reduction potential.—The preparation of sterility medium always posed a problem due to oxidation and reduction potential existing in an anaerobic broth. Preliminary work done with reducing agents such as dextrose agar and thioglycolate give substantial fall in reduction oxidation potential and the results are quite encouraging.

Routine.—During the year 17,464 litres of Casein hydrolysate medium for Cholera were prepared. No Casein Hydrolysate for Plague was prepared.

For T. A. B. Vaccine 3, 110 Roux Bottles of 200 ml. agar medium each and for Cholera 1,491 Roux Bottles of 200 ml each were supplied. 61,164 bottles of 80 ml. each "Sterility test" medium (Aerobic and anaerobic) were supplied.

Parenteral Solution Section.—The parenteral solution section has continued to produce more and more and the production for the year excelled that of previous ones. Below is the quantities of the injectible issued :—

	Issued in litres.			
Glucose Saline	..	..	..	38,908
5% Glucose Solution	..	..	..	28,525
25% Glucose Solution	..	..	..	1,813
50% Glucose Solution	..	..	..	42
Normal Saline	..	..	..	7,609
Hypertonic Saline	..	..	..	4,111
Protein Hydrolysate	..	..	..	917
Sodium Sulphate	..	..	..	116
Sodium Citrate	..	..	..	300
Anti-coagulation Solution	..	..	..	716
Distilled Water	..	..	..	2,240
Total				85,297

VIII. DEPARTMENT OF VIRUS DISEASES.

General.—Shri M. R. Darekar, I. C. M. R. Research Assistant resigned his post to proceed abroad. Kum. Savitri, Government of India Scholar, who has completed her term, was appointed I. C. M. R. Research Assistant in place of Shri Darekar for the duration of the scheme. Kum. Ved Prakash, Post Graduate student has joined the staff of the I. C. M. R. Polio Research Unit. Kum. R. Mendes rejoined the department as a Research Scholar in Encephalitis.

Staff for K. F. D.—The Government has appointed Dr. H. J. Mansharamani as a Principal Medical Officer. Shri Dandavate will take over shortly as Chief Technician. The other staff for the project has joined duties.

RESEARCH.

1. *Investigation on immunogenicity of viral vaccines with a view to standardization of testing procedures.*—43 throat washings were obtained from various sources with paired blood samples where possible. 7 strains of influenza were isolated, and in serological testing are seen to belong to Type A (Asian). Work on standardization and potency assay of influenza vaccines is being continued. A mouse lung adapted strain of Asian virus is being maintained in the laboratory. On serial passages the strain does not show increased virulence for mice. Different lots of vaccines prepared at the Institute are being tested by single dose and multiple dosage immunization for antigenicity by direct challenge method in mice. The tests are being carried out using vaccines which contain equivalent number of hemagglutination units and have been stored for varying periods to study the effect of storage on antigenic quality of the vaccine in terms of hemagglutination unit.

2. *Investigation on antigenic patterns of recently isolated influenza virus strains and study of changes in viral antigenic type* has been started in November. 6-7 strains have been selected for this purpose. The selected strains have been revived and all antigens have been prepared. Preparation of sera has been started in fowls. The sera are being tested and when titre is found to be sufficiently high hemagglutination inhibition studies using absorbed sera will be started.

3. *Adaptation of rabies street virus to chick embryo and study of changes in pathogenicity.*—During the year under report, study on the adaptation of locally isolated street virus strains to embryonated eggs was continued. One new strain, 40/58 isolated in 1958 was tested in eggs with no success. Two strains adapted to growing chick embryo (reported in 1958) were further serially passaged in eggs. These two strains 64/57 and 13/58 completed 21 and 22 more egg passages respectively, during the year. At present the strains are at 28th and 38th egg passage level.

While studying pathogenicity of both the egg adapted strains, slight modification in pathogenicity of strain 64/57 in rabbits was observed at egg passage 15. Strain 13/58 continued to be non-pathogenic for rabbits when inoculated

intramuscularly. Serum of rabbits which had escaped after intramuscular inoculation with embryo suspensions of the egg adapted strains was tested for rabicidal antibodies. Rabicidal antibodies in high concentration were detected in the serum even 12 months after inoculation.

4. *Studies on Flury Vaccine.*—Seven batches of high egg passage Flury vaccine were prepared and titrated for viral content. Potency test of one of the vaccines (205 th passage) has been carried out in guinea pigs, according to the recommendation of W. H. O. and found satisfactory.

The N. Y. C. strains has been passaged in dogs to obtain challenge virus material, for testing Flury vaccine in dogs.

5. *Studies on adaptation of rabies virus to tissue culture and changes in pathogenicity of adapted strains.*—Attempts at cultivation rabies virus strains in monkey kidney epithelium cell cultures have been started. Titration of harvested fluids for virus content are to be undertaken.

6. *The mechanism of sensitization in tuberculin sensitivity.*—Work on tuberculin hypersensitivity was studied. The work has been concluded. Using the guinea pig as the test animal, experiments to test for presence of tuberculin sensitivity, as measured by Mantoux test, and for antibody titre, as measured by the Boyden hemagglutination technique, were carried out following injection of sensitizing antigen (BCG or heat killed tubercle bacilli) and tuberculous antigen (PPD), in differing sequence and at different time intervals. These experiments are still in progress.

7. *Continuation of work on Adenovirus and ECHO Virus*—(a) *Adenovirus.*—Four strains isolated earlier were typed. One was found to belong to type 1, another to type 6 and the remaining two showed heterotypic reaction with types 1 and 2.

Four fresh Adenovirus strains have been isolated. The strains are yet to be typed. All throat washings obtained for influenza were also simultaneously tested for Adenovirus ; all were negative.

(b) *Echo Virus.*—Work on isolation of viral agents from rectal swabs of normal children is being continued by Kum. Ved Prakash at the Polio Research Unit. 15 viral agents have been isolated. 11 strains were tested. 5 belonged to type 7, 3 showed cross reactions and are being retested, and 3 were strains of poliovirus. Further studies are in progress.

8. *Analysis of reports of antirabic treatment with hyperimmune sera from the field and preparation of further field trials.*—Studies on Field trials of hyperimmune rabies serum under Second Five Year Plan are continuing by utilizing serum and vaccine treatment (as recommended by WHO) for severely bitten cases. The data are still incomplete in many cases. Reminders are being sent to local authorities and to the patients concerned for obtaining

complete information. Reports available are inconclusive in that no deaths from rabies have been reported in either patients treated with serum and vaccine or in untreated persons involved in the same incidents.

9. *Studies on antibody response.*—Studies on Rabicidal antibody levels in vaccinated persons and animals have been continued. The overall results obtained were similar to those mentioned in the previous annual report.

10. *Study of Kyasanur Forest Disease Virus strains and preparation of suitable vaccine.*—The building where KFD work is proposed to be done is undergoing certain alterations to suit the type of work to be done. Part of the required equipment has been obtained and some has to be imported on import licence granted. The staff has been appointed, and is getting training in general laboratory procedure, and other sections of the Haffkine Institute. It is however proposed to start KFD work on limited scale, in 2 small rooms available as soon as the staff has been vaccinated.

12. *Poliomyelitis.*—(1) Quantitative testing of sera for neutralizing antibodies against 3 types of polio virus was carried out. 50 sera were tested.

(2) Immunization of rabbits against 3 types of poliovirus for production of high titre sera has been started and 18 rabbits have been immunized. The immune sera were tested and found to possess high titre of antibody.

(3) Production of larger volumes of tissue culture fluids infected with polio-virus with a view to produce an inactivated vaccine after immunization. :—Work on preparation of vaccine against Type 1 virus is in progress.

(4) Testing of virulent strains of Polio virus in monkeys :—One set of animals has been inoculated, the work will be continued.

5. Collection of sera from mothers and infants and cords for antibody are levels :—200 sera are collected so far and they are under study.

ROUTINE.

(a) *Supply of Biologicals.*—(i) Influenza vaccine production has been stopped. The demand for such vaccine also has fallen.

(ii) *Anti rabic vaccine.*—36,13,057 ml. of vaccine were supplied during the year as compared to 33, 94, 232 ml in 1958. No fresh indent for high titre antirabic serum was received from treatment centres.

(iii) *Yellow fever.*—During the year 6,682 persons were inoculated. Number of potency tests was 21. 7,175 doses of vaccine have been supplied to different places.

(iv) *Frei's Antigen.*—Preparation of this antigen was undertaken after obtaining a lyophilized LGV strain from Armed Forces Medical College, Poona. Small batches of antigen and control suspensions have been prepared and tested for absence of infectivity and non specific toxicity. Samples have been supplied to various hospitals for clinical trials and report.

(b) *Diagnosis*.—36 brains specimens were received for rabies diagnosis. Thirteen were from human autopsies and the remaining were animal brains. Six brains were positive and one human brain was received in a decomposed state and could not be tested. Out of 23 animal brains examined nine were positive. Biological test was performed in nine cases. Four dog salivary glands, were found to be positive by biological test.

ACADEMIC.

Kumari R. Mendes, and Shrimati S. Cherian received the M.Sc. degree of the Bombay University. Shri M. R. Darekar proceeded to Germany on a West German Government Scholarship. There are now three students working for Ph. D. degree and three for M.Sc. degree.

Yellow Fever Vaccine and Inoculation Section.—The Yellow Fever Inoculation work and testing of potency of yellow fever vaccine stocked here on behalf of Government of India was carried out by the Assistant Port Health Officer-in charge, Yellow Fever Section at this Institute. Several batches of Rockefeller Foundation and Wellcome Yellow Fever vaccine were tested for potency. Total number of potency tests performed were 21.

IX. BIOCHEMISTRY SECTION.

Staff.—Dr. (Smt.) Alamela Venkataraman, the Senior Biochemist and Officer in-charge of the section has returned from abroad after one year training in Enzyme chemistry at the Enzyme Research Laboratory, Wisconsin (U. S. A.).

Training of Workers.—Besides Technician's Training Course, twenty persons were given training for various periods in the Section. Some of them were given Short-Term training in Clinical Biochemistry for a period of three months. Amongst others were trainees from hospitals, students and fellows from Universities and other countries.

Research Activities.—In addition to routine work, the following problems were taken up for special study: Estimations of serum iron levels in normal pregnant women and anemia cases, referred by Dr. Daftary and Dr. Parekh of Wadia Maternity Hospital, Parel, Bombay 12, were continued during the period under review.

Fifty cases of women patients suffering from anemia were studied for serum iron levels before and after the treatment at regular interval of one week. The patients were treated with intravenous iron. 55 cases of normal pregnant women were studied for serum iron levels thus completing a total of 120 normal pregnant cases for serum iron levels (the average value works out to be 97 micrograms of iron per 100 c. c. of serum).

A study of serum iron levels in cord blood samples was also continued. Estimation of total iron binding capacity of serum was tried using the method of Theodore Peters *et al.* (J. Lab. and Clin. Med; 48, 274, 1956). Anion exchange resin, Amberlite IRA-410 was used to remove excess iron added, but it was found that the final solution to be used for colorimetry was turbid. Hence Ramsay's method using magnesium carbonate "light" for adsorption was tried. The results obtained, however, were found to be higher than those of other workers. Study is being continued.

Studies on Liver function tests to correlate Liver Biopsy findings is being carried out. So far 25 cases of Cirrhosis of liver have been fully studied including 8 follow up cases. A battery of liver function tests in addition to other laboratory investigations like Liver Biopsy, Rh, Blood Group, Blood and Liver Culture, Prothrombin Time estimations etc. were carried out on these cases.

A notable feature was the introduction of Serum Glutamic Oxalacetic and Pyruvic transaminase estimations as one of the liver function tests.

Hundred normal cases, which include blood donors attending the Haffkine Institute Blood Bank and laboratory workers both males and females have been studied for transaminase determinations. The findings are in good agreement with those of other workers.

Routine.—During the year under review, the section continued its activities of examination of clinical materials from hospital and private clinics. Although work from private practitioners and clinics is decreasing, Government Hospitals are sending a large number of samples with a variety of estimations. The total number of analysis carried out is 8,709 as against 8,815 in the previous year. It is observed that the emphasis is more and more on liver and kidney function tests and other special tests like Basal Metabolic Rate and Glucose Tolerance Tests. There were 7,074 samples of blood, 270 of urine and stools, 956 of cerebrospinal fluids and other body fluids and 8 milk samples. 400 special tests were carried out.

Some standard solutions, reagents and containers for collection of blood samples were supplied to hospitals and private parties on request.

It is hoped that the section will in future be in a position to undertake more specialised type of work. Already it is in a position to undertake estimations like Urinary 17-Ketosteroids, serum iron, transaminases, cholinesterase etc.

X. BLOOD BANK SECTION.

General.—The demands for Dried Human Plasma are on increase. This year this section was not able to meet with all the demands for Blood Plasma which it received, from the civilian hospitals and the Defence Forces. The main difficulty being the paucity of blood donors. To increase this number of blood donors, enormous amount of publicity and propaganda is absolutely necessary. Hence the urgent need for expansion of Blood Bank.

Staff.—(1) Dr. K. V. Kulkarni, M.B.B.S., B.M.S. Class II, Officer In charge Blood Bank Section joined the department of Antitoxins and Sera as Senior Bacteriologist from 22nd April 1959.

(2) Dr. R. T. Shahani, M.B.B.S., B.M.S. Class II, has taken the charge of the post of Medical Officer, Blood collecting unit from 6th April 1959.

(3) Kumari N. H. Shah has joined the section as Technician from 1st June 1959.

Training of Workers.—Two batches of the Technicians' Training Course have completed their training in this section. In addition to this, two Medical Officers and twelve Laboratory Technicians were trained in Blood Bank methodology.

RESEARCH ACTIVITIES.

(1) *The Preparation of Rh Anti-D Serum.*—The preparation of Rh anti-D serum by immunising Rh negative blood donors with Rh positive blood is being carried out. So far 10 donors have been immunised, out of which four donors have already responded by producing Rh antibodies.

(2) *Rh grouping of blood donors.*—The study of the Rh blood grouping and sub-typing of all the blood donors who donate blood in the Blood Bank section is being undertaken. So far 300 donors have been grouped, out of which fifteen are Rh negative (5 per cent.). All these Rh negative donors belong to sub-group cde/cde.

(3) *Preservation of tissues from cadavers.*—Some preliminary methods are being tried in this connection. At first animal tissues are being tried. The blood vessels of the dogs were dissected out, sealed up in polyethylene tubes and kept in refrigerator at a Temperature of 0–4°C. The vessels were observed at an interval of 5, 10, 15, 20, 25 days and so on. The elasticity of the grafts was well maintained. However, the sterility was not maintained. The other method which is being tried is excision of arteries of dogs. This is followed by freezing of these arteries in dry ice at a temperature of –79°C. Next these vessels are dried in our drying machine. These vessels are under trial so far as their clinical use is concerned.

(4) *Preparation of Anti A and Anti B serum.*—There is an increasing demand for these sera as blood transfusion is becoming popular in our country. It is becoming difficult to get high titred serum on a large scale from paid professional donors. The titre of these antibodies can be raised by immunising A and B group donors with specific group substance. The specific group substance has been prepared from meconium collected from the neighbouring Wadia Maternity Hospital.

(5) *Screening of Vegetable Extracts for Blood group activity.*—Saline extracts were prepared from the following 20 different pulses and were examined for blood group activity :—

- (1) White Pea.
- (2) Green Pea.
- (3) Black Pea.
- (4) Cow Pea.
- (5) Aconite bean.
- (6) Field bean (Two varieties).
- (7) Red Bean.
- (8) Double bean (Three varieties).
- (9) White bean.
- (10) Gram (Green variety).
- (11) Gram (Brown variety).
- (12) Kabuli gram.
- (13) Green gram.
- (14) Horse gram.
- (15) Black gram.
- (16) Red gram.
- (17) Lentils.

out of these the following three extracts showed specific agglutination with "A" group cells.

- (1) Double bean (Red variety).
- (2) Double bean (White variety, Poona variety).
- (3) Horse gram.

(6) *Preparation of Plasma Fractions from Placentas.*—In this connection some preliminary work was carried out. Placentas were brought from the Wadia Maternity Hospital. The blood was extracted out of them by mincing. The plasma fractions were separated by ammonium sulphate precipitation method.

(7) *Preservation of RBCS for long intervals at subzero temperature.*—Attempts were made to preserve RBCS in Glycerol for longer intervals. Initial experiments showed that antigenicity of cells was maintained even after a period of three months. These experiments are being pursued further.

ROUTINE.

4282 blood donors were bled during the year for preparation of dried plasma. 635·750 litres of dried plasma were prepared from this 76·250 litres of plasma were distributed free and 542·250 litres of plasma were sold making a total of 618·500 litres.

2340 Kahn tests were performed. Out of these 480 were positive (i.e. 20 per cent.).

350 samples were tested for Rh test. Out of them 20 were Rh negative i.e. 5·5 per cent.

38340 ampoules of Antivenine were dried.

61700 ml. of blood was supplied to the clinical pathology department for preparation of Anti A and Anti B grouping sera.

XI. DEPARTMENT OF NUTRITION.

General.—Nutrition department of Government of Bombay continued to work at this Institute. It took part in academic and Research activities, whose report is produced below. The unit worked under Assistant Director Dr. M. V. R. Rao.

RESEARCH.

1. *Nutritional Evaluation of Foodstuffs Commonly Consumed in Bombay State (Indian Council of Medical Research Enquiry).*—The work on the enquiry was continued on the lines as indicated in the last report.

In all, 32 different foodstuffs were analysed for various chemical constituents. Of these, 26 foodstuffs were new and six were from the last year's list continued during the year. In 16 foodstuffs, besides filling in the gaps in the Health Bulletin No. 23, 13 accessory constituents were also estimated; while 6 foodstuffs were analysed for filling in the gaps in the Health Bulletin.

During the nutritional studies of the backward tribes of Thana District by this Department, it was observed that they amongst other things, consume rice bran (*Oriza sativa*) and dried tamarind leaves powder (*Tamarindus indica*). These two foodstuffs were also therefore analysed. Thus, in all over 415 estimations in duplicate were made, during the period under review.

Estimation of riboflavin by chemical method gave very high values. Similarly chemical estimation of nicotinic acid did not give satisfactory results. Hence, for the estimation of both these vitamins microbiological methods are followed.

From the foodstuffs analysed during the year, amaranth leaves and plantain flowers have a high content of oxalic acid. Drumstick leaves and green tomato are rich in riboflavin. Green peas and amaranth leaves are fairly rich in choline, while safflower and *tinda* do not contain choline. As expected, rice bran is very rich in thiamine and a good source of riboflavin. The dried powder from the tamarind leaves gave good values for calcium and iron. This may be due to the addition of crude common salt as preservative to the powder of the leaves.

2. *Studies on the Nutritive Value of Some Leafy Vegetables and their Supplementary Effects.*—Some of the remaining chemical analyses of the two leafy vegetables viz. *ambadi* (*Hibiscus cannabinus*) and *methi* (*Trigonella foenum-graecum*) mentioned in the last report were completed. They have been further analysed microbiologically for essential amino acids. It is proposed to study the supplementary effect of these two leaf-proteins on a millet viz. *jowar* (*Sorghum vulgare*). The latter was also therefore, analysed for essential amino acids. The values for these amino acids are given in Table I.

TABLE I.

Amino acid Composition : (Values expressed in g. per 100 g. of dried power).

Amino Acid.				Jowari (Sorghum Vulgare)	Ambadi (Hibiscus cannabinus)	Methi (Trigonella foenumgrae- cum)
1. Leucine	..	..	..	0.744	1.721	1.257
2. Isoleucine	..	..	..	1.206	1.885	1.493
3. Valine	..	..	..	0.974	1.280	1.150
4. Lysine	..	..	..	3.400	2.111	1.644
5. Histidine	..	..	..	0.174	0.681	0.482
6. Phenylalanine	..	..	..	0.329	1.353	1.203

The biological value of jowar at 6.8 per cent. protein level by growth method was determined. Similar tests were conducted in connection with the above-mentioned two leaf-proteins. But the animals refused to eat the diets when the entire source of protein was either of the leaf-protein. Supplementary effects of these leaf-proteins at 2 per cent. protein level on *jowar* was carried out separately in groups of rats. The results are summarised in Table 2.

TABLE 2.

Supplementary Effect of Leaf-Proteins on Jowar.

Diet.				No. of rats.	P. E. R.
Jowar	..	..	..	8	0.92
Jowar + <i>Ambadi</i>	..	..	..	8	0.94
Jowar + <i>Methi</i>	..	..	..	8	1.54

It will be seen that supplementation of jowar protein by ambadi and methi proteins improves the biological value of the former. Though the growth with the latter diet was much more, 6 of the 8 animals were observed losing their hair to an appreciable extent. When these animals after the completion of the experiment were transferred back to the stock diet, hair were restored to

normal. This interesting observation could perhaps be explained once the three proteins are analysed for their sulphur containing amino acids viz. methionine and cystine which are important in hair growth.

Further work on the biological evaluation of these three food materials by nitrogen balance method is in progress.

3. *Protein Metabolism and Vitamin B12*.—The feeding experiments with rats were continued as mentioned in the previous report. At the end of 8th and the 13th week, the R. B. C. count and the haemoglobin content of the blood of the animals of different groups were determined. At the end of the sixth month, the rats were weighed killed, and their serum and livers were taken out for various estimations. The moisture of the livers, the protein content of the serum and livers and the vitamin B12 content of the livers were determined. The results are summarized in Table 3.

The microbiological methods for the estimations of vitamin B12 and folic acid using *Lactobacillus leichmannii* and *Streptococcus faecalis* respectively were standardized. In doing so, considerable difficulties were experienced, particularly with vitamin B12 assay. After carrying out several critical trials, it was observed that erratic results were obtained when the test tubes were washed only with water and soap. This difficulty was overcome when the test tubes were washed with detergent followed by thorough washing with dilute hydrochloric acid and distilled water and subsequent sterilization.

The vitamin B12 estimations were confirmed by repetitions. Folic acid was also estimated in few samples. With respect to group III and IV, vitamin B12 was estimated in two out of seven and three out of eight liver samples respectively. The remaining vitamin B12 estimations are in progress.

From the results given in Table 3, it appears that there is no marked difference in the haematological picture in the groups of rats fed on raw/autoclaved soyabean meal supplemented with or without vitamin B12. Also there is no appreciable difference in the weights of livers, the liver moisture and in the protein contents of serum and livers of rats from these four groups. Significant observation is that raw soyabean meal has growth retardation effect which is overcome by vitamin B12.

However, as expected, there is an appreciable difference in the vitamin B12 contents of the livers of rats, supplemented and unsupplemented with vitamin B12.

TABLE 3.

Effect of Vitamin B12 on Raw/Autoclaved Soyabean Diets.

(8 rats in each group).

Group No.	Diet.		R.B.C. count at the end of 13th week millions per cmm.	Haemoglobin content at the end of 13th week g/100 ml.	Average gain in weight in 6 months g.	Serum.		Liver.		
						Average protein g/100 ml.	Moisture per cent.	Average weight of fresh liver g.	Average protein g/100 g. of fresh liver.	Average Vitamin B12 content ug/100 g. of fresh liver.
1	Raw soyabean diet—Vit. B12	..	10·2	17·0	162	7·2	69·2	8·8	22·2	3·4
2	Raw Soyabean diet + Vit. B12	..	9·2	16·9	208	6·9	69·5	8·1	23·2	19·3
3	Autoclaved Soyabean diet—Vit. B12		9·7	17·2	213	7·0	69·5	9·8	22·8	3·8
4	Autoclaved Soyabean diet + Vit. B12		10·2	17·7	227	7·4	68·8	9·2	22·4	14·0

4. *Certain Aspects of Protein Metabolism in Relation to Vitamin A.*—It is well recognised that young animals, when deficient in vitamin A, decrease in their body weight. Growth arrest in a deficiency of vitamin A implies its influence in some way in the synthesis of cellular proteins. It has also been reported that administration of excess of vitamin A to a rat causes a significant disturbance in nitrogen metabolism. In hyper vitaminosis A condition, osteoblasts lose their activity with the result that they lay down the bony matrix which is a fibrous tissue chiefly composed of proteins. While the general effects of vitamin A on different organs have been reported, yet there is no information concerning changes in tissue protein composition resulting from its deficiency or from excess administration of vitamin A. Therefore, the study on the amino acid composition of the proteins of various tissues of the rats in normal, in hypervitaminosis A and in hypovitaminosis A conditions will be of interest, besides other related investigations.

Preliminary experiment has just been started in which twelve weanling male rats of 21 days old, weighing 30–35 gms. were taken. They are fed on a diet free of vitamin A.

After production of vitamin A deficiency the animals will be killed and relevant determinations in various tissues will be made.

5. *Studies in Fermented Foods.*—In previous reports results of supplementation of *idli* to high fat low protein diet in deposition of fat in livers of rats were presented. Also the effect on regeneration of R. B. C. and haemoglobin in phenylhydrazine anaemic rats and its biological value were reported. This work was further extended in which its capacity to regenerate liver and serum protein was studied. For the purpose a group of adult rats was made hypoproteinemic by keeping it on a no protein diet for 3 weeks. They were then divided in three groups and fed on 18 % Casein diet (control) and two experimental diets having 18 per cent. protein (on dry weight basis) from *idli* and the corresponding unfermented preparation respectively for four and seven days.

Besides this, the *idli* and the unfermented preparation were assayed for choline, methionine, vitamin B12 and folic acid in view of the observed lipotropic effect of the former.

The conclusions drawn from the whole work are given below :—

- (1) '*Idli*' (4 parts of blackgram and one part of rice) lowers the fat percentage of the livers of rats fed on high fat low-protein diet. This was shown both biochemically and histologically.
- (2) As a result of fermentation, there is an increase in choline, methionine and folic acid values.
- (3) Fermentation does not influence the B12 contents of the mixture of blackgram and rice.
- (4) There is no statistically significant difference between '*Idli*' and the unfermented preparation with respect to the growth promoting value.
- (5) '*Idli*' possesses a better regenerating capacity for R. B. C. as compared to unfermented preparation.

(6) 'Idli' has no effect on haemoglobin, liver and serum protein regeneration.

(7) Fermentation of blackgram and rice results in a decrease in biological value.

These observations are summarised in Table 4.

TABLE 4.
Summary of Important Findings.

	'Idli'			Unfermented Preparation.
1. Fatty change on high fat low-protein diet.—				
(i) Histologically			±	+++
(ii) Biochemically	..	..	Fat is reduced . . .	Fatty liver.
2. Lipotropic Factors—				
(i) Choline gm. per cent.	..	..	0.434	0.324
(ii) Methionine gm. per cent. ..	..	..	0.153	0.129
(iii) Folic acid mcg. per cent. ..	..	..	67.34	42.38
(iv) Vitamin B12 mmcg. per cent. ..	..	..	3.74	3.93
3. Biological Value	..	..	66.31	77.90
4. Protein Efficiency ratio	..	..	2.55	2.28
5. R. B. C. Regeneration	..	..	Improvement	No improvement.
6. Haemoglobin regeneration	..	..	No difference.	
7. Serum protein regeneration	..	..	No difference.	
8. Liver protein regeneration	..	..	No difference.	

5. *Effect of Commercial Sterilisation on the Nutritive Value of Milk (Indian Council of Agricultural Research Scheme).*—In commercial sterilisation, milk is subjected to more drastic heat treatment. It is likely that under such rigorous heat treatment, the milk may be reduced in its nutritive value. It is, therefore, desirable to evaluate the nutritive quality of sterilised milk as compared to that of pasteurised and ordinary boiled milk. In view of this the present work was undertaken under the auspices of the Indian Council of Agricultural Research, New Delhi.

In order to study any variation in chemical composition, six samples of each type of milk were analysed. The results of analyses are summarised in Table 5. The samples of milks were obtained fresh from Aarey Milk Colony on six different occasions. It will be seen that in general there is lowering in vitamins A, B1 and C as we go from boiled, pasteurised to sterilised milk.

Biological values of boiled, pasteurised and sterilised milk were also determined by growth method (P. E. R.). Eighteen young rats of about 45 g. were distributed equally into 3 groups of 6 rats each. They were kept on three milk diets for a period of 4 weeks. Daily consumption of food was recorded and rats were weighed twice a week. The P. E. R. value of the three milks were found to be 3.20, 2.94 and 2.91 respectively.

TABLE 5.

Chemical Composition of Boiled Pasteurised and Sterilised Milks (average of 6 samples of each.)

(Values express per 100 ml. of milk.)

Sample.	Specific gravity.	Acidity. gm.	Moisture. gm.	Total solids. gm.	Fat. gm.	Protein. gm.	Ash. gm.	Calcium. gm.	Iron. mg.	Phosphorus. gm.	Vit. A. I.U.	Vit. B1. mg.	Vit. B2. mg.	Vit. C. mg.	Nicotinic acid. mg.
Boiled ..	1·039	0·163	86·62	13·38	2·77	4·637	0·783	0·203	0·381	0·130	25·5	43·66	0·145	1·15	0·105
Pasteurised ..	1·037	0·161	86·91	13·09	2·5	4·455	0·789	0·207	0·408	0·125	23·7	33·59	0·147	0·96	0·093
Sterilised ..	1·036	0·144	87·66	12·34	2·13	4·205	0·696	0·155	0·309	0·116	20·5	25·22	0·140	0·43	0·098

XII. CRITICS CLUB.

Forty-two Scientific Meetings were held during the year under the auspices of the Critics Club. Eight of these were addressed by Scientists from outside and at one meeting the research work carried out by the different departments of the Institute was discussed. The following is list of speakers and the subjects :—

1. Kumari K. K. Patel .. Collection of Ectoparasites of Laboratory Animals.
2. Prof. R. Courier .. Some Observations on the thyroid gland
(Prof. of Endocrinology with radioactive iodine.
Univ. of Paris.)
3. Dr. A. H. Trivedi .. Biosynthesis of fatty acids.
4. Shri A. S. Narsimhan .. The Rat-flae *X-cheopis* and the plague
bacillus-a curious biological relationship.
5. Dr. K. V. Kulkarni .. Tissue Banking.
6. Dr. Mary F. Lockett .. Assay of Insulin.
(Prof. of Pharmacology,
chelsea college of Techno-
logy, London.)
7. Shri M. G. Nerurkar .. A study of the decomposition of glucose
solution.
8. Shri M. B. Walawalkar .. Estimation of Halogen derivatives of
8-hydroxyquinoline in pharmaceutical
preparations.
9. Dr. N. K. Dutta .. The role of cholera toxin in production of
signs and symptoms of cholera.
10. Dr. R. W. P. Master .. Enzymes in Indian Snake Venoms and
their Identification.
11. Kumari P. K. Khandwala .. Studies in fermented foodstuffs.
12. Shri G. Bhaskaran .. Preliminary studies on the endocrine glands
in the Indian Housefly. *Musca Nebulo*.
13. Shri A. B. Martins .. The Evolution of the Tuberculin reaction.
14. Kumari A. Bundealli .. Comparative study of different liquid
media for the growth of virulent strains
of *M. tuberculosis*.
15. Kumari S. H. Aswani .. Results of some preliminary antibiotic
sensitivity tests carried out on some
routinely isolated microorganisms.
16. Shri R. N. Joshi .. A study of serum iron levels in normal
pregnant women and in anaemia cases.
17. Dr. S. S. Sabnis .. Erythroblastosis Foetalis.

18. Shri M. K. Habbu .. Present position of plague in the country based on the observations of susceptibility of rats in endemic zones in India.
19. Shri Y. S. Nimbkar .. Purification of Antitoxins.
20. Dr. K. K. Govind Nenon Metabolism of dicarboxylic acids.
(Post Graduate Fellow,
University of Cleveland,
U. S. A.).
21. Mrs. K. Sunder .. An 'in ovo' potency test for Influenza.
22. Dr. S. D. Ambegaokar .. Dietary factors in experimental liver injury.
23. Dr. K. D. Kulkarni .. Synthesis of new compounds of possible antibacterial activity.
24. Shri A. S. Narasimhan .. Comparative studies with an anaerobic typhoid antigen in Routine Widal tests.
25. Shri D. V. Shintre .. Some practical applications of colorimetry in pharmaceutical analysis.
26. Shri H. K. Mhatre .. Triple Vaccine, its manufacture and assay.
27. Dr. V. N. Jai .. Some observations on the Nutritional studies in an Adivasi population of Thana District.
28. Kumari B. A. Ver .. Purification of rabies fixed virus.
29. Heads of Departments .. Research work carried out in the different departments.
30. Shri S. E. Mhasalkar .. Synthesis of drugs with possible anticonvulsive properties.
31. Kumari S. H. Aswani .. Antigenic composition of Casein hydrolysate cholera vaccine.
32. Shri K. P. Nayak .. Preliminary studies on the roots of *Withania somnifera*.
33. Dr. Ruth L. Huenemann Public Health Nutrition.
(Assoc. Prof. of Public
Health Nutrition, School
of Public Health, Berkeley,
California).
34. Dr. T. Fujino .. Physiological character of candida.
(Prof. of Microbiology.
Res. Inst. for Microbial
Diseases. JAPAN).

35. Dr. L. J. Evans .. Recent advances in Automatic analysis of
Managing Director, Tech- Biological material.
nicon Instruments,
U. S. A.
36. Dr. S. R. Wagle, Univer- Cofactors in protein Biosynthesis.
sity of Illinois,
Urbana.
37. Shri E. D. Bharucha .. The study of serum transaminase levels in
normal and pathological cases.
38. Dr. S. S. Sabnis .. Blood Donor problem in Bombay.
39. Shri V. G. Fadnis .. Cultivation of anaerobes and their relation
with oxidation-reduction potential.
40. Dr. I. K. Karakoolov, Vaccination against Brucellosis in U. S. S.R.
Chief of Epidemiology
Medical Institute,
U. S. S. R.
41. Dr. P. J. Deoras .. Recent advances in insect physiology with
special reference to *Corpora allata*.
42. Shri A. P. Advani .. Methods employed in the investigations
of intermediary metabolism.

XIII. LIBRARY.

Staff.—A Bulletin Clerk was appointed from 11th February 1959 to start the work of Library Bulletin.

General.—Sixteen Meetings of the Library Committee were held this year and various reorganization and other matters were considered.

Training.—From December 1959, 3 students attending the Course in Librarianship elsewhere, were allowed to work honorarily in the Library and they are getting a practical training in Routine Library work. The Library took part in the training programme of laboratory technicians.

Reorganization work in the Library.—(i) The indexing work of about 1,500 books is completed and Author Catalogue, Title Catalogue and Subject Catalogue of about 400 newly purchased books in the year 1958-59 are brought up-to-date. The backlog in the cataloging of the remaining books will be removed shortly.

(ii) About 6,000 volumes of the periodicals in this Library have been classified, catalogued and accessioned for the first time and their evaluation has been completed. The work is still in continuation and will be completed in due course.

(iii) The Library wishes to participate in the exchange of the Scientific Books programme sponsored by T. C. M. and the list of about 150 periodicals, short with us, has already been prepared. The list will be cyclostyled and circulated under exchange programme.

(iv) The Library bulletin service is being continued and is helping the Research workers. Requests for Bulletin from outsiders are received and are attended to. At present 130 copies are distributed each week.

ROUTINE.

The Library continued to work in co-operation with other Libraries in Bombay. The Reprint Section, Periodicals Section, Report Section and Book Section were properly arranged for quick location and reference.

Library Statistics for the year January to December 1959.

(i) Number of Books purchased this year	..	466
(ii) Number of Scientific Reports received this year	..	80
(iii) Number of Journals subscribed	..	140
(iv) Number of Journals received in exchange	..	2
(v) Number of Journals received as gratis	..	60
(vi) Total grant for the year 1959-60	..	Rs. 27,000
(vii) Number of outside readers attending the Library	..	1,100
(viii) Number of Books, Periodicals asked for, by our readers from other Libraries under Inter-Library Loan.		100
(ix) The Number of books issued on loan to other Libraries	..	300
(x) The number of volumes issued to the members of the staff of this Institute.		1,996
(xi) Number of paper published (Jan.—Dec. 1959)	..	27

XIV. ANIMAL LABORATORY.

GENERAL.

During the year under review the activities in this section have been greatly increased. To meet the growing demands for various animals for research and production purposes, the breeding and supply, had, perforce, to be stepped up. With the shortage in accommodation and staff, it was a great strain. Nevertheless, the breeding and supply of different animals were considerably higher than the previous years.

In order to maintain this tempo, it is necessary to enlarge the accommodation for the animals. Plans are under way for the construction of a new Animal Laboratory. [Proposals have already been submitted to the Government for additional staff.]

The repairs of the existing Animal House have been completed. More "special" small cages have been obtained for breeding white mice. The food supply position is improving. Experiments are under way to evolve a better and if possible, a cheaper type of food for white mice and rats.

Training of Students.—The batch of Technician Training Course were given general instructions in breeding, feeding, handling and general management of the various Laboratory Animals.

The following table shows the number of animals produced, issued to the Institute, sold to other laboratories and purchased during the year 1959 :—

Species of Animals.				Number of Animals Produced.	Number of Animals Issued.	Number of Animals sold.	Number of Animals purchased.
1	White mice H. I.	..	..	28,626	15,327	234	1,580
2	White mice (Swiss)	..	..	31,706	13,785		
3	Rats	..	..	4,814	2,304	980	....
4	Rabbits	..	..	1,598	1,236	195	....
5	Guinea pigs	..	..	1,819	1,602	159	126
6	Hamsters	..	..	174	....	9	....
7	Cotton rats	..	..	86	....	....	....
8	Mice DBA (Barold)	..	..	254	13	....	....
9	Mice C57 (Black)	..	..	274	13	....	....

Besides these animals mentioned above, the following animals were maintained in Animal House and issued for Research, tests and production to the different Departments of the Institute as and when required :—

1	Sheep	..	..	2,438	
2	Dogs	..	..	84	
3	Cats	..	..	168	
4	Monkeys	..	..	180	(includes animals maintained for Polio Research Unit of the I. C. M. R., J. J. Hospital).
5	Fowls	..	..	240	
6	Pigion	..	..	6	
7	Horses	..	..	152	(average number maintained for the production of different antitoxin sera.)

This year two new strains of mice (DBA and C57) were brought from Indian Cancer Research Centre, for breeding for certain special experiments.

XV. BUSINESS MANAGEMENT.

Staff.—During the year under review, Shri R. S. Thaney, B.A., M.Com., Supervisor (Physical Verification) resigned. In his place, Shri S. A. Mulay, B.A., has been appointed.

Mr. W. H. Eastman, Expert, International Labour Organisation, was deputed by Government of Bombay to conduct in April short courses in Productivity for the officers of the Government of Bombay deputed for the purpose. The courses were conducted at the Institute and most of the officers of the Institute participated.

Mr. Eastman was also deputed by the Government of Bombay to undertake studies in Productivity at this Institute from 1st August till the middle of September. He worked in the Departments of Chemotherapy and Stores and Purchase Sections. As far as the Chemotherapy Department is concerned, suggestions made by him are being incorporated to the extent possible. As far as Stores and Purchase Departments are concerned, his final report is still awaited. Meanwhile, certain suggestions regarding revision of purchase procedures etc. are being implemented.

Routine.—The productive activities continued to maintain the tempo. The overall business position is as follows:—

Our position as on 31st March 1959.

	1958-59.		1957-58.	
	Rs.	Rs.	Rs.	Rs.
<i>What we have—</i>				
1. Land and Buildings	.. 39,94,116		39,66,201	
2. Equipments ..	.. 19,55,584		18,28,377	
3. Library Books ..	.. 5,00,000		5,00,000	
4. Live Stock (excluding gifts)	.. 1,10,358		87,751	
5. Stocks and Stores ..	.. 15,95,420		17,56,615	
6. Amount to be received	.. 16,42,314		16,01,957	
7. Cash and other balances	.. 12,67,197		1,93,604	
		1,10,64,989		99,34,505
<i>What we owe—</i>				
1. Depreciation Fund ..	.. 8,79,805		7,25,084	
2. Leave and Pension Reserve	.. 3,79,097		3,31,179	
3. Amounts to be paid ..	.. 15,18,843		4,89,876	
4. Miscellaneous Deposits	.. 1,74,621		1,39,999	
		29,52,366		16,86,138
		81,12,623		82,48,367
<i>Surplus to be distributed between the Government and the Institute—</i>				
1. Net surplus (after providing for all expenses).		8,99,549		16,45,322
<i>What remains—</i>				
1. Capital		72,13,074		66,03,045

What we earned and spent in 1958-59.

	1958-59.		1957-58.	
	Rs.	Rs.	Rs.	Rs.
<i>What we earned—</i>				
1. From selling biologicals and drugs	50,12,109		47,39,370	
2. Value of free supplies			75,654	
3. From Analytical Tests .. 1,15,467			54,146	
4. Value of free analytical tests			1,40,652	
5. Miscellaneous sources .. 44,133			15,339	
6. Value of closing stock .. 15,95,420			17,56,615	
		67,67,129		67,81,776.

What we spent—

1. On our Employees	12,19,236		11,43,367	
2. On raw materials	18,19,592		15,86,787	
3. On other purchases and services..	4,06,081		4,65,322	
4. On provision for depreciation, etc.	6,66,056		4,56,527	
5. Value of Opening Stock .. 17,56,615			14,84,451	
		58,67,580		51,36,454

Surplus to be distributed between the Government and the Institute—

1. Net surplus (after providing for all expenses).	8,99,549	16,45,322
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How the surplus will be distributed—

1. 50 per cent to the Government ..	4,49,775	8,22,661
2. 50 per cent to the Institute's Development Fund.	4,49,774	8,22,661

The net profit has been arrived at after accounting for all expenses like depreciation, interest, leave and pension reserve etc. It is anticipated that in the coming year, significantly greater demands will be made on the Institute in the direction of its productive activities. Attempts are being made to cope up with this.

Acute shortage of staff continued and a heavy starin was placed on the existing staff. The necessary consolidated proposal for staff for placing the Business Management Section on systematic and scientific lines is under the consideration of Government. During the current year, the Institute succeeded in obtaining a foreign exchange of Rs. 16,11,036.00 for imports. The import licences are being duly processed.

During this year, the Section of Centralized Finished Products was proposed to be started. However, due to the non-appointment of the officer concerned, this section could not be brought into operation. It is hoped that in the coming year, this section will start working, which would lead to relieving the technical departments from the finished products indent work.

Exports.—In this year, the value of exports came to Rs. 36,881·37 nPs.

General—

The number of items requisitioned by departments during the year—

(1) (a) Local.	..	..	..	..	4,747
(b) Imports	..	..	..	..	1,790
(2) The number of customers served			..	..	3,562
(3) The number of bills issued to customers			..	..	16,190
(4) The number of parties supplying material	..			..	551
(5) Physical Verifications :—					
(a) Dead stock items.....	19,833				
(b) Finished Products.....	282,924 ampoules				

WORKSHOP SECTION.

Staff.—There has been no change in the Staff.

Activities.—This section comprises of two units namely, The Maintenance Section and Carpentry Section.

The former unit looks after all the Electrical, Mechanical and Refrigeration Plants, Machinery and Research equipment of the Institute including Nutrition Department, which is housed in this Institute. During this year “Desivac Plant” was completely overhauled. This plant has been frequently used now for “Freeze Drying” products, for other manufacturers resulting in more work of running and maintenance of this machine. The number of charges taken out during this year is about 65.

In addition to this, this unit has actively helped all the departments in designing small appliances and gadgets. The Animal house was provided with a pattern of teakwood movable tables for carrying food trays, Entomology Department with Scorpion rearing hood and some patterns etc. were prepared for the chemotherapy Section for casting purposes.

Further this section is assisting business side in scrutinizing of technical quotations, purchase of machinery, Research equipment and raw material.

The carpentry unit, carried out, the preparation of large number of varieties of crates and small furniture requirements of all the departments, and the maintenance of all the articles of furniture and research equipment.

Scope of work.—The work and responsibilities of this section has increased considerably.

During the period under report, a large number of plant, machinery and research equipment have been imported and locally purchased. These required installation testing and maintenance.

Fifteen air condition units and four water coolers were added this year to fulfill Drug act and Factory act, whose maintenance rests with this section.

This section also deals with the maintenance of four Institute Vehicles.

Training.—One of the workshop personnel was deputed for training in welding Techniques at the Indian Oxygen and Acetylene Company Limited for four months during this period.

In view of the above developments and increasing activities of the varied fields of expansion of the Institute, the section has keenly felt the shortage of needed technical and ministerial personnel and space.

XVII. GRANTS (1959).

✓ 1. <i>Indian Council of Medical Research, New Delhi.</i>		Grants.
		Rs.
(i) Drug Research Unit under Dr. N. K. Dutta	..	12,640
(ii) Enquiry on the Adaptation of Rabies Street Virus collected locally to chick embryo under Dr. A. N. D. Nanavati		6,505
(iii) Enquiry on the Nutritive Value of Foodstuffs under Dr. M. V. Radhakrishna Rao.		23,035
(iv) Enquiry on the study of Rodent Species and their susceptibility to Plague Infection under Director, Haffkine Institute, upto 31st March 1959.		1,650
(v) Enquiry into the Liabilities to Venereal Infection by migration and transference of rural population to industrialised urban centres under Dr. H. I. Jhala, Dr. H. P. Dastur and Dr. B. A. Daruwala upto 31st March 1959.		7,200
(vi) Enquiry on the location and isolation of the pupation hormone in the Indian House-fly <i>Musca nebulosa</i> Fabr. under Dr. P. J. Deoras upto 31st March 1959.		800
(vii) Project for the manufacture of Virus Vaccine against Kyasanur Forest Disease.		1,65,000

There are several research fellowships awarded at this Institute by national agencies, such as the Indian Council of Medical Research, Council of Scientific and Industrial Research, State and Central Governments. The Institute also takes up research fellows who may be recipients of fellowships of the National Institute of Sciences of India or any other endowment. These fellowships are open to science and medical graduates. The Institute takes the advantage of sponsoring research schemes through the Indian Council of Medical Research on specific projects. The Laboratories of the Institute are exceptionally well-equipped with laboratory apparatus and attract international visitors and trainees from organisations like the World Health Organisation, UNICEF, Colombo Plan and Rockefeller and other International Foundations. The Institute has contributed substantially in several fields of medical research.

The following Research Fellowships and Scholarships were attached to the Institute during the period under review.

Serial No.	Sponsors.	Subject of Fellowship/Scholarship.	Name of the Candidate and Period.	Amount.
		<i>Fellowship/Scholarship</i>		Rs.
1	Council of Scientific and Industrial Research, New Delhi.	For carrying out studies on Hormones and Glandular Products.	Dr. S. A. Vasavada, B.Sc. (Hons.), B.Sc. (Tech.), Ph.D., from 1st June 1959. (Senior Research Fellow).	400 per mensem.
2	Do.	Do.	Shri P. A. Malik, M.Sc. from 5th June 1959. (Junior Research Fellow).	250 per mensem.
3	Do.	For carrying out research on "Co-factors in Protein Biosynthesis".	....	400 per mensem.
4	Do.	For "Studies on Proteins and certain B. Vitamins Inter-relationship".	....	250 per mensem.
5	National Institute of Sciences of India, New Delhi.	Studies in Enzymes Systems in the venoms of Cobra and Russel's Viper with special emphasis on the nucleases and phosphatases.	Dr. R. W. P. Master, M.Sc., Ph.D., from 1st June 1959.	400 per mensem.
6	Government of India Research Training Scholarship.	For carrying out Research in Organic Chemistry.	Shri B. S. Rathore, M.Sc., from 9th October 1959.	200 per mensem.
7	Government of India Research Training Scholarship.	For carrying out Research in Micro-biology.	Kumari M. Savitri, M.Sc. upto 27th August 1959.	200 per mensem.
8	Government of India Research Training Scholarship.	For carrying out research in Bio-chemistry.	....	200 per mensem.
9	Government of Bombay	For studies in Anticoagulant Action of Cobra Venom.	Kumari V. N. Wankar, B.Sc., from 1st July 1959.	150 per mensem.

Serial No.	Sponsors.	Subject of Fellowship/Scholarship.	Name of the Candidate and Period.	Amounts.
				Rs.
10	Government of Bombay ..	.. For carrying out Researches in Organic Chemistry.	Kumari S. J. Shahane, M.Sc., from 5th August 1959.	150 per mensem.
11	Do. ..	.. Post Doctoral Research Fellowship to continue work on "Isolation of study of the Biologically important constituents of Venoms of Cobra and Russel's Viper".	Dr. R. W. P. Master, M.Sc., Ph.D., upto 31st May 1959.	300 per mensem.
12	Do. ..	.. For carrying out Virus Survey on Encephalitis.	Kumari Rayna Mendes, M.Sc., from 11th November 1959.	250 per mensem.
13	University of Bombay, Bombay	.. For carrying out Research on Rat Fleas.	Shri A. K. Joshi, M.Sc., from 22nd February 1958.	100 per mensem.
14	Unichem Laboratories, Bombay	.. For Research on "Indigenous Drugs"	Shri S. D. Kakade, M.Sc., from 11th September 1958.	250 per mensem.
15	Do. ..	.. For Research on "Pharmacology" ..	....	250 per mensem.
16	Haffkine Institute, Diamond Jubilee Celebrations Committee, Bombay.	For carrying out Research in the Department of Chemotherapy.	Shri C. B. Thanawalla, M.Sc., upto 17th August 1959. Shri S. G. Panjabi, M.Sc., from 25th November 1959.	250 per mensem.
17	Do. ..	.. For carrying out Research in Synthetic Drugs.	Shri P. K. S. Pillai, M.Sc., from 9th December 1959.	250 per mensem.
18	Haffkine Institute, Diamond Jubilee Celebrations Committee, Bombay (Sponsored by Messrs. Dumes Ltd.).	For carrying out Research Work in Bacteriology.	Shri M. V. Panse, M.Sc., from 10th January 1959.	250 per mensem.
19	Colombo Plan Fellowship ..	....	Shri P. M. Adhikary, B.Sc., from 6th June 1959.	175 per mensem.

XVIII, LIST OF DISTINGUISHED VISITORS DURING 1959.

Dr. Rajendra Prasad	..	Rashtrapati, New Delhi.
Shri Sri Prakasa	..	Governor of Bombay, Bombay.
Dr. Prakarb Tuchinda	..	Minister of Public Health, Bangkok, Thailand.
Dr. V. K. Traskar	..	Joint Secretary, I.M.A. Bombay.
Dr. Harold Trapido	..	Deputy Director, Virus Research Centre, Poona.
Dr. S. P. Aniker	..	Special Officer, K. F. D. Sagar, Mysore.
Dr. I. B. Hingorani	..	J. J. Hospital, Bombay 8.
Dr. V. Parvateshwara Rao	..	S. V. University, Tirupati.
Dr. Madan Prasad	..	Principal, Darbhanga Medical College, Bihar State.
Dr. R. M. Kasliwal	..	S. M. S. Medical College, Jaipur.
Dr. T. P. Vyas ..	..	Santa Cruz, Bombay.
Dr. Ronald M. Scanttebury	..	National Institute of Health, U. S. A.
Dr. Ivan Malek	..	Czechoslovakian Academy of Sciences, Czechoslovakia.
Dr. C. Puranananda	..	Queen Saovbha Memorial Institute, Thailand.
Dr. Hari Prasad	..	Indian Medical Association, Darbhanga Branch, Bihar State.
Dr. L. Sahai ..	..	Animal Husbandry Commissioner, Government of India, New Delhi.
Dr. L. M. Kakoti	..	Pasteur Institute, Shillong.
Dr. Shurvir Singh	..	General Hospital, Udaipur.
Dr. T. P. Magill	..	College of Medicine, State University of New York, U. S. A.
Dr. J. A. R. Miles	..	University of Utaga, New Zealand.
Dr. Johannes Ipsen	..	Harvard School of Public Health, Massachusetts, U. S. A.
Prof. Dr. A. Herrlich	..	German Research Association, Munich, West Germany.
Prof. R. L. Meyer	..	Ciba Pharmaceutical Products, New Jersey, U. S. A.
Dr. K. F. Meyer	..	G. W. Hooper Foundation, California, U. S. A.
Dr. J. R. Busvine	..	London School of Hygiene and Tropical Medicine, London.
Dr. Rajinder Pal	..	Malaria Institute of India, Delhi.
Dr. C. M. Singh	..	U. P. College of Veterinary Sciences, Mathura.
Dr. Leroy R. Allen	..	Rockefeller Foundation, New Delhi.
Dr. S. C. Seal	..	All India Institute of Hygiene and Public Health, Calcutta.
Shri D. E. Reuben	..	Bombay Natural History Society, Bombay.
Dr. F. Hawking	..	National Institute of Medical Research, London.
Dr. D. L. Shrivastava	..	Central Drug Research Institute, Lucknow.

Dr. K. K. Govil	.. State Hygiene Institute, Lucknow.
Dr. N. B. Kuppurajan	.. King Institute, Guindy, Madras.
Dr. P. K. Tope	.. State Vaccine Institute, Patwadnagar (U. P.).
Dr. S. Govindarajan	.. King Institute, Guindy, Madras.
Dr. J. K. Adranvala	.. B. J. Medical College, Poona.
Dr. A. S. Balachowsky	.. Pasteur Institute, Paris.
Dr. I. G. K. Menon	.. Pasteur Institute, Coonoor.
Dr. Derik Rowley	.. Wright Flemming Institute, London.
Mary Mell nby	.. Medical Research Council, London.
Lt. Col. J. P. Evans	.. U. S. Embassy, New Delhi.
Lt. Col. Oscar Felsenfeld	.. Walter Reed Army Institute of Research, U. S. A.
Dr. B. G. Chatterjee	.. Indian Institute of Technology, West Bengal.
Dr. N. K. Battacharyya	.. Indian Institute of Technology, West Bengal.
T. J. Lalvani	.. I. M. A., Bombay 16.
Lt. Col. S. N. Wanchoo	.. A. F. M. C., Poona.
Dr. Indu Mohan Gupta	.. Kasturba Medical College, Mangalore.
Dr. M. V. Shanbhag	.. I. M. A., Shimoga, Mysore State.
Shri L. Q. Khan	.. Andhra Pradesh.
Dr. A. Zahra	.. W. H. O., New Delhi.
Shri P. F. Ghadialy	.. National Academy of Science India, Allahabad.
Dr. A. D. Daftary	.. Hon. Joint Secretary, I. M. A. Bombay.
Dr. M. A. Panwala	.. I. M. A., S. V. Patel Road, Bombay.
Shri N. C. Mitra	.. India Government Mint, Bombay.
Dr. C. L. Jhaveri	.. Lady Hardinge Road, Bombay.
Prof. A. do. Ameral	.. Institute Butantan, S. Paula, Brazil.
Dr. S. Pradhan	.. Indian Agricultural Research Institute, New Delhi.
Shri S. C. Bhatia	.. Entomologist, Public Health Department, Poona.
Dr. A. Barkhtus	.. W. H. O., New Delhi.
Dr. J. B. Shrivastav	.. Director, Central Research Institute, Kasauli.
Prof. P. Malangeau	.. Facult -de. Pharmaci—Paris.
Dr. T. W. Burrows	.. Microbial Research Establishment, Porton, London.
Dr. M. Sirsi	.. Indian Institute of Science, Bangalore.
Mlle. S. Besson	.. Facult de. Pharmaci de Nancy, France.
Col. T. D. Chablani	.. D. D. H. & P., Army H. Q., New Delhi.
Shri N. R. Ramakrishnan	.. Directorate of Public Health, Madras.
Dr. P. D. Kulkarni	.. Penicillin Factory, Pimpri.
Dr. D. W. Henderson	.. Director, Microbial Research Establishment, Porton, London.
Dr. R. G. Chitre	.. G. S. Medical College, Bombay.
Dr. P. G. Gollerikari	.. Kasturba Medical College, Mangalore.

Dr. R. Anantanarayan	.. Prof. of Bacteriology, Medical College, Trivandrum.
Wing Commander, H. N. Dutta	Blood Transfusion Unit, A. F. M. C., Poona.
Dr. Vinayak P. Vaishnav	.. B. J. Medical College, Ahmedabad.
Dr. T. H. Rindani	.. Mahim, Bombay.
Shri P. N. Bhatt	.. Virus Research Centre, Poona.
Darden's Andre	.. Teacher of French in Tok'yo University, Japan.
Dr. Arne Tiselius	.. University of Uppsala, Sweden.
Greta Tiselius	.. University of Uppsala, Sweden.
Dr. D. B. Desai	.. B. J. Medical College, Poona.
Dr. J. M-rdecai	.. B. J. Medical College, Poona.
Shri S. P. Agharkar	.. Maharashtra Association for cultivation of Science, Poona.
Dr. Edmund Mikulaszek	.. Polish Academy of Science, Warsaw, Poland.
Dr. V. Krech	.. Serum & Vaccine Institute, Bern, Switzerland.
Shri G. T. Tonapi	.. Poona.
Hiss Urmila R o	.. Virus Research Centre, Poona.
Shri Girdhari Parsram	.. Bombay.
Shri T. M. Bajaj	.. Bombay.
Dr. J. Pereira	.. Superintendent, P. H. Laboratory, Trivendrum.
Dr. E. W. R. Steacie	.. President, National Research Council of Canada, Ottawa.
R. Courier	.. Paris.
Shri S. R. Kanthi	.. Speaker, Mysore.
Shri V. Venkatappa	.. Chairman, Legislative Council, Mysore.
Shri R. C. Sharma	.. Mayor of Nagpur.
Shri Vasant Rao Dhawale	.. Deputy Mayor of Nagpur.
Shri Bholasingh Naik	.. Chairman, Standing Committee, Nagpur Municipal Corporation.
Shri D. J. Madan, I.A.S.	.. Municipal Commissioner, Nagpur.
Dr. N. G. Yash henkov	.. Geneva, W. H. O., U.S.S.R.
Shri M. A. Menick ovelu	.. Minister for Health, Madras.
Dr. L. E. Burney	.. Surgeon General, U. S. A.

XIX. LIST OF PAPERS PUBLISHED IN THE YEAR 1959.

1. Ananthanarayan, K. G., Kudalkar, V. G., Madiwale, M. S. and Desai, H. H. Estimation of Hydrogen derivative of 8-hydroxyquinoline. Indian Journal of Pharmacy. 21 ; 263-266, 1959.
2. Ananthanarayan, K. G., Madiwale, M. S. and Phondge, S. Y. A note on calorimetric determination of strychnine in easton's syrup. Indian Journal of Pharmacy 21 ; 286-287, 1959.
3. Bharucha, E. D., Joshi, R. N. and Venkatraman, A. A study of serum amylase activity in normal adult Indian males. Journal of J. J. Group of Hospitals and G. M. C. 9 ; 274-276, 1959.

4. ✓✓ Bharadwaj, T. P., Gaitonde, B. B. and Jhala, H. I. Histamine and tropicaleosinophilia. *Indian Journal of Medical Research* 47 ; 377-381, 1959.
5. ✓✓ Bharadwaj, T. P. and Jhala, H. I. Steroidogenic assay of endogenous ACTH in normals and patients of tropical eosinophilia. *Annals of biochemistry and Experimental Medicine*, 19 ; 19-22, 1959.
6. ✓✓ Bharadwaj, T. P. and Jhala, H. I. Studies in the disappearance of infused hydrocortisone from the plasma of normal subjects and of tropical eosinophilia patients. *Annals of Bio. and Expt. Medicine*. 19 ; 51-53, 1959.
7. ✓✓ Bharadwaj, T. P. and Jhala, H. I. Adrenocortical function test in normal Indians and in patients of tropical eosinophilia. *Indian Journal of Pathology and Bacteriology*. 2 ; 41-48. 1959.
8. ✓✓ Bharadwaj, T. P.; Sutaria, P. B. and Jhala, H. I. 17-Hydroxysteroids in the plasma of normal Indians. *Indian Journal of Medical Research* 47 ; 178-183, 1959.
9. ✓ Bundeally Amina, Habbu, M. K. and Deliwala, C. V. Curative value of Sulphamethoxypyridazine in experimental plague infection in mice. *Indian Journal of Medical Sciences*. 13 ; 423-426, 1959.
10. ✓✓ Deoras, P. J. and Joshee, A.K. Proventricular teeth in some rat flea. *Indian Journal of Medical Research*. 47 ; 261-265, 1959.
11. ✓✓ Deoras, P. J. and Gokhale, M. S. Studies on Bombay Rats Part III. Some observations on the flea parasites of Bombay Rats. *Journal of Bombay University* 22 ; 30-33, 1959.
12. ✓ Dutta, N. K., R.B.M. Colah and Vaidya, S. D. Neomycin in experimental Cholera. *Proceedings of the symposia on chemotherapy (1958) at Central Drug Research Institute, Lucknow and Pub. by C. S. I. R. New Delhi*, pg. 61-63, 1959.
13. ✓ Dutta, N. K., Panse, M. V. and Kulkarni, D. R. Role of Cholera Toxin in Experimental Cholera. *Journal of Bacteriology*. 78. 594. 1959 ;
14. Jhala, H. I. Haffkine Institute of Bombay. A pioneer of research in communicable diseases of Mankind, *Health Horizon (U. S. A.)* No. 3 ; 20-24, 1959.
15. ✓ Khemani, K. M. Importance of Biological tests, in the diagnosis of Rabies. *Indian Journal of Medical Sciences*. 13 ; 17-20, 1959.
16. ✓✓ Khemani, K. M. and Jhala, H. I. Study of Rabies Virus tropism for salivary glands. *Indian Journal of Medical Sciences*, 13 ; 420-422, 1959.
17. ✓ Kulkarni, K. D. and Ganapathi, K. Chemistry of the thiazoles-Synthesis of Some Amidino- and Pyridinothiazoles. *Journal of Scientific and Industrial Research*. 18. B ; 376-378, 1959.
18. Kulkarni, K. D. and Shirsat, M. V. Chemistry of thiazoles-Synthesis of 2-amino 5-alkylthiazoles. *Journal of Scientific and Industrial Research* 18B ; 411-413, 1959.
19. ✓✓ Master, R. W. P. and Rao, S. S. Identification of choline esterase in cobra venom after electrophoretic separation of starch gel. *Current Science*, 28 ; 112-113, 1959.
20. Mendes Rayana and Jhala, H. I. Antibody response in human volunteers vaccinated with Asian influenza vaccines. *Indian Journal of Pathology and Bacteriology* 2 ; 278-285, 1959.

21. Mendes, Rayna and Jhala, H. I. Antigenic study of Asian Influenza Virus. Indian Journal of Pathology and Bacteriology 2; 271-277, 1959.
22. Modi, B. G. and Dogra, J. R. Chloramphenicol therapy in Laboratory diagnosis of enteric fever, Journal of J. J. Group of Hospitals and G. M. C. 4; 33, 1959.
23. Patel, M. C. and Sant, M. V. Studies on lysogenicity of *S. Typhi* and *S. Paratyphi A*. cultures and vi Bacteriophage typing of *S. typhi* cultures Indian Journal of Pathology and Bacteriology. 2; 144-149, 1959.
24. ✓ Patki, V. M. and Shirsat, M. V. Chemotherapy of intestinal infection, Part I-Synthesis of N4-Acyl infection derivatives of N1-Substituted sulphanilamides. Journal of Scientific and Industrial Research 18C; 113-116, 1959.
25. Ovalakar, I. R. and Sant, M. V. Some observations on use of culture media in isolation and identification of *Salmonellae*. Indian Journal of Medical Sciences. 13; 909-919, 1959.
26. ✓ Sabnis, S. S. and Shirsat, M. V. Studies in the synthesis of P-Amino-salicylic acid Part II-Synthesis of 4-Nitrosalicylic acid from 2-Amino-4-nitrotoluene via 2-Alkoxy-4-nitrobenzoic Acid. Journal of Scientific and Industrial Research. 18B; 240-242, 1959.
27. ✓ Shah, M. H., Mhasalkar, M. Y., Patki, V. M. and Deliwala, G. V. Synthesis of some N-1-N3-Disubstituted sulphonylureas. Journal of Scientific and Industrial Research, 18C; 202-204, 1959.

**XX. LIST OF PAPERS SUBMITTED FROM HAFFKINE
INSTITUTE DURING JANUARY-DECEMBER 1959
AND WAITING FOR PUBLICATION.**

1. Bharucha, E. D.; Master, R. W. P. and Rao, S.S. Blood Sugar Cholesterol level of rabbits injected with Cobra Venom. Indian Journal of Medical Research (In press.)
2. Dutta, N. K.; Shastry, M. S. and Tamhane, R. G. Pharmacological action of an alkaloidal fraction isolated from *saussurea lappa* (clarke). Indian Journal of Pharmacy. (In press.)
3. Ganapathi, K. Chemical pathways in Carbohydrate metabolism. Journal of Scientific and Industrial Research (In press).
4. Hazra, A. K. and Agnihotri, S. R. Occurrence of toxigenic *Cl. tetani* in ear discharge. Indian Journal of Medical Sciences. (In Press).
5. Jhala, H. I. Vitamin B₁₂ in human tissues and sera. Agra University Journal (In press).
6. Kulkarni, K. D.; Sabnis, S. S. and Kulkarni, B. S. Chemotherapy of bacterial infection Part I. Synthesis of pyrimidine, thiazole and pyrazol derivative. Journal of Scientific and Industrial Research (In press.)
7. Master, R.W.P. Histochemical procedure in the location of esterase after starch gel electro-phoresis. Biochemica et Biophysica acta. (In press.)
8. Master, R. W. P; Bharucha, E. D.; and Rao, S. S. Blood Sugar Cholesterol and phosphorus levels in rabbits after the injection of Russell's Viper Venom. Indian Journal of Medical Sciences. (In press)

9. Master, R. W.P. and Rao, S. S. Studies in the esterase of Cobra Venom. *Annals of Biochemistry and Experimental Medicine* (In press).
10. Modi, B. G. Validity of Semi-quantitative Biological tests in the diagnosis of Vesicular Mole. *Journal of Obstetrics and Gynaecology of India* (In press.)
11. Patki, V. M. and Shirsat, M. V. Chemotherapy of intestinal infection part II-Synthesis of N-Acyl derivatives of P-amino salicylic acid. *Journal of Scientific and Industrial Research*. (In Press).
12. Sabnis, S. S. and Kulkarni, K. V. A survey for the detection of homologous serum hepatitis in the blood donors in Bombay. *Indian Journal of Pathology and Bacteriology*. (In press.)
13. Sabnis, S. S. and Shirsat, M. V. Studies on the Synthesis of Para Amino-salicylic acid. *Journal of Scientific and Industrial Research*. (In press.)
14. Sabnis, S. S. and Shirsat, M. V. Synthesis of P-Aminosalicylic acid Part III. Reduction of 4-nitro salicylic acid to 4-amino-salicylic acid. *Journal of Scientific and Industrial Research*. (In press).
15. Samant, M. S. ; Rao, S. S. and Modi, B. G. A comparative study of Kahn, Minickie and V. D. R. L. flocculation tests for serodiagnosis of syphilis. *Journal of J. J. Group of Hospitals and G. M. C.* (In press).
16. Shah, M. H. ; Mhasalkar, M. Y. and Patki, V. M. Chemotherapy of Tuberculosis, Synthesis of 1-acyl and 1-acyl-4-alkyl thiosemicarbazides. *Journal of Scientific and Industrial Research* (In press).

XXI. ACADEMIC COURSES.

The Institute is affiliated to the University of Bombay for post-graduate training courses in the following degrees :—

- M. Sc. and Ph. D. in Microbiology, Bacteriology, Biochemistry (including Nutrition), Zoology and Organic Chemistry.
- M. Sc. (Med.) and Ph. D. in Pathology, Bacteriology and Parasitology and Pharmacology.

The following are post-graduate teachers recognized by the University of Bombay :—

1. Dr. H. I. Jhala
2. Dr. K. Ganapathi
3. Dr. N. K. Dutta
4. Dr. P. J. Deoras
5. Dr. C. V. Deliwala
6. Dr. M. V. Sant
7. Dr. A. N. D. Nanavati
8. Shri K. G. Anantanarayanan
9. Dr. S. S. Rao
10. Dr. M. V. R. Rao
11. Dr. S. M. Patel
12. Dr. K. D. Kulkarni

The Institute is also recognized by the College of Physicians and Surgeons of Bombay for training candidates (a) for F. C. P. S. Examination in Pathology and Pharmacology and (b) for D. B. P. examination of the College.

The following Officers of the Institute are recognized as teachers of the College :—

1. Dr. H. I. Jhala
2. Dr. N. K. Dutta
3. Dr. M. V. Sant

The Institute is further recognized for the various post-graduate degrees by the undermentioned Universities :—

1. Gujrat University
2. M. S. University of Baroda
3. Poona University
4. Sadar Vallabhai Vidyapeeth

During the period under review the following Science Graduates, who had their names registered at this Institute, were afforded facilities for prosecuting their post-graduate studies.

1. Shri M. S. Madiwale
2. Shri C. J. Mehta
3. Shri S. E. Mhasalkar
4. Shri S. A. Vengsarkar
5. Shri A. K. Joshee
6. Kum. K. C. Patel
7. Kum. L. S. Kadaba
8. Kum. P. K. Khandwala
9. Kum. K. K. Patel
10. Kum. C. Vedprakash
11. Shri K. M. Khemani
12. Kum. M. C. Patel
13. Kum. B. A. Ver
14. Kum. M. Sawitri
15. Smt. K. Sunder
16. Shri M. L. Chainani
17. Shri D. V. Mehta
18. Shri R. J. Talvalkar
19. Shri M. G. Nerurkar
20. Shri A. B. Martins
21. Kum. V. N. Waknis
22. Kum. S. L. Shah
23. Kum. M. N. Guttikar
24. Kum. D. H. Shah
25. Kum. S. H. Aswani
26. Shri G. Bhaskaran
27. Shri A. P. Bhandarkar
28. Shri M. V. Panse

29. Shri P. M. Adhikary
30. Shri Y. G. Vaidya
31. Kum. Nilima Kaushik
32. Kum. Amina I. Bundealy
33. Shri S. P. Deshpande
34. Shri P. M. Parikh
35. Kum. Nalini G. Bhat
36. Shri R. A. Balani
37. Kum. Umashashi Tonse
38. Shri S. S. Sabnis
39. Shri M. H. Shah
40. Shri R. A. Bellare
41. Shri B. S. Kulkarni
42. Shri K. Madhukar Kamat
43. Shri M. V. Shirsat
44. Shri M. K. Habbu
45. Smt. Susy Cherian
46. Kum. I. R. Ovlekar
47. Kum. M. S. Savant
48. Shri M. R. Shirsat
49. Shri F. F. Dias
50. M. R. Darekar

Out of these, those at serial numbers 46 to 50 have discontinued their registration during the year.

The undermentioned post graduate students obtained their M. Sc. Degrees during the year.

1. Shri M. S. Madiwale
2. Kum. Rayna Mendes
3. Kum. P. K. Khandwala
4. Kum. L. S. Kadaba
5. Smt. Susy Cherian
6. Shri N. E. Vad.

XXII. TRAINING OF HEALTH PERSONNEL.

The Institute plays an important role in the dissemination of scientific knowledge by affording facilities to persons desirous of learning different types of techniques, either for the prosecution of research problems or for routine working in their different spheres of activities. In addition, short courses of training of a preliminary nature are given to Public Health Personnel with a view to enable them to carry on their disease control work efficiently.

Following is the list of persons to whom training was given in various departments during the year 1959.

Serial No.	Name.	Designation and Address.	Department allotted.	Duration of training.
1	2	3	4	5
1	Kumari K. S. Godanani .. ..	....	Clinical Pathology	.. 5th January 1959 to 4th April 1959.
2	Dr. S. N. Deshpande, M.B.B.S., B.M.S. Cl. II. .	Blood Transfusion Officer, St. George's Hospital, Bombay.	Blood Bank	.. 30th January 1959 to 21st February 1959.
3	Shri M. R. Mulay, B.Sc.	Analytical Chemist, Comteck Laboratories, Bombay.	Pharmacology	.. 2nd February 1959 to 15th April 1959.
4	Kumari S. D. Shetty, B.Sc. .. ..	....	Clinical Pathology	.. 2nd March 1959 to 1st May 1959.
5	Kumari S. J. Shah, B.Sc. .. ..	....	Biochemistry	.. 12th March 1959 to 11th May 1959.
6	Shri F. K. Das	.. Senior Laboratory Technician, K. J. Mehta, Tuberculosis Hospital, Amargadh, Songadh.	Clinical Pathology and Blood Bank.	.. 1st April 1959 to 30th June 1959.
7	Shri P. V. Khale	.. Bhalchandra Laboratory, Bombay ..	All Departments	.. 1st April 1959 to 30th September 1959.
8	Shri V. V. Herwardkar	.. Teacher, King George English School, Bombay.	Biochemistry	.. 1st April 1959 (discontinued.)
9	Kumari S. P. Rode	.. Sister, Bhatia General Hospital, Bombay ..	Clinical Pathology	.. 1st April 1959 to 30th June 1959.
10	Shrimati S. S. Shastri	.. Bombay	Clinical Pathology	.. 1st April 1959 to 30th June 1959.

Serial No.	Name.	Designation and Address.	Department allotted.	Duration of training.
1	2	3	4	5
11	Shri Bruno D'Silva .. ..	....	Chemotherapy	.. 1st April 1959 to 30th June 1959.
12	Kumari I. Shah	W. T. Suren. & Co., Bombay	.. Pharmacology	.. 16th April 1959 to 15th July 1959.
13	Shri George J. Abraham .. ..	....	Biochemistry	.. 1st April 1959 to 30th June 1959.
14	Shri F. I. Khumri .. ..	....	Chemotherapy	.. 4th May 1959 to 3rd August 1959.
15	Shri B. G. Phadnis	M/s. T. Walker Pharmaceutical Laboratories, Poona.	Pharmacology and Media..	11th May 1959 to 10th August 1959.
16	Shri S. V. Kuwadkar .. ..	....	Biochemistry	.. 1st July 1959 to 30th September 1959.
17	Shri S. J. Kulkarni .. ..	....	Chemotherapy	.. 1st July 1959 to 30th September 1959.
18	Shri P. N. Padhye .. ..	....	Biochemistry	.. 1st July 1959 to 30th September 1959.
19	Shri S. P. Nene .. ..	....	Chemotherapy	.. 1st July 1959 to 30th September 1959.
20	Shri S. D. Diskalkar .. ..	.....	Blood Bank	.. 1st July 1959 to 30th September 1959.
21	Shri S. J. F. Fernandez .. ..	....	Chemotherapy	.. 4th July 1959 to 3rd October 1959.
22	Shri V. K. Shah	Observer from M. S. University of Baroda	Vaccine ..	.. 13th July 1959 to 21st July 1959.

23	Shri M. M. Palnitkar ..	..	International Francis Ltd., Bombay ..	Pharmacology ..	20th July 1959 to 19th September 1959.
24	Shri S. N. Purohit ..	..	Chemist, International Franchises Pvt. Ltd., Bombay.	Pharmacology ..	20th July 1959 to 19th August 1959.
25	Kumari K. Janaka ..	..	....	Clinical Pathology ..	3rd August 1959 to 2nd November 1959.
26	Kumari N. K. Daundkar ..	..	....	Clinical Pathology ..	3rd August 1959 to 2nd November 1959.
27	Shri K. Panchapikeshan ..	..	Chemist, Fine Pharmaceuticals, Kum-bhakonam.	Pharmacology ..	21st September 1959 to 5th October 1959.
28	Kumari G. W. Oke ..	..	Research Assistant at the Poona I. C. M. R. Unit.	Virus Diseases ..	1st October 1959 to 31st December 1959.
29	Shri N. M. Shah ..	..	Surat Borough Municipality ..	Clinical Pathology ..	1st October 1959 to 31st December 1959.
30	Shri K. S. Shrinivasan ..	..	Member of the technical staff I. C. I. (India) Pvt. Ltd., Bombay.	Clinical Pathology and Media.	1st October 1959 to 31st October 1959.
31	Shri A. K. Dhamoon ..	..	....	Vaccine ..	1st October 1959 to 31st December 1959.
32	Shri M. Correa ..	..	....	Pharmacology ..	1st October 1959 to 31st December 1959.
33	Shri P. R. Chandran ..	..	....	Chemotherapy ..	1st October 1959 to 31st December 1959.
34	Shri G. N. Shetty ..	..	....	Biochemistry ..	1st October 1959 to 31st December 1959.
35	Shri L. L. Jhaveri ..	..	....	Serum ..	1st October 1959 to 31st December 1959.
36	Shri S. P. Gadkari ..	..	....	Chemotherapy ..	1st October 1959 to 31st December 1959.
37	Shri M. K. Dhakappa ..	..	....	Chemotherapy ..	1st October 1959 to 31st December 1959.

Serial No.	Name.	Designation and Address.	Department allotted.	Duration of training.
1	2	3	4	5
38	Shri R. M. Dudhelia ..	.. C. J. Mehta, Tuberculosis Hospital, Amargadh.	Blood Bank, Clinical Pathology and Biochemistry.	1st October 1959 to 31st December 1959.
39	Shri S. V. Subramanian ..	....	Pharmacology ..	1st October 1959 to 31st December 1959.
40	Shri A. V. Desai ..	....	Chemotherapy ..	1st October 1959 to 31st December 1959.
41	Shri G. C. Shonkeen ..	....	Biochemistry ..	1st October 1959 to 31st December 1959.
42	Shri P. L. Thomas ..	....	Biochemistry ..	1st October 1959 to 31st December 1959.
43	Kumari Vijayalaxmi Rangarajan ..	....	Clinical Pathology ..	1st October 1959 to 31st December 1959.
44	Shri A. B. Kelkar ..	....	Vaccine ..	1st October 1959 to 31st December 1959.
45	Kumari Kumud R. Pai ..	.. Bombay ..	Blood Bank ..	1st October 1959 to 31st December 1959.
46	Shri A. Hamid ..	....	Chemotherapy ..	12th October 1959 to 11th January 1960.
47	Shri R. N. Kohli ..	.. Demonstrator, in Clinical Medicine, Rajasthan, College of Veterinary Science and Animal Husbandry, Bikaner.	All the Departments ..	22nd October 1959 to 5th November 1959.
48	Shri A. L. Chaudhari ..	.. Demonstrator, in Parasitology, Rajasthan, College of Veterinary Science and Animal Husbandry, Bikaner, Rajasthan.	All the Departments ..	22nd October 1959 to 5th November 1959.
49	Shri Gorhe ..	.. Bombay Veterinary College, Bombay ..	Virus Department ..	9th November 1959 up-to-date.
50	Shri S. N. Narasimhaiah, M.B.B.S...	Assistant to the Superintendent of Laboratory, Public Health Institute, Bangalore.	Vaccine and Media ..	11th November 1959 to 23rd December 1959.

LABORATORY TECHNICIANS' TRAINING COURSE.

With the inauguration of the Laboratory Technician's Training Course from 11th August 1958, the Institute has gone one step further in the dissemination of the Scientific knowledge, which is one of the premier functions of this Institute. In a country which has pledged its economy to a planned development, there is always an unprecedented demand for scientific and technical personnel. Any scientific or technical graduate with mere academic qualification cannot fit in properly in the structure of the planned development unless he has undergone a specialized training suitable for the plan.

The duration of the course is of nine months only. After the candidate has successfully completed the Elementary Course lasting for six months, he has the option to select any one of the specialized subject for training, viz, Pathology and Bacteriology, Clinical Biochemistry, Drug Analysis, Production and Standardization of some Biologicals, Organic and Biochemical Analysis and Zoology. There will be an examination at the end of the advanced course and the successful candidates will be given a certificate in this connection.

Sixteen Science Graduates were admitted in the first batch of this training course for the year 1958-59, and the undermentioned fourteen candidates who completed their training successfully were awarded the certificates.

(1 to 16 except Serial No. 2 and 9).

1. Kumari J. S. Vatandar.
2. Shri J. K. Oza.
3. Shri N. I. Shaikh.
4. Kumari N. J. Shah.
5. Shrimati K. B. Madekar.
6. Shri S. W. Parchure.
7. Shri P. K. Deshpabhu.
8. Shri G. T. Kamat.
9. Kumari U. K. Naik.
10. Shri B. D. Sohoni.
11. Shri K. Madhukar.
12. Shri R. G. Bhatwadekar.
13. Shri N. K. Maladkar.
14. Kumari S. S. Sawant.

A second batch of nineteen graduates has started training for the current session from 1st August 1959.

XXIII. MISCELLANEOUS.

(a) *Exhibition Activities.*—Although Haffkine Institute needs no introduction to the Medical World and the Public in general, the experience of participation in “India 1958” Exhibition at New Delhi last year clearly indicated the need of bringing to the notice of the public the modern preventive and therapeutic aids made available by the Institute.

With this end in view, the Government of Bombay approved the idea of a separate exhibition unit at the Haffkine Institute and the post of an exhibition assistant was sanctioned and filled in the month of November 1959. It was only possible to participate in “India can make it” exhibition at Bombay.

An independent stall of 240 Sq. feet of floor space was occupied and the activities of the Institute were displayed through pictures, photographs, life-size colourful cut-outs and actual samples of the life-saving biologicals and other drugs manufactured by the Institute. Emphasis was laid on the importance and uses of vaccines and toxoids Antivenin etc.

(b) *The Haffkine Institute Co-operative Credit Society Ltd. has made satisfactory progress during the year.*—(1) The total strength of the members of the society is as stood on 30th June 1959 is 437.

(2) The subscribed capital of the society as on 30th June 1959 is Rs. 1,85,621·88nP. showing an increase of Rs. 12,550·38nP. over that of the previous year.

(3) The society is functioning the business of advancing loans to members of the society. The loans advanced to members during the current year amounts to Rs. 1,87,702·82nP. which is more than the amount advanced in the previous year by Rs. 15,582·76nP.

(4) The society is registered as an agent under the existing rules for the following agencies.

(1) Janata Policy of Life Insurance Corporation of India.

(2) *Small Savings Scheme such as National Saving Certificates.*—Due to these agencies the society has offered the opportunities to its members to encourage thrift and help them in small saving drive of the Government, for the national cause.

(5) The society has invested in Government Securities and in Bombay Municipal Debentures and National Saving Certificates which amounts to Rs. 33,034·07nP.

(6) The Society is also running a grainshop for the benefits of its members as well as the residents of the Institute and has transacted a business of Rs. 80,164·23nP. by way of sales showing an increase of Rs. 24,944·14nP. over that of the previous year. It is an authorised shop in rationed foodgrains.

The appropriation of profits for the year 1958-59 in as follows:—

				Rs. nP.
Reserve fund 25 per cent.	..	..	..	2,102·73
Dividend Equipment Fund	..	..	..	150·00
Charity fund	..	..	..	50·00
Divident at the rate of 3·3/5 per cent.	..	..	..	6,450·00
Bonus to staff	..	..	..	324·00
Balance	..	..	..	323·27
				9,400·00

(C) *Welfare Activities.*—(1) Haffkine Institute Sports Club continued to function as before. The strength of the members of the Club at present is 205. So far Rs. 2931 have been collected as subscription from members. Cement concrete Courts for Tennis and Badmington and a new table for Table Tennis were the fresh additions to the Club and a room was allotted to the Sports Club for its activities on the premises. The Club took active part in presenting games on the occasion of the Diamond Jubilee when competitions in various games were held. The Cricket Club participated in the E. Merck Tournaments. The football Club functioned as before. Indian games have also been started during the year.

(2) *Welfare Center Library.*—As a Welfare activity for the benefit of staff of Institute, a Welfare Library was inaugurated on 17th August 1959 by Shri A. V. Modi of Unichem Laboratories. More than 15 popular magazines and periodicals are subscribed by this Library and about 100 books for general reading are also available to the Library. About 140 readers are taking the advantage of this Library.

(3) *S. S. C. Coaching Class.*—There are a number of Class IV staff members who have not been able to complete their education upto S. S. C. due to lack of facilities of coaching. Senior members of staff of the Institute volunteered their services to conduct classes in various subjects prescribed for S. S. C. after office hours and the Classes thus started from November 1959 and 32 workers of the Institute from different departments are taking advantage of the Classes.

(4) *UNICEF Skim milk distribution Scheme.*—Under the UNICEF Skim-milk distribution Scheme the Haffkine Institute welfare centre is continuing to distribute reconstituted skim milk to 75 children with the age group of 3-14 years and one nursing mother. These are from the families of the staff residing within the compound of this Institute.

The Nutrition Department, Government of Bombay kindly supervises our activities in this reconstitution and distribution work, done at the welfare centre of Haffkine Institute.

(5) *Medical Treatment—Dispensary.*—Institute Dispensary continued to cater to the needs of the workers of the Institute and their dependent relations, as usual. All required drugs are made available for treating the ailing personnels. The Clinical Pathology department is helping in early diagnosis in many obscure conditions. It was felt in 1958 that a suitable place be provided for housing dispensary and a suitable clinical examination room.

Tuberculosis Survey.—With the kind co-operation of the Bombay State Anti-tuberculosis Association, a survey of the incidence of the tuberculosis was undertaken. Four hundred and sixty workers were covered by this survey. They were X-rayed and in doubtful cases, examination of blood for E. S. R. and differential counts were carried out and physical examinations also were carried out. The cases detected were referred to the J. J. Hospital for further treatment. The advised treatment was followed up here. The Government has been pleased to sanction that in future such cases can be treated at this Institute and the medicines be supplied by this Institute.

Ophthalmic Examination.—All the persons engaged in sealing the ampoules (i.e. working against bright light) were referred to the C. J. Ophthalmic Hospital for examination of their eyes, and in some cases refraction errors due to age were detected and the glasses prescribed.

First Aid facilities.—First aid centres are fitted up in different centres. Necessity is felt about fitting up an ambulance room and steps are being taken in this direction. Minor injuries are attended to locally and serious ones are directed to the neighbouring hospital.

