



सत्यमेव जयते

Government of Maharashtra

**HAFFKINE INSTITUTE ANNUAL REPORT
FOR THE YEAR 1961**

by

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REPORT OF THE HAFFKINE INSTITUTE FOR THE YEAR 1961.

I. GENERAL REVIEW.

The year under review had been one of considerable stress and strain on the resources of the Haffkine Institute and its working. The unfortunate natural calamities that visited the State as also the other parts of the country had the dual effect of placing more demands on the manufactured products of the Institute and creating a necessity to effect utmost economy in expenditure. Fortunately, the Institute was able to meet all the demands and also continue the main activities.

The year also heralded the beginning of the third five year plan of the State of Maharashtra and, according to the finalised State Plan, the Institute has been allotted fifty lakhs of rupees for the entire plan period. The Plan schemes include the manufacturing and developmental projects like the expansion of production of sera by establishing at Pimpri a full-fledged Serum Laboratory ; expansion of the Blood Bank to produce more plasma and also gamma globulin ; production of triple antigen against diphtheria, tetanus and pertussis ; expansion of the diagnostic reagent section ; schemes for the expansion of the research and development, and addition to the existing facilities at the Institute.

Dr. A. K. Hazra, Assistant Director, Department of Immunology retired on the 31st December, after a long and meritorious service. Dr. Hazra joined the Institute in 1943 and during his long association with the Immunology Department has contributed significantly to the development of the Department which made a start in 1940. Dr. Hazra also played a notable part in the development of the new polyvalent antivenene in the freeze-dried form, for which the Institute is specially famous. Dr. S. Srinivasa Rao, who was a Senior Bacteriologist in the Department, has succeeded Dr. Hazra and thus ensures the continuity of work in the Department. The Department has also been strengthened by the return of Shri Y. S. Nimbkar after advanced training for two years in England under the Colombo Plan. Shri Nimbkar obtained his Diploma in Bacteriology at Manchester. These officers have an arduous task of building up the Serum Laboratory at Pimpri to enhance the production of the sera as well as to improve their quality.

The Department of Bacteriology which is engaged in the manufacture of cholera, plague and typhoid vaccines, was without an Assistant Director for a number of years. Dr. (Kum.) H. B. Patil joined the Department as the Assistant Director temporarily for a year. Since the Department has very responsible work to discharge it is hoped that a permanent Head to shoulder the responsibilities would be available soon.

Significant additions to research facilities have been made this year by the import of specialised equipment like the gasflow and Geiger counter with a scaler for radioisotopic work, Spinco preparative ultracentrifuge, an additional MSE refrigerated high speed centrifuge, Zeiss recording spectrophotometer covering the ultraviolet and visible regions, a Zeiss spectrophotometer with chromatogram

and microcell attachment, Infra-cord infra red recording spectrophotometer, ultrasonic disintegrator, an amino acid analyser, continuous electrophoresis equipment, etc. Financial stringency has led to the postponement of purchase of some more specialised equipment. Through the courtesy of the UNICEF, the Institute also received gratis about fifteen thousand dollars worth of laboratory glassware. It is hoped all these would help the Institute to undertake more advanced types of research.

Another fillip has been given to the researches at the Institute by the functioning from March of the Haffkine Institute Diamond Jubilee Research Unit, under which one Senior and four Junior Fellows have been employed. The full complement of personnel have not yet been employed. These Fellowships are for carrying out fundamental researches in the subjects of chemical microbiology, immunology and virology. Two pool officers of the Council of Scientific and Industrial Research are also working in the Institute.

The research work progressed mainly on the lines indicated last year. The work on the synthetic oral hypoglycemic agents has led to the discovery of a few compounds which compare favourably with tolbutamide and these are under clinical trial. Similarly a few synthetic diuretics also show promise and are also under clinical trial. The screening of the Indian Medicinal plants as curatives against cholera infection in infant rabbits has resulted in the discovery of the alkaloidal fractions of two plants which give good protection. Work on the role of cholera toxin on the pathogenesis of cholera has shown the importance of the toxin on the onset and progress of the disease. The venoms of cobra and Russel's viper have been fractionated electrophoretically and the components isolated were studied for the nature of their toxic properties. Sialic acid has been found to be a component of the various strains of *Past. pestis* irrespective of their virulence or encapsulation. The enzyme systems of the bacteria and the metabolism of carbon sources and carbohydrates are giving interesting results on the biochemistry of this pathogen. The susceptibility of rats in Bombay and near localities to plague is being studied, and also the frequency of the rat population in these areas.

The manufacture of the biological products during the year was at its full tempo. The manufacturing capacity established fifteen years ago has been fully saturated. Without significant further additions, it would be unsafe to push the manufacture any further. The supply and manufacture of cholera vaccine reached 20 million ml. this year which is just above the maximum supply made so far. The demand for plague vaccine has dwindled. The output of the antitoxins was 1,832 litres and toxins, toxoids and triple vaccines was 2269.41 litres. This production will increase gradually in the succeeding years. The Blood Bank handled 5455 donors and produced 764 litres of dried plasma. The production capacity is limited by the actual availability of blood donors. The supply of vitamin and sulfa drug tablets during the year touched a peak of 70 million and with the expansion of Employees' State Insurance Scheme the demand for these is expected to be doubled. Proposals are under consideration for the expansion of the facilities of the Chemotherapy Department to cope up with this anticipated increase in demand. The supply of the parenteral

solutions to the hospitals is also on the increase and the demand is now about twice the normal capacity of the Department. With the opening of more antirabic centres in the State, the demand for antirabic vaccine is also on the increase and the Institute supplied about 5 million ml. to the various centres. The manufacture of triple vaccine for regular supply was taken up this year. The Institute can make only a limited supply and cannot meet heavy demands. The capacity of the Institute for the production of the snake venoms is in excess of the demands.

Among the building works undertaken the civil portion of the cold storage and the floors above, a floor on the Chemotherapy block, extension to the Diphtheria block, workshop and surface water storage tank have been completed. The electrical works and the fitting up of the laboratories remain to be undertaken. Work on the new animal house at the Institute has started ; after completion this will relieve the congestion in the present animal house. In Pimpri, about 45 acres of additional land have been purchased and a master plan for the expansion programme has been prepared. Due to the cut in the Plan provisions, the work at Pimpri has to go at much slower pace than originally anticipated.

During the year under review forty nine candidates have been working for the research degrees—thirty-three for the M.Sc. and sixteen for the Ph.D. The Departments have also to shoulder the heavy load of training of laboratory technicians. There were fourteen trainees for the Laboratory Technicians Training Course, and fifty two for the Short-term Training Course of three months, each run in four sessions continuously. There is rush for training in drug testing, clinical pathology, and preparation of parenteral solutions.

The sales of the Institute during the year amounted to Rs. 56·66 lakhs and we were left with a surplus of Rs. 9·36 lakhs. With the expansion of research and non-manufacturing activities, the surplus will dwindle year by year and self-sufficiency will have to be achieved by increased production, and by taking up more items of importance.

The social activities went on as usual. The Haffkine Institute Co-operative Society celebrated the Diamond Jubilee, with the Honourable Shri Sri Prakasa, the Governor presiding over the function. The Critics Club held meetings every week. The Sports Club was also active and there was an annual tournament and distribution of prizes.

II. DEPARTMENT OF BACTERIOLOGY.

GENERAL.

Dr. (Kum) H. B. Patil took charge of the post of Assistant Director, Department of Bacteriology, from 15th June, 1961, relieving Dr. H. I. Jhala, Director, from the additional charge. Dr. M. K. Habbu has been appointed as a Senior Bacteriologist in this department from 20th November 1961.

The research in cultivating the typhoid and paratyphoid bacilli in the casein hydrolysate liquid media was continued with additions of other growth promoting factors to the medium, with the object of increasing the yield. On the production side, there was an increased activity as regards both anti-typhoid and anticholera vaccine and this was one of the years in which our production was very high.

ROUTINE AND PRODUCTION.

During the period under review, 274,726 ml. of plague vaccine, 20,204,504 ml. of cholera vaccine, and 584,897 ml. of T.A.B. vaccine were issued while 21,571,800 ml. of cholera vaccine and 413,248 ml. of T. A. B. vaccine were produced. Total quantity of vaccines issued during the year is 21,064,127 ml. The demands for plague vaccine were mostly from Madras and Bengal; those for cholera vaccine were from Maharashtra State, Gujarat, Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan and Karnatak as well as from other Asian countries like Singapore; and those for T.A.B. vaccine were mostly from Maharashtra State. The demands for cholera vaccine were unprecedentedly high. The issue of cholera vaccine this year showed is the highest on record and the supplies of T.A.B. vaccine also have shown a perceptible rise.

RESEARCH

Liquid medium for T.A.B. vaccine.—A few batches of T.A.B. vaccine have been prepared in the casein hydrolysate medium with some growth promoting factors. When tested for antigenicity along with the usual agar vaccines by active mouse protective tests, these vaccines were found to be equally potent.

III. DEPARTMENT OF BIOCHEMISTRY.

GENERAL.

During the year under review, the Department maintained its routine, training and research activities. The total number of tests performed during the year, was 6,645, as against 6,835 in 1960. Though somewhat reduced in number, the emphasis has been more and more on special tests. This is probably due to the fact that some of the Government Hospitals are trying to develop their own laboratories attached to them. Shri R. N. Joshi, Junior Biochemist, was promoted to the post of Senior Biochemist.

The department is now in a position to take up quantitative estimation of serum protein fractions by paper electrophoresis and by chemical techniques. The procedures and techniques, standardised after certain trials and errors, have yielded very satisfactory results. At present, due to lack of proper instrumentation, the quantitation of the various fractions is carried out by elution techniques.

Standardisation and evaluation of methods for the quantitative estimation of serum, protein bound iodine and urinary catechol amines, are under progress.

ROUTINE.

The Total number of tests performed during the year under review was 6,645 as shown below :—

Blood	..	..	..	..	4,476
Urine and stool	..	..	..	..	261
C.S.F. and fluids	..	..	..	..	1,000
Milk	..	..	..	..	6
Special tests	..	..	..	..	902
Total ..					6,645

Of those, the special tests numbered 902.

Name of the test.	No. done during the year.
Basal metabolic rate	51
Gastric analysis	61
Glucose tolerance test	80
Kidney function test	82
Lange's colloidal gold curve	165
Serum potassium	62
Urinary and serum sodium	65
Urinary 17-ketosteroids	20
Serum iron	7
Serum transaminases	217
Urinary catecholamines	9
Serum protein fractions (Chemical)	12
Serum protein fractions (Paper electrophoresis)	51
Fecal fat	2
Urinary calculi	4
Urinary diastase	4
Fragility of R.B.C.	3
Urinary and serum amino nitrogen	2

RESEARCH.

Biochemical studies on meconium :—Meconium is a rich source of blood group substances and since large quantities of the various group substances are required for immunising blood donors a systematic study of the meconium itself has been undertaken. Some preliminary work has been done on twelve samples consisting of 6 'O' group and 3 belonging to A and B groups each. The moisture, nitrogen, cholesterol, phosphorus and reducing sugars of the samples tested are as shown in the table :—

	Moisture content per- cent of wet weight.	N. percent dry sample.	Cholesterol percent. dry sample.	P. percent.	Reducing sugar percent.
Average	62 (12)	6.33	3.71	.044	36.4
Range	55—71	5.75—7.2	2.17—6.6	0.042—0.046	32.8—37.8

Further work is in progress.

A study of serum and urinary mucoproteins.—Under various pathological disorders, the serum and urinary mucoproteins are believed to deviate significantly from normal levels. However, not much data has been published on these lines. Since mucoproteins are complexes of carbohydrates and proteins containing hexosamines, hexoses, fucose and sialic acid, it is planned to have a systematic study of these components in clinical materials.

Some of the procedures have been studied for evaluation and standardisation. The accompanying table gives an idea of some of the components in normal sera. This work is in progress :—

Constituent assayed.	No.	Range: mg. percent.	Mean: $\pm$ S. E.
Protein Bound Hexose ..	25	115-175	133.9 $\pm$ 2.8
Protein Bound Fucose ..	25	0.04-15.51	8.42 $\pm$ 0.56
Protein Bound Hoxosamine ..	25	75-117.5	93.15 $\pm$ 1.91
Sialic acid ..	25	56-1.86.6	66.4 $\pm$ 1.33

Biochemical disorders in mentally retarded children.—Since some of the inborn errors such as phenylketonuria, sucrosuria, maple sugar disease, etc. have been found to be associated with mental retardation in children, it was thought worthwhile to carry out some investigations on the children available from the Institutions for the mentally underdeveloped children in Bombay. It was however, not easy to arrange for the collection of the necessary materials always. Some seventy-eight urine samples from the children's home at Mankhurd were tested for phenyl pyruvic acid, sucrose and lactose but none of them were positive for any abnormalities. At this stage it was felt necessary to investigate any deviation in the amino acid composition of urine samples of these children as there are now reports of cases of unusual branched chain amino acids in cases leading to mental underdevelopment in children. Methods were

standardised for the estimation of urinary amino acids and the separation of individual amino acids by paper chromatography.

Study of serum protein fractions by paper electrophoresis and comparison with chemical fractionation techniques.—In the course of this study, data has been collected for the reproducibility of electrophoretic patterns using Whatman no. 1 and no. 3 filter papers. It was observed that, although both the types of papers gave reproducible patterns, Whatman no. 1 yielded figures which were more comparable with those obtained by chemical fractionations. Albumin trailing was greater using no. 3 paper as indicated by lower albumin and higher gamma globulin percentages. Data has been collected using 25 samples of pooled normal sera, 12 cases of infantile cirrhosis, 30 cases of miscellaneous hospital samples and 38 cases from suspected enteric fever with Widal positive, negative and para typhoid A diagnosis.

Study of infantile and childhood cirrhosis.—Fifty clinically diagnosed cases of infantile liver cirrhosis, in addition to seventeen follow up cases were completed for the study of liver function tests and liver biopsy. Majority of the cases showed abnormal values for thymol turbidity, alkaline phosphatase, serum bilirubin and the transaminases. However, there was not much correlation between the various liver function tests and the liver biopsy picture. This work was carried out in collaboration with the Department of Clinical Pathology and Wadia Children Hospital, Bombay.

Quantitative estimation of amino acids in casein hydrolysate and the changes during the growth of P. pestis.—Buffered paper chromatographic procedures for the quantitative separation and estimation of the various amino acids have been standardised.

A nonvirulent EV strain of *P. pestis* was used for the work using casein hydrolysate medium fortified with salts. The liquid medium and the cells were analysed for the amino acid contents at intervals of 21 and 48 hrs. The following table gives some of the results obtained. Further work is in progress :—

Sample	Total Nitro-gen.	Amino Nitro-gen.	Tyro-sine.	Glycine	Glutamic acid.	Serine	Thre-onine.	Alanine.	Cysteine
MEDIUM.									
				<i>mgm/100 ml.</i>					
S-0	.. 389.2	221.6	82.79	69.96	145.2	169.0	85.65	59.74	56.32
S-21	.. 332.8	230.3	75.11	45.24	122.8	134.0	73.4	59.74	56.32
S-48	.. 320.4	145.8	127.0	23.0	83.66	115.1	58.01	51.21	73.89
CELLS.									
				<i>gm percent of dry weight.</i>					
C-21	.. 10.74	6.209	15.38	1.502	..	5.868	4.221	4.65	..
C-48	.. 12.16	7.319	1.966	..	..	5.279	..	4.898	..
EV	.. 10.57	8.907	3.067	5.467	5.048	6.365	1.687	4.984	..

IV. DEPARTMENT OF CHEMOTHERAPY.

GENERAL.

The department continued its activity in research, production, testing and training programme. As per the general plan, the research work carried out related to the synthesis and testing of potential hypoglycaemic agents, diuretics, antitubercular compounds, anticonvulsants and central nervous system stimulants. The hormone unit which was working for the last two years, continued its activity this year also. The work on the isolation of digitoxin from *Digitalis purpurea* grown in the Nilgiris was carried out and data regarding the isolation of the glycoside on a pilot plant scale were also obtained. The Drug Screening Unit continued its activity in testing bacteriostatic activities of the compounds synthesized. The demands for the products of the department rose by about 10 percent over those of the previous year.

ROUTINE AND PRODUCTION.

During the year under review, the department continued to manufacture and supply vitamin, sulpha drugs and quinine preparations to the hospitals and dispensaries of Government and Municipalities and to the Employees' State insurance Scheme. All demands were fully met. The table shows the products supplied during the year.

Statement showing the sales of the Vitamin and Sulpha Tablets during the period from 1st January 1961 to 31st December 1961.

Serial No.	Name of the Products.	No. of Tablets supplied.
1	Vitamin AD tablets	11,481,800
2	Vitamin A Forte tablets	160,100
3	Vitamin AD Forte tablets	871,878
4	Vitamin BC tablets	17,727,598
5	Vitamin BC No. 3 tablets	688,700
6	Vitamin B1 tablets	2,080,046
7	Vitamin B2 tablets	174,096
8	Vitamin C tablets	2,593,056
9	Nicotinic Acid tablets	512,566
10	Nicotinamide tablets	45,250
11	Multivitamin tablets	16,205,142
12	Vitamin K tablets	117,250
13	Magnesium Trisilicate tablets	519,800
14	Sulphathiazole tablets	4,431,200
15	Sulphadiazine tablets	8,112,400
16	Sulphaguanidine tablets	4,767,225
17	Quinine Sulphate tablets	321,465
Total ..		70,809,582

Serial No.	Name of the Products.
18	Pemon 29,481 lbs.
19	Sulphanilamide Cream 408 lbs.
20	Sulphathiazole Powder B. P. 5,595 kgs.
21	Solapsone Strong B. P. C. Solution 981 × 50 ml.

During the period under review 696 kg. of sulphathiazole powder was manufactured and 120 kg. of B. P. grade quinine sulphate was obtained from substandard quinine sulphate after purification.

The Analytical Section of the department analysed 848 samples of raw materials and finished products during the year. Microanalyses of 570 compounds synthesised in the department were carried out.

RESEARCH.

Antitubercular Compounds.—The screening of the monosemicarbazone (R-153) and the monoisonicotinylhydrazone (R-154) of 2-methyl-1:4-napthoquinone showed some encouraging antitubercular activity *in vitro*; hence the synthesis of a series of substituted hydrazones was further undertaken and these compounds are being screened for their antitubercular activity.

Various ethyl N-(2-thiazolyl) malonamates were prepared by the interaction of different 2-aminothiazoles and diethylmalonate. Ethyl N-(2-thiazolyl)-malonamates were then converted into N-(2-thiazolyl)-malonamic hydrazides. These hydrazides were reacted with p-alkoxyphenylisothiocyanates to give corresponding 1, 4-substituted thiosemicarbazides. These compounds are being tested for their *in vitro* tuberculostatic activity.

Oral antidiabetic drugs.—The work on the sulphonylureas and bis sulphonylureas was continued this year and systematic evaluation of their hypoglycaemic effect was carried out in the Department of Pharmacology. A few compounds which showed definite activity were prepared in larger quantity for tests. R-94 (N-Benzenesulphonyl-N'-isopropylurea) and R-131 (N-Benzenesulphonyl-N'-n-butylurea) tablets were prepared and given for clinical trials conducted at the K. E. M. Hospital under Dr. J. C. Patel. R-94, which showed highest hypoglycaemic action and probably the best known in the sulphonylurea family for the purpose, produced tinnitus and led to impairment of hearing. These symptoms disappeared when the drug was withdrawn. Since the effective dose is much lower than the dose tried clinically, efforts were made to try this compound (R-94) clinically again at a much lower dose and also in combination with vitamin 'C' or nicotinic acid. The results are being awaited.

Extensive clinical trials of the drug R-131 (N-Benzenesulphonyl-N'-n-butylurea) are being taken at the same place by Dr. J. C. Patel. This drug is showing promising results.

Oral Diuretic Agents.—In continuing the work in the s-triazine series, some more compounds were synthesised and are being tested as diuretic agents.

About forty 3, 4, 5-trisubstituted 1, 2, 4 triazoles were prepared to test them as diuretic agents. Preliminary screening tests carried out in the Pharmacology Department, Seth G. S. Medical College, indicate that R-207, R-234 and R-235 possess diuretic activity comparable to chlorothiazide. Since about 18 compounds out of 40 showed diuretic effect when fed to animals, the work was extended further to prepare 25 additional compounds and these have been submitted for evaluation of their diuretic activity.

Analgesic and muscle relaxing agents.—(a) Various 2-*o*-acetylmandelamidothiazoles were prepared by the action of *o*-acetylmandelylchloride on various 2-aminothiazoles and these amides were then reduced with lithium aluminium hydride to 2- β -hydroxyphenethylaminothiazoles. These compounds are being tested for their analgesic and muscle relaxing properties.

(b) Twelve new α -aroyl- γ -butyrolactones were prepared and converted into 3-aryl-4-(β -hydroxyethyl)-2-pyrazoline-5-ones by reacting with hydrazine hydrate. All these pyrazolones are being screened for their analgesic and anticonvulsant activity. Some of these substituted α -butyrolactones were reduced with lithium aluminium hydride to 1-aryl-2-hydroxymethyl-1 : 4-butanediols.

PILOT PLANT STUDIES.

A suitable method for the extraction of active glycosides from indigenously grown *Digitalis purpurea* as reported in last year's annual report was taken up for trial on a pilot plant scale. The working data, cost, yields, etc., will be published shortly.

To study the variables in the production of isoniocotinic acid hydrazide (I.N.H.) the preparation of isonicotinic acid ester from the corresponding acid and subsequent conversion to isonicotinic acid hydrazide, were studied on a laboratory scale and the suitable conditions for taking up the production on the pilot plant scale have been worked out.

Conditions for the pilot plant manufacture of the oral antidiabetic drug, tolbutamide, have been worked out and the trial production as per our Indian Patent Specification Nos. 64323 and 62696 on pilot scale is underway.

The work on the investigations on the extraction of insulin, ACTH, thyroindine, adrenaline, pepsin etc., carried out under the C. S. I. R., Scheme was completed and the report submitted to C. S. I. R.

BIOLOGICAL TESTING.

Twenty-five compounds were tested *in vitro* against *M. tuberculosis* (strain H37Rv.) in Youmans medium containing 10 percent horse serum by the method of Doub and Youmans (1950). Out of these, 8 compounds exhibited anti-tubercular activity at or below 10 µg/ml. concentration. Table I gives the name and lowest inhibiting concentration of these 8 drugs.

TABLE I.

Code No.	Formula.	Lowest inhibiting drug concentration.
R-469	.. p-iso-Propoxy-p'-(2-methyl-4-thiazolyl) thiocarbanilide.	10 µg/ml.
R-470	.. p-n-Butoxy-p'-(2-methyl-4-thiazolyl) thiocarbanilide.	10 µg/ml.
R-472	.. p-n-Amyloxy-p'-(2-methyl-4-thiazolyl) thiocarbanilide.	10 µg/ml.
R-475	.. p-n-Propoxy-p'-(2 : 5 dimethyl-4-thiazolyl) thiocarbanilide.	0.04 µg/ml.
R-476	.. p-n-iso-Propoxy-p'-(2 : 5 dimethyl-4-thiazolyl) thiocarbanilide.	0.1 µg/ml.
R-477	.. p-n-Butoxy-p'-(2 : 5 dimethyl-4-thiazolyl) thiocarbanilide.	1.0 µg/ml.
R-478	.. p-iso-Butoxy-p'-(2 : 5 dimethyl-4-thiazolyl) thiocarbanilide.	4 µg/ml.
R-501	.. o-Chloro benzoic acid hydrazide	10 µg/ml.

It can be seen that compounds R-475, R-476 and R-477 are showing promise. The best of these three appears to be R-475 whose *in vitro* activity equals to that of INH (0.04 µg/ml.) tested under the same experimental conditions. Hence the above compound R-475, and also the other two R-476 and R-477, merit further studies for chronic toxicity and *in vivo* curative activity against tuberculosis in experimentally infected mice and guinea pigs.

Tuberculostatic serum activity of animals fed with Capparis.—For this testing, the material was obtained from the following :—

(i) Fresh fruits and fresh fruit juice of *C. moonii* Wight were kindly supplied by M/s Vats and Sons, Khandala.

(ii) Dry fruits of Capparis (Konkan variety) were kindly supplied by Mr. Amrut Mody of Unichem Laboratories, Bombay and

(iii) Rudanil tablets were kindly made available by Shri G. Krishnamurthy Vaidyaguru, Mahopadhyaya of Bombay.

The fruits (dry *C. moonii* as well as fresh *C. moonii*) and the Rudanil tablets were extracted with water and groups of animals were fed separately with (a) aqueous extracts as obtained above, (b) fresh fruit juice, (c) dry fruit powder of *C. moonii* and Rudanil tablets and (d) residual powder of *C. moonii* after removal of aqueous extract. The sera of the treated animals were tested *in vitro* against virulent human strain of *M-tuberculosis* (H37Rv) 3, 7, 14, 21, 28 days after administration of drug. The results showed that only the sera of animals fed with dry fruits of *C. moonii* (konkan variety) and the fresh fruit juice of *C. moonii* Wight inhibited the growth of *M. tuberculosis* (H37Rv).

Tuberculostatic serum activity of animals fed with 10 synthetic compounds was also tested. These compounds were R-373, R-365, R-376, R-368, R-362, R-349, R-354, R-360, R-153 and R-154. Out of these only sera of animals treated with compound R-153 inhibited the growth of tubercle bacilli *in vitro* at the dosage level used.

Testing of compounds against gram positive and gram negative organisms.—Eight aminobenzimidazole derivatives were tested against *E. coli* (0112) and *S. aureus* (P 209) at concentrations of 200, 100, 40, 2 μ g/ml. Results of the experiment showed that none of these 8 drugs inhibited the growth of either the *S. aureus* or *E. coli* organisms even at a concentration of 200 μ g/ml.

Screening for Central Nervous System (C. N. S.) Activity.—Nine compounds were tested for C.N.S. activity. These were R-25, R-506, R-507, R-508, R-510, R-511, R-593, R-599 and R-601. Deptazole was kept as a standard control. The compounds were injected intravenously into the Haffkine Institute mice of 20 gms. average weight, keeping four mice per dose. Observations were made on the spontaneous movement, sedation, respiration, convulsions, piloerection, etc.

From the experimental results it was found that R-25 gave good respiratory stimulation, better than deptazole. It was also non toxic at 200 mg/kg. The respiratory stimulation was quite high (+ + + +) even at dosage level of 50 mg/kg. Also R-593 gave high (+ + + +) respiration at dosage level 200 mg/kg and it was also non toxic upto 800 mg/kg. Higher dosage was not used due to non-availability of compound.

Oral diuretic agents.—The department supplied R-37 2-(m-chloroanilino)-4-amino-s-triazine, which showed potent diuretic property, to the department of Pharmacology Seth G. S. Medical College for detailed and thorough investigation regarding its activity and toxicity. The results are being awaited.

Compounds, R-362, R-373 and R-376 were fed orally to Haffkine Institute mice of average weight 25 gms. at three dosage levels 3 gms/kg., 1.25 gm/kg and 0.125 gm/kg. The drugs were fed for 30 days. The results showed that animals fed with all these drugs, at all three dosage levels, gained weight similar to untreated normal controls. Also, none of the experimental animals fed with the drugs died due to the chronic drug toxicity. Histopathological examination of the organs of treated animals kindly carried out by Dr. Sant, Assistant

Director, Clinical Pathology Department, showed that the lungs, liver, spleen, kidney, stomach and heart of these animals was similar to those of normal, untreated controls and nothing abnormal was detected on microscopical examining of these tissues, except in case of animals fed with R-376 (at all the 3 dose levels) when the liver of animals showed fatty degeneration accompanied with peripheral zonal necrosis.

V. DEPARTMENT OF CLINICAL PATHOLOGY AND DIAGNOSTIC REAGENTS.

GENERAL.

During the year under review, the various functions of the Department were fully discharged by the department. Antibiotic-sensitivity test was improved with the use of a four-hours growth in broth, the test time has been reduced to two days in all. Similarly a rapid two-hour pregnancy test, using hyalase, has been evolved for a quick diagnosis in cases of threatened abortion or excessive bleeding. Dr. J. K. Bhatt, joined the Department as a Medical Officer-in-charge, Mobile Unit, from 27th January 1961. Dr. B. G. Modi was deputed for a course of Training in Radiation Medicine, in Delhi, under the auspices of Department of Atomic Energy, Government of India, for three months from December 1960. Shri A. S. Narasimham, attended a Seminar on Enterobacteriaceae held at the Central Research Institute, Kasauli, from 5th to 9th June 1961, and read a paper on typhoid antigens.

ROUTINE AND PRODUCTION.

Arrangements are progressively being made for carrying out specialised types of diagnostic work by the department and reducing simple routine tests. The department now carries out typing of salmonella cultures. Nichol's virulent strain of *T. pallidum* is maintained and the immune fluorescence antibody (I.F.A.) technique has been developed for syphilis. Thirteen passages were carried out intratesticularly in rabbits and sufficient antigenic material has been collected with a view to start IFA test as early as possible. The venereal diseases reference laboratory section is proving useful. Guidance was given to a number of workers, students and laboratory personnel in regard to the various standard techniques and reagents.

Mobile Unit.—The medical officer was appointed in the month of January. There was a suspected epidemic of enteric fever in the town of Kalyen. The unit had gone there and with the help of the District Health Officer, Thana, and Local Municipal health authorities, this was investigated. Another epidemic of suspected cholera in Bhivandi was also investigated. Containers for carrying out of the collection of material in a suspected epidemic of gastroenteritis in Malegao were sent.

General Bacteriological work.—Samples of suspected food and beverages received from the Forensic Science Laboratory, Bombay, are being examined for evidence of toxin or poison.

Histological Section.—During the year under review, 3440 pathological specimens, received from different hospitals in the State of Maharashtra 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 total number of blocks cut were 4650.

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

CP-H-139	..	..	Tuberculous prostate.
CP-H-885	..	..	Granulosa cell carcinoma.
CP-H-1010	..	..	Adenocarcinoma testes.
CP-H-1007	..	..	Carcinoma thyroid.
CP-H-1308	..	..	Gynecomastia.
CP-H-1384	..	..	Pleomorphic adenoma of orbit.
CP-H-1527	..	..	Retinoblastoma eye.
CP-H-2043	..	..	Leiomyosarcoma-uterus.
CP-H-2499	...	..	Chondrosarcoma thigh.

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 test. There were 426 calls for blood collection. 1230 Widal and clot cultures were carried out. Widal tests were positive in 486 cases. 114 cultures were isolated, of which 73 were of *S. typhi* and remaining 41 were of *S. paratyphi A*.

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

I. *Serological Examination :*

(1) Wassermann test	..	..	..	371
(2) Kahn test	..	..	..	411
(3) V. D. R. L.	..	..	..	181
(4) Triple Widal test	..	..	..	1,724
(5) Agglutination test for—				
(a) Typhus	..	..	..	1,230
(b) Brucellosis	..	..	..	1,230
(c) Paul-Bunnell test	..	..	..	9

II. *Bacteriological and Biological tests :*

Clot culture for enteric group	..	..	..	1,230
Urine culture for pathogenic organisms	..	..	..	143
Throat swab for Diphtheria	..	..	..	385
Stools and rectal swabs for culture	..	..	..	27
Sputum and body fluids for A.F.B. for smear, culture and animal inoculation tests.				556,93,20
Blood culture routine	..	..	..	44
Preparation of autogenous vaccine	..	..	..	62
Bone marrow	..	..	..	2
Material for smear examination for the presence of pathogenic organisms like G.C. etc.				29
Stool	..	..	..	525
Urine	..	..	..	528
Prothrombin time estimation	..	..	..	20
Pregnancy test	..	..	..	1,135
Rideal Walker test	..	..	..	66
Antibiotic sensitivity test	..	..	..	127

Diagnostic Reagents.—This section is proving useful. The demands for all the reagents continue as before. There is a general increase in the demand for group sera, the supply of which had to be short of the demands because of difficulties in production.

The supply of diagnostic reagents made during the period under report are :—

Killed suspension for Widal and Weil-Felix test	..	251,070 ml.
Blood grouping sera	..	18,931 ml.
High Titre sera and Amboceptor	..	1,497 ml.
Kahn Antigen	..	13,150 ml.
W. R. Antigen	..	730 ml.
Russell's Viper and Cobra Venom Solution	..	2,371 ml.
Biological stains	..	573,000 ml.

RESEARCH.

Sero-typing of E. coli strains.—*E. coli* strains isolated from stools, sputum samples, and vaginal swabs were received from the city hospitals and the Polio Research Unit, Bombay. In all, 209 strains were typed. The predominant sero-types isolated from stool in the order of frequency were 0119, 0112, 0111, 086 and 0127. From vaginal swabs, the commonest serotypes isolated were 0112 and 086.

Bacteriological study of cervix in sterility.—Eighty-five cervical swabs from sterility cases were studied culturally and the two predominant organisms in these cases were *E. coli* and Staphylococci. The pathogenic significance of these organisms in sterility is under investigation.

Anaerobic studies on S. typhi.—Samples of anaerobically grown organism serving as antigens for slide-agglutination tests are being studied. Addition of dyes to increase the sensitivity of the antigen is also being investigated.

Agglutinin level against S. typhi and S. paratyphi in normal population.—About 400 subjects have been studied so far. The investigations are in progress.

Pregnancy test : Use of hyalase to hasten the reaction in Rat test.—This method was found to be advantageous in saving time and preventing toxic reactions to experimental animals. About 300 tests carried out with hyalase-mixed urine on rats, gave in 2 hours 95 % agreement in results with the routine 24 hours rat tests. The study is in progress.

Immunological studies on Tissue Cells : Cellular sequence of events in antibody production.—Attempts are under way to detect and separate out the type of cells involved in antibody production by different techniques like the pyronin take-up, sticking capacity in tissue culture and adherence on sheep cells of the various tissue cells.

Studies on the alimentary canal of rat-fleas.—The plague growth promoting effect of the whole alimentary canal, the proventriculus the stomach and the intestine separately of the rat-fleas are being studied.

Study of puerperal pyrexia cases.—About 18 cervical, uterine and vaginal swabs were studied for bacteriology of puerperal pyrexia cases from Wadia Maternity Hospital. About 50 % of the cases gave *E. coli*.

Antibacterial principles from plants.—Different extracts from few common plants have been tested for their antibacterial reactions against typhoid and cholera group of organisms. Five plants appear to have some suggestive lethal effects on these organisms. Detailed studies are in progress.

Anti-streptolysin O levels.—Work on the estimation of antistreptolysin 'O' levels in normal and suspected cases of rheumatic fever continued. An analysis of over 100 tests carried out indicate that an anti-streptolysin titre of over 1 : 100 may be of diagnostic value. Further studies are in progress.

Studies on Byssinosis.—The experimental work was undertaken regarding the etiology of "Byssinosis" in collaboration with department of Industrial Health of Tata Services Private Limited. So far the antigen extracts of the various dusts from the various departments of the textile mill have been collected and prepared. These were tested on laboratory animals (Rabbits). Another batch of rabbits has been kept for observation in the same departments. About sixteen cases of clinically diagnosed "Byssinosis" have been tested with the prepared antigen along with a similar batch of normal controls. The study is in progress.

VI. DEPARTMENT OF ENTOMOLOGY.

GENERAL.

The Assistant Director attended the 10th Pan Pacific Science Congress held in Hawaii for 3 weeks in August to participate in two symposia on Venomous animals and Bombay rats.

The Junior Scientific Officer toured the districts of Kolaba, Satara and West Khandesh to collect the information about the snakes for the Maharashtra District Gazetteers.

The department attended to 140 enquiries during the course of the year.

RESEARCH.

Mouth parts of X. cheopis and X. astia.—The mouth parts of *X. cheopis* and *X. astia* differed in the length of these parts, being greater in the females than in the males, and also in the numbers of teeth and papillae. In *X. cheopis*, two thirds of the distal part of the lacina is provided with teeth while in *X. astia*, teeth are found only upto half of the distal length of the lacina. The number of teeth in females and males has been found to be 70 and 75 in *X. cheopis* males and females respectively, and 60 and 65 in *X. astia* males and females respectively. On the overall basis, *X. cheopis* in the both sexes have more teeth than *X. astia*.

Insecticide testing.—Standard factors with respect to the modified Potter's tower were worked out for the dusting and recovery of 5% DDT. powders. Mean value of these factors gave a fine residue amounting to about 0.80% of the total quantity of powder dusted in a Petridish having an area of 0.0065 sq.ft. *X. cheopis*, *X. astia* and *Ct. felis* collected from the field were tested for their susceptibility to DDT and compared with the fleas bred in the laboratory. The mortalities in all cases showed that they were susceptible to the insecticides.

Rat burrows.—The field observations on the burrow pattern of *B. bengalensis* showed that 176 burrows were of the ramifying type and 31 simple and blind. The patterns of these burrows, the prevailing temperature, percentage humidity and the fauna were recorded. It was noted that out of 207 burrows, only 11 were infested with fleas and all the 426 fleas recovered from the burrow were *X. astia* of which 179 were males and 247 were females. Rats were recovered only from three burrows in 207 attempts.

Rat population and flea indices.—Work done in the Port Trust area on the frequency of rat population and the flea index for 3 months has revealed that out of 1,180 rats collected during this period, 910 were *Rattus rattus* and 235 were *B. bengalensis*. The total no. of fleas recovered from these rats was 380, out of which 283 were *X. cheopis* and 97 were *X. astia*. Out of these 380 fleas, 30 *X. cheopis* were recovered from the *B. bengalensis*. During the last three months, 290 rats were collected at Mahim out of which 215 were *B. bangalensis* and 71 were

Rattus rattus. Out of the 215 bandicoots collected, 114 were males and 101 were females and out of 71 *Rattus rattus* 32 were males and 39 were females. 241 fleas were collected during this period out of which 207 were *X. cheopis* and 534 were *X. astia*. The flea index was found to be 2.5.

A new method of recovering the fleas was tried in the Port trust area. The flea index for the area was found to be 0.33. Flea pool experiments were done with the fleas obtained from the Port Trust and results were found to be negative to plague. Experiments done to estimate the period of starvation and the longevity of fleas at different temperatures and humidity indicates that the flea survives for 3.5 to 4 days after one feeding; this period being slightly longer in females than in males. It was further observed that females take more time than males for feeding. The average number of attempts to feed which a flea makes before the actual act of feeding were worked out for *X. cheopis*.

Studies on hormones in Musca nebulosa :—Histological studies, on some glands in the housefly *Musca nebulosa*, during different stages, have shown that the corpus allatum remains inactive during the pupal period. The corpus cardiacum on the other hand shows great secretory activity, particularly at the time of emergence. Large stainable colloidal particles are observed in the cells of corpus cardiacum and in the oldest pupae these colloidal particles are observed to have been accumulated in the intercellular spaces, which are closely associated with the aortic wall. This presumably represents their mode of entry into the haemolymph. The peritrichal glands degenerate completely by the time the adult is ready to emerge or within a few hours after emergence. From the histological evidence, therefore, it may be concluded that the corpus cardiacum plays an important role in the differentiation and the growth of the imaginal buds, and also in the mechanism of emergence.

Studies on the neurosecretory cells of the adult female housefly confirm the histological findings that the neurosecretory material increases during ovary development. The Acid Alcian Blue method of staining of Adams and Sloper showed that in young females the neurosecretory cells contain little secretory material but in older females the intensity of staining of this material increases considerably and then falls by the time oviposition has begun. This cyclical change is probably associated with ovary development.

Confirmatory experiments have also been done to establish the fact that extirpation of corpus allatum from young females prevents maturation of the ova and transplantation of the corpus allatum from a mature female will induce ovary development in such extirpated females. The ring gland from early larvae can also stimulate ovary development in the extirpated females, but ring glands from older larvae failed to promote ovary development. On the other hand the second series of experiments on the extirpation of the neurosecretory cells, failed to confirm the previous results. The origin and development of these endocrine glands is being studied by histological sections.

Studies on the susceptibility of Rattus rattus to Plague.—Rats were collected from Javli and the ectoparasites recovered. Only *X. cheopis* were recovered in this collection. Flea pool inoculation experiments were done and the results were found to be negative. *Rattus rattus* males collected from Pandharpur and Khardi. 95 percent of them were found to be resistant to plague. The females are kept for breeding in the laboratory. Collection of rats from Kamati-pura (E. West) ward showed that *B. bengalensis* is the predominant species of rat in the locality. *X. astia* were found to be the main flea on *B. bengalensis*. The traps used for these experiments were single rat-catch-traps. The work on similar lines was done at National Park, Borivli. Majority of the *Rattus rattus* collected from this locality were white bellied. In the preliminary experiments on breeding the following results were obtained.

Pregnant female rats were collected from the fields and only 10 percent of these delivered normally in the laboratory. The rest were either premature births or the mother ate the young ones. Of these born normally 56 percent have now lived upto 72 days and are due for challenging. Electric shock, inoculation of spermatozoa and desensitising were used to effect breeding. Only the last method has succeeded and that too only in *Mus musculus*. The rats that survived definite doses of *P. pestis* have been bled and the serum is processed. This is being used for compliment fixation test and flourscent anti-body technique.

Frequency of rat population by the capture and recapture technique procedure was done at Bhandup, Javli and Kelghar.

Following results were obtained at Bhandup :—

Table showing the rats collected from 20th September, 1960 to 15th December, 1961.

Rat type.	Male.	Female.	Total.	Percentage.	Sex-ratio.
R. rattus	169	76	245	24.5	2.2 : 1.0
B. bengalensis ..	143	59	202	20.2	2.5 : 1.0
B. Indica	4	....	4	0.4	(1) : 0
L. nagarum	261	230	491	49.1	1.1 : 1.0
B. gigantea	23	30	53	5.3	1.0 : 1.8
G. gujarati	7	8	15	1.5	1.0 : 1.1
Total	607	408	1,010		

Ectoparasites collected and the flea indices of X. Cheopis.

Rat species.	Total No. of Rats.	X. cheopis.			Flea index.	Mites.	Ticks.	Lice.
		M.	F.	T.		D. muris.		
R. rattus ..	245	138	117	255	1.05	113	17	53
B. bengalensis..	202	13	3	16	0.07	142	4	41
B. Indica ..	4	..	..	..	..	....	..	..
L. nagarum ..	491	..	..	..	..	....	6	..
B. gigantea ..	53	4	3	7	0.15	43	..	..
G. gujarati ..	15	..	..	..	..	....	..	..
Total ..	1,010	155	123	278	0.26	398	27	94

Table showing the percentage of different rats collected at Javli and their sex ratio.

Rat species.	Male.	Female.	Total.	Percentage.	Sex-ratio.
R. rattus ..	105	72	177	63	1.0 : 0.7
B. bongalensis	85	13	98	34	1.0 : 0.16
L. budduga ..	3	....	3	1	(3) : 0.0
L. nagarum ..	....	5	5	2	0.0 : (5).0
Total ..	193	90	283	100	10 : 31

The work on the similar line is now started at Kelghar in Satara District. The results are awaited.

Studies on X. cheopis and Plague infection.—In collaboration with Clinical Pathology Department.—Experimentally in pit a clear influence of climatic factors and vector efficiency of *X. cheopis* have been established. This temperature effect is curiously establishing a biological relationship between *X. cheopis* and the Plague bacillus.

The presence of Plague growth promoting factor in the alimentary canal of *X. cheopis* is noted.

The larvae of *X. cheopis* are able to develop in the presence of only infected faecal droppings of the mother fleas, whereas *X. astia* is not able to do so. This suggests possibility of a symbiotic relationship between *X. cheopis* and *P. pestis*.

ROUTINE AND PRODUCTION.

The Department maintained a regular programme of spraying various departments of the Institute for the purpose of cockroach and fly control and also provided various departments with the poisoned rat-bait and rat traps for rat control. During the year, the Department spent 13 Kg of DDT powder, 9 Kg of BHC and 18 litres of pyrethrum extract and about 40 litres of kerosene was used for the purpose of preparing various formulations. Trapping was conducted in the residential quarters of the Institute to control the rats in the Institute premises.

Department supplied to the Jamnagar, Baroda, and Aurangabad Medical colleges, the specimens and the permanent mounting material of Public Health importance. Few snakes are kept in modified cinkered glass cages. The electric light provided inside and dark outside helps one to observe snakes from outside without disturbing the animal and study their behaviour. Milking of the snakes is now done in a stainless steel funnel which is fixed on a stand with a ampoule below it. This provides a direct collection of venom in the ampoule and thus minimises the chances of venom being lost in the process of transferring and also minimises the loss in breakage.

Scorpions are being reared in special cages designed for the purpose. A modified technique was evolved for collecting the venoms of the scorpions by giving electrical shocks which varied from 6 volts in *Buthus* species to 12 volts in *Palamneus* species respectively. The venom thus extracted was collected in the measuring glass from where it was transferred into ampoules. The total quantity of snake venom extracted and supplied during the year was 70·2958 gms. and 124·5339 gms. respectively. The total number of snakes purchased in the whole year was 216 out of which 3 were cobras, 80 were vipers, 3 were kraits, 37 were echis and 93 were other non-poisonous snakes including one python. The department sold 576 dead snakes to various parties for educational and other purposes.

The total quantity of scorpion venom extracted this year was 2·6421 and 2·5295 gms. supplied for research. The total number of scorpions purchased this year was 7370. These were mainly purchased from Ratnagiri, Kolaba, North Satara and Ahmednagar Districts.

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 9 dead rats, 44,166 live rats from the City and 4,571 live rats from the Bombay Port Trust area were examined for plague. No plague infection was detected.

VII. DEPARTMENT OF IMMUNOLOGY.

GENERAL.

The need for increasing the production facilities of the department has been keenly felt for the last few years on account of the increasing demands for the products of the department. Forty-four acres of additional land adjacent to the present farm at Pimpri were acquired in March-April this year to develop the farm into a full fledged manufacturing Institution. A bleeding chamber to be built at Pimpri Farm next year will enable us to bleed horses there after immunization with snake venom and bring the plasma to Bombay for further processing. A few trial bleedings of horses immunized with venom were made at Pimpri towards the end of this year and the separated plasma were transported to Bombay for further processing.

The research activities of the department have been maintained inspite of pressing demands on its technical staff for production work. For the production of high titre tetanus and diphtheria toxins, peptone media was successfully replaced with digest media and semisynthetic media. Horses are being immunized with toxins and toxoids prepared with the new media and the preliminary results obtained are encouraging. A new medium for production of pertussis vaccine is being studied and preliminary results show that it gives better growth.

After the retirement of Dr. A. K. Hazra, Dr. S. S. Rao succeeded him as the Assistant Director. Dr. M. K. Habbu officiated as the Senior Physical Chemist from 7th August 1961 to 20th November 1961 in place of Shri Y. S. Nimbkar, who was deputed under the Colombo Plan for higher education and training in U. K. He returned after obtaining his Diploma in bacteriology at Manchester and training at the M.R.C. Biological Standardization laboratory and took over from 21st November 1961. Shri A. S. Narasimhan officiated as the Senior Physical Chemist from 20th November 1961.

RESEARCH.

Studies in Tetanus toxin production.—Two media were tried for the production of tetanus toxin (a) partial peptic hydrolysate of beef, and (b) Mueller's medium containing tryptic digest of casein. The ability of different strains of *Cl. tetani* to grow in these two media were studied. Attempts were also made to adapt the more promising strains and to isolate high toxin yielding variants. In the media containing peptic digest of beef, tetanus toxins having a mouse MLD of 1 : 260,000 to 300,000 have been obtained with a variant of strain A-471. In Mueller's medium, toxins having MLD of upto 1 : 800,000 have been obtained. Efforts are now being made to convert them into toxoids and to purify them before issuing for human use. Some horses have been taken up for immunization with tetanus toxin and toxoid produced in the peptic digest media. The preliminary results obtained are encouraging.

Studies in production of high titre diphtheria toxin.—Papain digest of veal was tried successfully as a medium for production of diphtheria toxin.

Optimum conditions for digestion were worked out. Toxins with 100 to 140 Lf per ml could be produced consistently in this medium. The toxoids produced gave satisfactory immune response in guinea pigs. The toxoid has been purified and complies with the Indian Pharmacopoea standards for the Diphtheria P.T.A.P. toxoid. The use of this toxin in the hyperimmunization of horses has also given very encouraging results.

Toxic effect of rabbit anti-rat liver sera to rats.—Anti-rat liver sera prepared by immunization of rabbits with rat liver preparations was found to have a toxic action when injected intravenously into 23-day old rats. The normal rabbit serum was non-toxic. The symptoms at the time of death were, paralysis of tail and neck, gasping, convulsions and spasm of anterior limbs. Out of the five organs studied, the liver and spleen showed profound changes. In the spleen there was hyperaemia, congestion and increase in red pulp, while in the liver, there were areas of haemorrhage and early fatty changes.

Oxidative phosphorylation of rat liver mitochondria in presence of antiserum.—Oxidative phosphorylation is a sensitive criteria for the integrity of structure and function of mitochondria. Rabbit rat-liver mitochondrial sera was found to bring about uncoupling of oxidative phosphorylation of rat liver mitochondria.

Isolation of high toxin yielding strains of C. diphtheriae.—The technique of Groman of plating out *C. diphtheriae* on suitable toxin producing medium containing 5 units of diphtheria antitoxin and picking up colonies showing quick growth and larger precipitin rings, was used to isolate high toxin yielding strains. A variant was isolated which showed 180 Lfs compared with 100 to 140 Lfs. shown by the parent strain under identical conditions.

Effect of oleic acid on diphtheria toxin production.—The inhibition of toxin production by *C. diphtheriae* in media containing excess iron is wellknown. Recently, it was reported by Groman that oleic acid stimulates the production of an inhibitor for the diphtheria phage. The effect of oleic acid on toxin production was therefore studied. It was found that in the presence of very small amounts of oleic acid of the order of 10 micrograms per ml. no toxin was produced even in the presence of optimum concentrations of iron. The mode of action of oleic acid in inhibiting diphtheria phage and preventing diphtheria toxin production is being studied.

Production of Pertussis vaccine.—A new medium for the production of pertussis vaccine using casein hydrolysate-charcoal-agar is being studied. The medium is simple and easy to prepare in the Institute and preliminary results have shown that better growth and higher yields are obtained with it as compared to the other media. Further work is in progress.

Preparation of antitoxic beta globulin from horse sera and study of its degradation by pepsin.—It has been found by electrophoresis that about 80 per cent. of the

antibody activity in the serum of hyperimmunized horses lies in the beta globulin region. For the isolation of this antibody protein from serum of horses hyper-immunized with diphtheria toxin, the following procedure gave best results and homogenous fractions. The antidiphtheria horse antiserum was purified by the 'phenol method' developed in this laboratory which yields antisera containing only beta and gamma globulins. This was further processed by adsorption on DEAE and CM celluloses. The antibody activity was completely lost when adsorbed and eluted through DEAE cellulose. With CM cellulose however, the antibody activity of the beta globulin remained intact. The product was also homogeneous. When the antibody beta globulin was treated with pepsin at pH between 3.5 and 4.5, it was split into two fragments one having the mobility of gamma globulin and the other the same as the original beta globulin. The first fragment had the antibody activity while the second was not active.

Phosphatases in venoms of Cobra and Russell's viper.—The action of the venoms of Cobra and Russell's viper on ATP, ADP and AMP was investigated. It was observed that with ATP the venom liberated inorganic phosphate with the simultaneous formation of a precipitate. This type of action is characteristic of a polymerizing enzyme. This possibility was investigated using P^{32} . The results were not conclusive and the investigation is being followed up.

Composition of venoms of Krait and Saw scaled viper.—The venoms of krait and saw scaled viper were investigated in detail using the starch gel electrophoresis technique. Krait venom was found to contain 4 toxins which explains its higher toxicity as compared with the other snake venoms investigated in this laboratory. The saw scaled viper venom was found to contain one toxin which was identified as a proteolytic enzyme having a strong coagulant action.

Composition of scorpion venoms (in collaboration with Pharmacology Department).—The composition of venoms of two species of scorpions *Buthus tamulus* and *Palamnaeus gravimanus* was investigated with special reference to their enzymic make up and guinea pig ileum contracting factor.

Work on plasma fractionation (in collaboration with Blood Bank).—Experimental batches of gamma globulins were prepared from the pooled human serum by using method of Kendall. The yield and purity were satisfactory. This product was also tested for antiviral activity against polio and showed high antibody content. It was released for human trial for use in prophylaxis against infective hepatitis epidemic which was prevalent in many cities in the state. Experiments to prepare the fraction from human plasma are in progress. Experiments to prepare the gamma globulin from human placental extracts have been undertaken. Work undertaken in small batches showed good promise. Handling placenta in large quantities is creating problems which need to be tackled. Immunological studies with these products are also in progress.

ROUTINE AND PRODUCTION.

The following quantities of antitoxins, toxins and toxoids have been produced in the department.

Anti sera.				litres.
Tetanus antisera	..	..	..	1,105.4
Antivenom serum	..	..	..	516.4
Diphtheria antiserum	..	..	..	193.7
Gas Gangrene antiserum	..	..	..	16.5
Total				1,832.0

Toxins, Toxoids and Vaccines.				litres.
Tetanus toxin	..	..	..	1,212
Diphtheria toxin	..	..	..	391
Welchii toxin	..	..	..	32
Tetanus toxoid	..	..	..	481.5
Diphtheria toxoid	..	..	..	119.0
H. pertussis vaccine	..	..	..	12.35
Triple vaccine	..	..	..	22.1

The following quantities of the products of the department were supplied during the year :—

				Quantity issued in ampoules.
1.	Tetanus antitoxin 1,500 I.U. 2 ml	..	..	305,832
2.	Tetanus antitoxin 5,000 I.U. 5 ml	..	..	2,151
3.	Tetanus antitoxin 10,000 I.U. 10 ml	..	..	48,278
4.	Tetanus antitoxin 10,000 I.U. 4 ml	..	..	2,896
5.	Tetanus toxoid 10 ml	..	..	1,632
6.	Tetanus toxoid 5 ml	..	..	1,932
7.	Tetanus toxoid 1 ml	..	..	109,994
8.	Diphtheria antitoxin 1,000 I.U. 1 ml	..	..	1,480
9.	Diphtheria antitoxin 5,000 I.U. 5 ml	..	..	889
10.	Diphtheria antitoxin 10,000 I.U. 10 ml.	..	..	13,832
11.	Diphtheria antitoxin 10,000 I.U. 5 ml.	..	..	6,917
12.	Diphtheria toxoid (PTAP) 5 ml	..	..	1,384
13.	Diphtheria toxoid (PTAP) 1ml	..	..	793
14.	Antivenom 10 ml	..	..	51,801
15.	Anti gas gangrene serum 10 ml	..	..	12,469
16.	Normal Horse serum 10 ml	..	..	189
17.	Schick Test toxin, 25 tests	..	..	194

The sale value of the products of this department was Rs. 20,79,150 during the year 1961.

VIII. DEPARTMENT OF NUTRITION.

GENERAL.

The Department of Nutrition of the Government of Maharashtra continued to be located at the Haffkine Institute and is actively collaborating in the academic and research activities of the Institute. Three research equities sponsored by the Indian Council of Medical Research, Indian Council of Agricultural Research, and the Council of Scientific and Industrial Research, are continued in the Department.

RESEARCH.

Nutritional evaluation of food stuffs commonly consumed in the State.—The work consists of the analysis of foodstuffs for different nutrients, viz., proximate principles, the newer B-vitamins, amino acids and minerals. In continuation of the work reported last year, 13 different foodstuffs, viz. Mustard leaves (*Brassica juncea*); Agathi flowers (*Sesbina grandiflora*); Ghosale (*Luffa aegyptica mill*); Onion stalks (*Allium cepa*); Garmal (*Coleus barbatus*); Almond (*Prunus amygdalus*); Garlic (*Allium sativum*); Green karwanda (*Carrisa carandus*); Strawberry (*Fragaria vesca*); Rai-amla (*Phyllanthus distichus*); Rose apple (*Eugenia jambos*); palmyra fruit (*Borassus flabellifer*); Zizyphus, Ahemadabad round type, (*Zizyphus mauritiana*) were analysed for edible portion, moisture, protein, fat, minerals, fibre, carotene, thiamine, riboflavin, nicotinic acid, vitamin C, chlorides, oxalic acid, acidity and alkalinity. Among the foodstuffs analysed, almond (dry) and garlic were found to contain fair amount of riboflavin (286, 285 mcg./100 g., respectively). Agathi flowers and dry garlic were fairly rich in nicotinic acid and thiamine content, respectively (1.05 mg., 260 mcg/100 g., respectively). Mustard leaves and Zizyphus are good sources of vitamin C. Mustard leaves contain carotene equivalent to 4,500 I.U. of vitamin A/100 g.

Effect of commercial sterilization on the nutritive value of milk.—Further to the studies reported last year, experiments were carried out to investigate the effect of boiled, pasteurised and sterilised milk on regeneration of liver protein, haemoglobin and red blood cells in rats. The results on regeneration of liver protein did not show any appreciable difference between the groups fed on boiled, pasteurised and sterilised milk. On the other hand, the rate of regeneration of red blood corpuscles and haemoglobin was less in rats fed on sterilised milk as compared to those fed on boiled and pasteurised milk.

Studies in proteins and certain B-Vitamins interrelationships.—In continuation of the studies reported last year on the interrelationship of vitamin B₁₂ and pantothenic acid, further experiments were carried out to find out the effect of pantothenic acid deficiency on regeneration of blood serum protein in 24 young male rats. Pantothenic acid deficiency (which was manifested by decrease in growth, loss of hair and sticky and 'spectacled' eyes) was produced in a group

of 12 rats within five weeks of feeding pantothenic acid deficient diet. The different components of blood serum protein in deficient as well as normal animals were estimated by employing the method described by Kibrick and Blonstein (1948). Levels of albumin and gamma-globulin were significantly decreased in deficient animals. A corresponding increase in beta-globulin was also observed.

Certain aspects of protein metabolism in relation to vitamin A.—Investigations of different tissues and urine for essential amino acids and certain enzyme activities in hyper and hypovitaminosis-A have been completed. The results obtained in this investigation are briefly summarised as follows :—

(i) In vitamin A deficiency, isoleucine and threonine in livers were lowered whereas tryptophane and phenylalanine were elevated. The levels of leucine, isoleucine, valine and methionine in livers of hypervitaminotic rats decreased significantly.

(ii) In vitamin A deficiency, valine and methionine in hind leg muscles decreased, whereas slight increase in phenylalanine was observed. In case of hypervitaminosis-A, leucine, isoleucine, valine and methionine in leg muscles were at lower levels.

(iii) Deficient rats excrete more of leucine, isoleucine, valine, methionine, and threonine and less of phenylalanine and tryptophane.

(v) Of the enzyme studied, the activities of succinic dehydrogenase, lactic dehydrogenase, choline dehydrogenase and alkaline phosphatase in livers were depressed and that of alcohol dehydrogenase increased in vitamin A deficiency.

Protein metabolism and Vitamin B₁₂ with special reference to inhibitors present in soyabean—(a) *Studies in Growth.*—It was reported previously that when vitamin B₁₂ was administered orally to rats, the ill-effect of feeding raw soyabean on growth was overcome. The feeding experiments, wherein B₁₂ was administered intraperitoneally, were carried out to study further the mode of action of vitamin B₁₂ vis-a-vis the growth inhibitors in raw soyabean. Administration of vitamin B₁₂ intraperitoneally partially affected the retardation of growth in rats fed on raw soyabean diet. It is, therefore, postulated that the reaction between B₁₂ and growth inhibitors in raw soyabean takes place in the alimentary canal.

(b) *Incorporation of succinyl sulphathiazole and iodo casein in soyabean diet.*—It was found that B₁₂ deficiency which is manifested by reduction in red blood cells and haemoglobin was not produced in rats fed on raw soyabean diet, as was reported in the literature. It was, therefore, considered interesting to study the effect of incorporation of succinyl sulfathiazole and iodocasein into raw soyabean diet on production of B₁₂ deficiency. Unexpectedly, it was observed that even the incorporation of succinylsulfathiazole and iodocasein in raw soyabean diet did not produce B₁₂ deficiency in experimental rats. Further experiments are in progress.

IX. DEPARTMENT OF PHARMACOLOGY

GENERAL.

During the year under review, a great variety of drugs and other products were tested. These consisted of Pharmacopoeial preparations, patent and proprietary medicines, chemicals, special biological products, insecticides, disinfectants, glassware, etc. The pressure of the routine work continued to be heavy and consequently the members of the staff could spend only a smaller part of their time on research problems. Nevertheless, research was continued as before and some significant contributions were made. Shri M. E. Kulkarni, Junior Scientific Officer, proceeded to Canada under Colombo Plan for a period of one year.

RESEARCH.

Pharmacological study of Tinct. saussurea.—This work has now been completed. *Tinctura saussurea* prepared according to I.P.L. contains an essential oil. It has been shown that the presence of essential oil is not desirable as it produces broncho-constriction instead of relaxation. Therefore *Tinctura saussurea* from defatted roots has been suggested as a more beneficial galenical.

Clinical trials of the alkaloid of Saussurea lappa.—A close co-operation between this department and the Director of Medicine, G. S. Medical College has been established for the clinical trials of the alkaloid. Now it has been established that the alkaloid is non-toxic within the doses used therapeutically. A series of cases suffering from acute asthma or chronic bronchitis are being treated with the alkaloid. The drug is being given orally as well as by injections.

Synthetic Antidiabetic Drugs.—Further work on synthetic antidiabetic drugs has been continued. Besides aryl sulphonyl ureas, a number of disulphonyl-ureas have also been tested. The N-Benzenesulphenyl-N'-n-butylurea (R-131) and N-p-methoxybenzenesulphonyl-N'-cyclohexylurea (R-277) have been found to be good hypoglycemic agents. Cross over tests for the two compounds, viz. R-94, R-131, with well known oral antidiabetic compounds viz. Chlorpropamide and Tolbutamide, were carried out in both rabbits and rats. In rats both the drugs have shown a steady and definite fall in blood sugar and this reduction is well maintained upto 48 hours. The difference in hypoglycemic effect of the two drugs was not very greatly significant but at the end of 24 hours the difference as judged by "t" value becomes significant. The maximum tolerated oral dose for the three compounds viz. R-94, R-131 and R-277 was found to be 400 mg/kg., 2,000 mg/kg. and 4,000 mg/kg. respectively as against 2,500 mg/kg. for Tolbutamide. LD₅₀ in mice by subcutaneous injection for R-94, R-131 and Tolbutamide were found to be 2050 mg/kg., 530 mg/kg. and 980 mg/kg. respectively. The effect of R-94 on growth of young weanling rats was studied and compared with Tolbutamide. These two drugs did not affect the growth.

Medicinal plants against cholera.—The screening of medicinal plants which are reported to be useful in the treatment of cholera has been continued. The new plants studied were :—

- (1) *Abrus precatorius*, Linn. (Leguminosae), seed.
- (2) *Schleichera trijuga*, Willd. (Sapindaceae), bark.
- (3) *Carum copticum*, Benth and Hook (Umbelliferae), fruits.
- (4) *Calotropis gigantea*, Linn R. Br. (Asclepiadaceae), roots.
- (5) *Achyranthes aspera*, Linn. (Amaranthaceae), seeds.
- (6) *Euphorbia helioscopia*, Linn. (Euphorbiaceae), seeds.
- (7) *Euphorbia hirta*, Linn. (Euphorbiaceae), whole plant.

Different extracts e.g. alcohol, chloroform, petroleum ether and ether from the different parts of the above plants, were studied in cholera of weanling rabbits. Extracts from the above plants did not show any beneficial effect in the treatment of experimental cholera even though the drugs were administered prior to giving the infection to the rabbit.

Medicinal plants against other infections.—Extracts of above plants were screened *in vitro* against *S. aureus*, *E. coli*, *S. typhi* and *S. dysenteriae*. The different types of extracts from *Abrus precatorius*, *Achyranthes aspera*, *Carum copticum* inhibited growth of *V. cholerae*. Ether extracts of *Abrus precatorius* inhibited the growth of *E. coli* and *S. aureus*. The chloroform extracts of *Carum copticum* prevented the growth of *S. typhi*.

Chemical and pharmacological study of HMP-25.—In our previous report it was stated that extract of one of the medicinal plants (HMP-25) investigated protected rabbits from death due to cholera infection when the drug was administered early. In the Ayurvedic system of medicine this plant has been used for treating cases of cholera and acute diarrhoea. Considerable efforts were made during the year in locating the active principle which is responsible for the cure of early cases of experimental cholera. The co-ordinated work between the chemist and the pharmacologist of this unit ultimately led to the isolation of an alkaloid which has proved to be the active principle. About 10 g. of the alkaloid has been prepared from the root of the plant as a reineckate salt. This is being studied pharmacologically and chemically..

Drugs (synthetic) against experimental cholera.—The screening of both synthetic drugs and medicinal plants against cholera using infant rabbit method (Dutta and Habbu, 1955) is being continued. Paramomycin, polymyxin (B) sulphate and furazoldone were tried. The antitoxins prevented the deaths of infant rabbits suffering from cholera if the treatment was started at an early stage of the disease.

Gastro-intestinal enzymes on cholera toxin.—Enzymatic extracts were prepared from the pancreas and small intestine of infant and adult rabbits using suitable phosphate buffers. The toxin prepared by Gallut's method was subjected to the action of gastro-intestinal enzymatic extract. It was found that the gastro-intestinal enzymes did not play any role in adding up to the pathogenesis and that the toxin got absorbed as whole molecules without undergoing any biological transformations in the gastro-intestinal tract. The findings were confirmed by substituting pure enzymes instead of gastro-intestinal enzymatic extracts.

Pharmacology of scorpion venoms.—Pharmacological actions of the two venoms namely, *Bathus tammulus* (red scorpion) and *Palamius graimanius* (black scorpion), are being studied. The two venoms were tested on the smooth muscle of guinea pig ileum, on cat's blood pressure and respiration, bronchial musculature in guinea pigs and perfusion of frog heart *in situ*. Differences in pharmacological activities of the two venoms in the above experiments have been observed.

Role of bacteriophage in the prevention and treatment of cholera.—Five different samples of bacteriophages were tried on infant rabbits infected with *V. cholera*. Three of these prevented the onset of the disease and proved useful in the treatment of early cases of experimental cholera. One (Phage R) of the phages which was successfully used during the cholera epidemic at Dacca by the Russian scientists proved to be useful both prophylactically and therapeutically in experimental cholera. The prophylactic and curative (if administered early) values of cholera phage as found in experimental cholera are in line with the observations made by the several workers in clinical cases.

Study on cholera toxin.—Gel diffusion tests have shown that the toxin is a mixture of many antigens (at least 6 or 7) indicating its highly crude nature. Experiments are in progress to purify the toxin.

ROUTINE.

During the year, the total number of samples tested was 4,077 as against 4,128 in 1960. The percentage of non-standard drugs for the year was about 19. The important sources from which the samples continued to be received, were the Drugs Control Administrations for the States of Maharashtra and Gujarat, Police Department, and Department of Prohibition and Excise, Maharashtra State and Private Pharmaceutical firms.

It is gratifying to note that most of the untested samples brought forward from previous year were reported upon. At the end of this year only a small number remained for testing. The number of samples tested under the Drugs Act was 2,292 including 484 from the State of Gujarat. Of the samples received from Drugs Control Administrations of Maharashtra and Gujarat States, the percentage of non-standard quality was found to be 19 and 31 respectively. Out of total 4,077 samples tested, as many as 1,935 samples belonged to categories of biological and special products. About 16 per cent. of this category was found to be of non-standard quality.

Pharmacology section.—The drugs that were tested in this section required animal experimentation. Dogs, rabbits cats, rats, mice, guinea pigs and pigeons were used. Except dogs, cats and pigeons the rest of the animals were bred at this Institute. Seventy samples of antibiotics were tested biologically. Most of them were penicillins and dihydrostreptomycins. There were eight samples of tetracyclines. Almost all the samples complied with the specified biological tests. Samples of estrogens were tested biologically on rats using the technique of Bulbring and Burn. Six hundred samples were tested for the absence of pyrogens on rabbits, only 11 samples did not pass the test. They were either distilled water, normal saline or glucose saline. Testing for sterility was carried out in 634 parenteral preparations. Besides testing for the absence of aerobic and anaerobic organisms, Sabouraud's medium was used in some cases for detection of fungal growth. Only nine samples failed to pass the sterility tests.

Nine samples of injection of adrenaline were tested for the potency in cats. Only one sample was found to be of substandard quality. Two samples of Tincture of Aconite were tested for their potencies on guinea pigs. Both the samples were found to be of standard quality. Most of the samples of Tincture Digitalis were tested using pigeons. Only one sample out of nine, was of substandard quality. Twenty four samples of antitoxin were examined. They were of diphtheria and tetanus antitoxins. The potencies of all these samples were not less than the claims made on the label. Mouse convulsion method was the method of choice for determining the potency of insulin. Twenty-nine insulin preparations were tested. Only one sample had slightly higher potency. Seventeen samples of liver extracts were tested for their contents of total depressor substances. In majority of these preparations the histamine content was low. Only 1 sample of liver extract did not comply with the test for undue toxicity. One sample of intravenous iron preparation was tested for toxicity. Several samples of dextran were tested for "foreign protein" by pharmacopoeial method. Guinea pigs were used for studying their antigenicity.

Biochemical section.—Different multivitamin preparations (both oral and parenteral) formed the bulk of the samples examined in this section. In all, 973 samples were tested. Besides the preparations a fair number of antibiotics and a few enzyme preparations were examined. About 25 per cent of the samples did not come up to the standard. Five hundred and ninety eight samples were tested that were received from the Drugs Control Administration, Maharashtra State, and 320 samples from the Drugs Control Administration, Gujarat State. The types of preparations in which the content of active ingredient was less, were mainly oral preparations containing vitamin A, Vitamin B₁, folic acid, pantothenate or vitamin B₁₂. Out of 63 samples examined for pantothenate activity, as many as 32 per cent. were found to be not or standard quality. This is the highest percentage of failure for any single vitamin to comply with the claim. The number of samples containing vitamin B₁₂ were 207. Out of these in 25 per cent the potency was found to be less. One hundred and twenty two samples containing Vitamin A were tested. Thirty five samples failed to conform to the claim made. Another vitamin which is probably difficult to stabilise, especially in oral preparations, was

vitamin B₁. In about 13 per cent out of 372 samples tested, vitamin B₁ was found to be less. In some samples it was very low. Out of a total of 186 samples tested for vitamin C content, 34 did not come up to the claims made. Folic Acid is yet another vitamin which was found frequently to undergo deterioration in oral preparations. Out of the 71 samples, 15 were of sub-standard quality. The samples of vitamin B₂ and nicotinic acid or its amide were generally found to be stable. More attention need to be paid to stabilise enzymes when dispensed in combination with vitamins. Twenty six preparations containing pepsin were analysed for their enzymic activity and about 35 per cent of them showed less activity. Quite a good number of antibiotics and their preparations were examined during this year. The total came to 275. They were penicillin and their salts, streptomycins, dihydro-streptomycins, chloramphenicols, tetracyclines, etc. Only about 14 per cent failed to meet the one of more specified pharmacopoeial standards. One hundred and twenty-two samples of penicillins and their preparations or mixtures containing penicillins were examined. Six of them were declared not of standard quality. Two samples of mixtures of penicillins and streptomycins were rejected because of presence of foreign matter. The foreign matter was found to be common house fly in one and charred paper in another. One hundred and seven samples of streptomycin and dihydrostreptomycin were examined. As many as 29 samples (14 per cent) were not of standard quality. All the samples of chloramphenicol numbering 42 were of standard quality. Twenty two samples of tetracyclines were tested. Two samples did not satisfy pharmacopoeial specifications.

Pharmaceutical Chemistry Section.—About 2,000 drugs were tested chemically. Those included galenicals, denatured spirits, chemotherapeutic remedies, hormones, anthelmintics, antihistaminics, counter irritants, carminatives, etc. Besides the conventional methods of analysis the newer methods of complexometry, titrations in non-aqueous media and partition chromatography were employed. The B. P. (1958) test for the identification of D.D.T. consists of heating D.D.T. with 0.5 per cent. hydroquinone in nitrogen free sulphuric acid. This results in production of wine red colour. This test is not sensitive below the concentration of 100 µg. It was observed that the reaction product obtained in the B.P. test when shaken in liquid paraffin, gives a violet coloured fluorescence to the later (Liquid Paraffin). This is perceptible even in day light at a concentration of about 100 µg. Lower concentration could be detected by ultraviolet light. This method was used in confirming the presence of D.D.T. in some of the unlabelled samples of insecticides. Forty-seven samples of an antirheumatic injectable, containing phenylbutazone sodium, aminopyrine and lignocaine were tested. Fifteen samples were found to be not of standard quality. In some, phenylbutazone was not found while in a few lignocaine was absent; a number of samples contained active ingredients but they did not conform to the labelled amounts; two samples were found to be non-sterile. Eleven samples of sodium salicylate of B.P. and U.S.P. quality of one manufacturer were tested. Four samples turned out to be of substandard quality. Two had high moisture content and were black in appearance while two others were brown in colour. Over five hundred spirituous preparations were tested. Many were claimed to be

Tinct. Zingiberis Mitis, Tinct. Hemidesmis, Extract Rauwolfia Liquidum, Tinct. Kaladana, Tinct. Saussurea, Liq. Iodi Mitis, Tinct. Niegel, Tinct. Benzoinii, Cologne spirit, Chloroform Spirit, "Asavas" containing high percentage of alcohol etc. Many of them were proved to be coloured alcohol. Some of the samples of Liquor Iodi Mitis contained high percentage of alcohol with traces.* Such samples might be misused for drinking purposes. Samples of Tinct. Iodine were received in large numbers. These were mostly in small packings. Thirty-one were found to be not of standard quality out of 41 samples tested under the Drugs Act. In five samples, iodine was completely absent, while in 23 iodine was less than the amount required. One sample was declared not of standard quality as the content of potassium iodide was more than the claim. A sample of Tincture Iodine B.P. contained denatured spirit instead of alcohol. Twelve samples of Oil of Eucalyptus were found to be not of standard quality, out of 30 samples analysed. Most of the samples failed to comply with the I.P. specifications for descriptions (characteristic odour), solubility and assay (for the content of cineole). It may be pointed out that the optical rotations of good quality of samples of Eucalyptus Oil were found to be between +5 and +10. Out of four samples of solutions of hydrogen peroxide tested, only one was found to be of standard quality. In one sample, the content of H_2O_2 was lower while in the remaining it was negligible. Five samples of compound tablets of aspirin, phenacetin and codeine phosphate, were found to contain caffeine instead of codeine phosphate. Two samples of chloroquin phosphate were found to contain acetylsalicylic acid instead. Samples without formula continued to be received in good numbers. Some of these preparations were labelled as Ayurvedic Medicines. Most of these were to be used for external applications they contained such drugs as boric acid, zinc oxide, methyl salicylate, sulphur etc. A sample of worm killer contained santonin and sodium bicarbonate, while another preparation contained magnesium sulphate. A sample of eye drops contained small quantity of boric acid while other contained boric acid and ammonium alum. A sample of purgative contained mercurous chloride, while one *Pudina Ark* contained menthol. Two samples of hair remover contained approximately 25 per cent. of barium sulphide. A sample of hair darkener showed the presence of sodium thiosulphate and lead acetate. In none of the above samples the ingredients were declared on the label.

Pharmacognosy Section.—The total number of samples examined were 176 which consisted of crude drugs and surgical dressings like absorbent cotton wool, bandages, gauze etc. Out of these 72 per cent were of non-standard quality. Eighty four samples of Ganja and Bhang were examined macroscopically as well as microscopically. None of these samples were found fit for medicinal purposes. Sixteen samples of crude drugs were sent for purposes of identification. They were found to be either Ganja or Bhang. Out of sixty four samples of surgical dressings, 39 did not comply with required standards. Most of the cotton wool failed in absorbance tests. Several samples of absorbent cotton wool were impregnated with fluorescent substances, which were detected by examining them under ultraviolet light. It is suggested that the Indian Pharmacopoeia may incorporate a test to exclude fluorescent substances in surgical dressings. One sample of Sarsaparilla which was unduly coated to improve its appearance, gave more ash content.

X. DEPARTMENT OF VIROLOGY.

GENERAL.

Dr. K. H. Dave, M.D. (Bom.) joined the staff of the department on 19th May as Senior Scientific Officer on a temporary basis.

ROUTINE.

Ninety two brain specimens and 25 salivary glands from human beings and animals suspected to have died of rabies were received for diagnosis. Eight were from human autopsies. Thirty eight dog brains and 2 human brains were found positive. No brains from other animals were found positive. Of the 40 positive results, 15 salivary glands were tested along with the brains by biological test in mice; 9 were found to be positive.

There was no instance where salivary gland was positive and brain negative in biological tests.

Preparation and supply of rabies vaccine was increased in response to increasing demand. Total number of 3,734 sheep were used for production of the vaccine.

RESEARCH.

Influenza.—Preparation of vaccine by the chick cell adsorption elution method using suitable strains representative of A, A-prime, A-asian and the B types was continued. The polyvalent vaccine is to be tested for potency in mice by the method which was standardised for testing monovalent vaccines.

Adaptation of one Asian type strain and the PR8, Fm1, and Lee strains to the mouse lung is in progress. The titres are expected to reach the level required for challenge experiments in a few passages when the work on potency tests of vaccines will be started.

Sixty-nine sera from apparently normal human beings were tested for anti-hemagglutinins against all types of influenza strains. It is now proposed to include the Sendai and mumps viruses for this study. The Sendai antigen has been prepared from the strain obtained from the World Influenza Centre, London, and is ready for use. The mumps virus was not supplied by W.I.C. and will be obtained shortly for preparation of the antigen. Further work on pattern of antihemagglutinins is expected to be resumed shortly.

Six strains of the virus have been studied individually for their marked characteristics. High titre sera against these strains have been prepared and stored for cross hemagglutination inhibition tests. Preliminary experiments have been carried out and the technique of de-embryonated eggs to be employed for recombination has been standardized. The mouse line influenza viruses will be used for recombination experiments.

Throat gargles and paired sera were collected from patients suffering from acute upper respiratory infection in Bombay and Pen (Kolaba District). On testing all the sera were found to be negative, i.e. showing no rise in antihemagglutinins against influenza virus. No virus was isolated from throat gargles.

Studies on Rabies Virus.—It is still unknown whether rabies virus is an RNA or DNA virus. Attempts were made to isolate RNA and DNA from sheep and mouse brains infected with rabies virus (Paris strain) by the methods described by Gierer and Schramm, and by Hotchkiss respectively. The extract of nucleic acid was prepared (and confirmed by U.V. absorption spectra). In several attempts so far the extract was not found biologically active. Further attempts, using both Paris strain and more recently isolated street virus strains, are in progress.

It has already been proved that influenza is an RNA virus. Attempts were made to isolate biologically active RNA from allantoic fluid of embryos infected with influenza PR8 strain. The first two extractions showed the extract to be infective directly when injected into embryonated eggs, in 1 : 100 dilutions, i.e. first passage allantoic fluid showed HA activity, which was specifically inhibited by anti-serum against PR8 strain; subsequently, two extractions showed presence of virus only after passaging in mice. Further extractions under identical conditions have failed to show infectivity in eggs. The reasons for this are under investigation.

Enquiry on Adaptation of Rabies Street virus to Embryonated Eggs.—Further passage in embryonated eggs of the two egg adapted strains 64/57 and 13/58, and the two sub-strains 13/58 Head and 13/58 Body of 13/58 strain was continued during the year. At present the four strains have completed egg passages. All the four egg adapted strains were tested for pathogenicity changes in laboratory animals at various egg passage levels. No further modification beyond already reported changes was observed.

Studies on tissue culture adaptation of rabies virus.—No further passage of rabies virus in hamster kidney cells was carried out, pending a study of quick methods for identification and titration of these tissue culture fluids.

In order to work out an easier and a quicker method to detect the rabies virus particles, tanned-cell hemagglutination technique was tried. Rabies infected sheep brain and phenolized antirabic vaccine were used as the antigens to coat the tanned sheep red blood cells, with normal sheep brain as control. These coated red cells were used against hyperimmune antirabic horse serum. The haemagglutination reaction was positive even in the cells coated with normal sheep brain material. This technique cannot, therefore, be used as a specific method to detect virus from sheep brain and from the vaccine. Modified methods are under study.

Attempts were also made using fluid from hamster kidney tissue cultures inoculated with rabies virus as the coating. Agglutination with hyperimmune

rabies serum was clearly shown by the tissue culture fluids which were infective to mice while negative result was shown by the tissue culture fluid which was non-infective to mice.

More work to confirm the above findings is in progress.

Flury vaccine.—Two large batches of Flury vaccine at the egg passage level 206A2 and 207A2 were prepared. Their titres after lyophilization were found

to be 10^{-4} and $10^{-4.5}$ respectively. Safety and protection tests as advised by WHO were carried out, (1) at the time of preparation (2) by reconstitution of lyophilized material (3) by reconstitution of lyophilized material after storage for six months. All tests were satisfactory and the vaccine has been made available for field trials. Further studies on keeping qualities of lyophilized vaccine will be carried out at suitable intervals.

Studies on Adenovirus.—Seventy-six clinical samples (41 throat swabs, 26 conjunctival swabs and 9 nasal swabs) were collected from 41 children suffering from upper respiratory infections and conjunctivitis from Bai Jerbai Wadia Hospital for Children. Children under the age of ten were selected for this study. Ten cytopathic agents were isolated in human amnion cell cultures, 6 from throat swabs, 3 from conjunctival swabs and 1 from nasal swab. The strains are yet to be identified.

Work on Kayasanur Forest Disease (K.F.D.).—During the current year, work was continued on the same lines as last year. Further studies were made on the three strains chosen for vaccine (P-9605, KF-37, and G-11338). All appear to be equally suitable from the point of view of vaccine preparation. After adaptation of KFD virus strains to chick embryo and tissue culture, studies were directed to obtain highest yield from these sources. Preliminary evaluation of various modifying factors on the growth of virus in these systems had to be carried out. The results of these investigations have furnished useful data.

The factors considered are (i) for eggs (a) age of chick embryo, (b) amount and dilution of inoculum, (c) time of harvest, (d) temperature of incubation, (e) route of inoculation. The results showed that 7-8 days old eggs, inoculated

by yolk sac route, with 0.2–0.5 ml. of 10^{-3} dilution of virus and incubated at 37°C gave highest yield when harvested on the 3rd day. (ii) for tissue culture (a) amount and dilution of inoculum, (b) type of medium used for growth, (c) number of viable tissue cells in the cell line, (d) time of harvest.

0.1–0.2 ml. of 10^{-5} dilution of virus, seeded into chick embryo fibroblasts, using M+Hanks with 10 per cent. BME as growth medium, gave high yields on the 3rd post inoculation day. Yield of virus was estimated by titration in infant mice. The methods of inactivation adopted were (1) formalization, (2) inactivation by beta-propio lactone, (3) thermal inactivation. Aliquots of vaccines prepared from the same original material, but using different methods of inactivation, were studied for immunogenic properties by the vaccine potency tests described previously. It was noted that vaccines inactivated with 0.2 per cent. formalin gave significantly higher protection.

The effect of storage on immunogenic properties of these vaccines is being studied.

Earlier batches of tissue culture vaccine prepared from the Virus Research Centre adapted strain did not offer satisfactory protection. The method of Danes and Benda, using strain P-9605 derived from mouse brain, and passaged once in tissue culture, was adopted for recent batches of vaccines. These have given protection comparable to that offered by mouse brain vaccine. Further work is continuing. A number of potency tests have been put up with the same, and different vaccines, at different times. The results obtained with the test as previously described, are fairly consistent and reproducible within narrow limits of experimental error. Hence the same technique has been continued. Serological tests such as haemagglutination inhibition (HAI), complement fixation (CF), and neutralization tests (NT) in mice and tissue culture have been done to supplement other studies. Sera of vaccinated mice, and of mice surviving the potency test, were tested for neutralizing (by I.C. route) or H.I. antibodies. No evidence of circulating antibodies was found by these methods. Neutralization test, using I.P. route for inoculation of serum virus mixture, appears to be more sensitive and is under study.

Work on Poliomyelitis.—An epidemic of paralytic poliomyelitis broke out in Andhra Pradesh during September, 1960 to March 1961. About 600 cases of paralytic polio were reported in Andhra Pradesh during this period. Materials for virus isolations and serological studies were received at the polio unit of the Haffkine Institute during March-May 1961. Results of virus studies on the samples received indicate that poliovirus type 1 was responsible for the epidemic. Of the 50 polioviruses isolated, 44 strains belong to type 1, 1 to type 2 and 5 to type 3. Four out of 5 strains belonging to type 3 were isolated from children with minor illness like common cold, mild fever and diarrhoea. All the samples of stools, throat swabs and rectal swabs, in addition to studies in tissue culture, were also inoculated into infant mice. So far 20 strains pathogenic to mice have been isolated. Further studies on these strains are in progress. One hundred and thirteen sera collected from clinical cases of paralytic poliomyelitis and their contacts were tested. The results of serological studies corroborated the virological evidence that the epidemic was caused by Type-1 poliovirus.

During the months of May-June 1961, about 130,000 children under the age of five years were administered polio vaccine, Live, Oral (Sabin) by the Health authorities of Andhra Pradesh in collaboration with the Polio Research Unit. Large quantity of post-vaccination materials were received at the Institute for further studies. Materials received are (i) serial samples of stools of vaccinated children for studies on the excretion of vaccine strains, (ii) samples of pre and post vaccination sera to study the efficacy of the vaccination. So far, 1368 samples of stools and 711 sera have been received. Results indicate that, (i) majority of the excrete the vaccine viruses, (ii) excretion has been found to commence from 2nd to 7th day after administration of the vaccine, (iii) majority of the children appear to excrete a single type at a time, a few two types and an occasional child only, excretes all the three types, (iv) the excretion of other enteroviruses, excreted during the period when the vaccine viruses are being

excreted has been found to be extremely low, (v) among the three types of the vaccine viruses, type-3 has been found to be the most frequently isolated among the excreted polioviruses.

Studies on pre-immunization samples of sera indicate that in the child population under study, antibodies against one or more poliovirus types were lacking in about 55 per cent. of the children. Sera collected at the time of administration of second dose of the vaccine indicated that there was a fairly high degree of immunization in the vaccines. Studies on sera collected 6 months after the first dose of vaccine are in progress.

Twenty-six sera from Bombay, 24 sera from Calcutta and 2 sera from Bangalore were received for serological tests for poliomyelitis. All these were from clinical cases of poliomyelitis. These have been tested and results reported.

Serological survey of newly born babies and their mothers is being continued.

Work on preparation of hyperimmune antisera against polioviruses is continued. Antisera against three types of poliovirus were supplied to Colombo, Ceylon.

Scheme for preparation of antisera against Echo and Cocksackie Viruses.—In continuation of the work reported under this I. C. M. R. Enquiry last year, antisera were prepared against 4 more Echo viruses (types 8, 9, 15 and 20). These have been tested and found to be satisfactory. (Prepared and type antisera) 3 ml. each, of Echo types 1, 2, 3, 4, 5, 6, 7, 11, 12, 13, 16, 21; Cocksackie types A9, B₁, B₅ and normal rabbit serum were supplied to the Department of Bacteriology, All India Institute of Medical Sciences, New Delhi.

Study on Encephalitis in Nagpur.—During the current year, the Research Fellow spent about 4 months in Nagpur for study of cases and collection of material for study. Following work was done during the year :—

(a) 50 cases, clinically diagnosed as encephalitis were seen during the year. All these were children, (b) Collection and study of samples : 45 samples of C. S. F.; 42 samples of throat swab ; 44 samples of rectal swab and 2 samples of blood (paired sera). Following virus agents were identified :—

2 Cocksackie B5 ;

1 Cocksackie A9 (from CSF)

1 ECHO 16

1 ECHO 1

1 Polio type 2

Study of the material collected and the results obtained so far, suggest that isolation and identification of viral agents from this material may take about two years.

Other egg line viruses.—(1) Preparation of Frei's Antigen on a commercial scale : It is proposed to start manufacture of this in the near future. (2) Preparation of typhus vaccine : though this is a time consuming procedure the vaccine will be manufactured in response to a request received from the Government of India, in view of the import difficulties. This Unit has been entrusted with the task of preparing this vaccine. The preliminary work of obtaining suitable strains from U.S.A. and collecting the necessary details and equipment has been completed and experimental work will be strated very shortly.

XI. BLOOD BANK.

GENERAL.

During the year under report the demands for dried plasma and the blood grouping sera showed a further increase especially from the Public sector concerns like Steel Plants. With the opening of many blood banks in the district hospitals in the State, the demands of the grouping sera further went up. The response of the donors at the local blood collection centre was very unsatisfactory, and therefore other avenues for enrolling blood donors has to be exploited. With this in view the mobile blood collecting unit arranged publicity drives in other cities of the State and enrolled donors from the members of the public and collected blood from these donors. Such campaigns were organised in Poona, Nagpur, Nasik, Aurangabad, Dhulia, Ahmednagar etc. Though the response from the public was encouraging, further work has handicapped for want of a full-fledged publicity unit. The need for such a unit is keenly felt to expand the activities of the department in this direction. The visits to the various prisons were arranged at more frequent intervals and these were extended to some more prisons not visited before. With the kind co-operation of the Inspector General of Prisons and other local prison authorities, it was possible to get better response from the prisoners also. Some publicity work was carried out in these prisons also. The allotment free quota of plasma was revised by the Surgeon General assigning free quota to all the district and college hospitals of the state and thus increasing the total free quota.

Dr. S. S. Sabnis, M.B.B.S., proceeded to Canada for higher studies in "Tissue Banking" under the Colombo Plan Fellowship award on 3rd October 1961. Dr. R. T. Shahani, M.B.B.S., was transferred to the St. George's Hospital, Blood Transfusion Section on 17th November 1961; Dr. P. D. Kulkarni joined in temporary capacity as one of the Medical Officers on 1st May 1961. Dr. J. K. Bhatt, M.B.B.S., was transferred to the Mobile Epidemiology Unit attached to the Deptt., of Clinical Pathology. Dr. W. N. Gatlewar, M.B.B.S., has recently joined the Department as one of the medical officers.

ROUTINE AND PRODUCTION.

During the year under report, 5455 blood donors were bled for the preparation of dried plasma and 764 litres of dried plasma were prepared from this. 134.3 litres of dried plasma were distributed free and 631.75 litres were sold making a total of 766 litres. In addition to this, 576 litres of liquid plasma was received from Armed Forces Medical College, Poona, for freeze-drying; 71.6 litres of plasma was received from various hospitals for processing into dried plasma.

The haemoglobin test, ABO groupings and serological tests were performed on the blood samples of all blood donors as a routine.

One hundred and seventy three samples of blood were received from the various hospitals and medical practitioners for Rh grouping, blood group iso-immunization tests, coomb's test etc. In the year, 36,300 ml of B group (Anti-A) and 31,500 ml of A group (Anti-B) blood was supplied to the clinical pathology department for the preparation of blood grouping sera. Fifty eight thousand four hundred and seventyfive ampoules (58,475) of antivenere were lyophilised for the Department of Immunology.

RESEARCH.

Preparation of Anti-Rh sera.—Further immunization of Rh negative donors was carried out and serum collected from these immunised persons who showed good titre. This sera is being further processed to be issued as Anti-Rh sera.

Preparation of Anti-A and Anti-B.—The demand for standard blood grouping sera continued to be high. To obtain it from the normal blood donors was well-nigh impossible. The low titre of the antibodies were raised by iso-immunization with the help of group specific substances. This gave a very good response some time showing a very high antibody titre.

Blood Group substances 'A' and 'B'.—The blood group substances A & B were prepared by chemical extraction of fresh meconium. Further studies on the substances were carried on. Immunization of the rabbits with these substances is being attempted.

Standardisation of Blood Grouping Sera.—All the Anti-A and Anti-B Sera issued by the Institute was tested with WHO standard sera and was found to be passing these standards.

Anti-haemophilic factor rich plasma.—Plasma rich in anti-haemophilic factor was prepared by processing freshly collected plasma. The methods for estimating this factor in this product are being developed and to improve the methods of its processing are being worked.

Tissue-banking.—Attempts to preserve pieces of bone recovered from the operation are being undertaken. They are kept in antibiotic bath and preserved in deep freezes, and sterility test are done at intervals.

Preparation of gamma globulin and other blood plasma fractions.—(In collaboration with Department of Immunology). A few experimental batches of gamma globulin have been prepared from pooled human blood serum. This was tested for antiviral activity and found to show good antibody activity. This has been released for human use to be used in prophylaxis in infective hepatitis. Experiments with human placental extracts and preparation of gamma globulin are also in progress.

XII. MEDIA SECTION.

GENERAL.

The activities of this Section were in full swing during the year under review. With increasing demands for intravenous preparations, the production reached a peak. This increased production could be managed only by employing extra temporary hands whenever required and allowing the staff to work on maximum overtime basis as permitted by factory rules.

From 1st April 1961 this Section was put in charge of Smt. Dr. A. Venkataraman, Assistant Director, I/c Biochemistry Department.

ROUTINE AND PRODUCTION.

In addition to a number of routine media and staining solutions required by the various departments of the Institute, various culture media and ampoules were supplied for research, routine and production, and testing of the biological products of the Institute.

The Section continued to supply various diagnostic reagents to the Diagnostic Reagents Section of the Institute, as usual.

Different kinds of intravenous solutions (2,55,013 bottles) were produced and supplied to hospitals in and outside the State of Maharashtra, some private and Railway Hospitals and practitioners in the city.

The Section also supplied various items sterilised and ready for use in the production work required by various departments.

XIII. ANIMAL HOUSE SECTION.

GENERAL.

During the year under report, general work of the Animal House, viz., production and supply of various laboratory animals was very satisfactory. In fact, the production of white mice has reached a record figure. Experimental trials were carried out in breeding techniques for white mice and the monogamous post-partum mating system gave the maximum productivity. Government has accepted the proposal for a New Animal House; the construction of the new Animal House building is already started and will be completed very soon.

ROUTINE AND PRODUCTION.

The following table shows the number of animals produced, issued to the various departments of the Institute, and sold to other laboratories or research institutions :—

Serial No.	Species of Animal.	No. of animals produced.	No. of animals issued.	No. of animals sold to other laboratories.
1	White mice (H I. strain)	43,175	25,719	1,655
2	White mice (Swiss strain)	85,671	50,909	994
3	Rats	8,523	3,488	2,973
4	Rabbits	2,438	1,768	468
5	G. pigs	2,613	1,810	582
6	Hamsters	428	38	11
7	Cotton rats	113	<i>Nil.</i>	<i>Nil.</i>
8	D. B. A. Bar	13	8	<i>Nil.</i>
9	C-57 Black	176	131	10

Besides the above animals following animals were maintained by the Animal House and issued to various departments of the Institute for research, tests and for the production of biologicals :—

Sheep 3529 ; Dogs 11 ; Cats 167 ; Monkeys 222 ; Fowls 279 ; Pigeon 79 ; Horses 158 (average maintained).

XIV. MAINTENANCE ENGINEERING SECTION.

This year " Desival Plant " was overhauled. This plant has been used almost every week for Freeze-drying products of other firms, blood plasma of military, as well as Institute's blood plasma and antivenine which resulted in more work of running maintenance of this machine. The number of charges taken out this year is about 94.

This section is maintaining plant rooms, cold rooms, centrifuge machine, defreezers, small ovens, vaccum pumps, air compressors, air conditions, refrigerators etc. and helping all the departments in designing small appliances, gadgets etc. and some patterns for casting purposes. This year welding and gas welding processes are also in progress.

The carpentry Unit carried out the preparation of varieties of credes and small furniture requirements of all the departments and the maintenance of all furniture and research equipment. Further advise is given to business management section and stores section in scrutinizing of technical quotations purchase of machinery, research equipment and raw materials.

Plant, machinery and research equipment which have been imported and purchased locally were tested, installed and put to commission. The maintenance of all these rests with this section. The section also deals with the maintenance of Institute's vehicles.

XV. LIBRARY SECTION.

This year 3 meetings of the Library Committee were held and re-organization and other related matters were discussed.

ROUTINE.

The Library receives regularly 325 Journals, 162 of which are in exchange for the publications of the Institute, or gifts. During the year January to December, 1961, eighty reports and fifteen books were received from Scientific Institutions, with whom exchange of publication is maintained. Two hundred and nine books were added to the Library and five hundred and forty five bound volumes of the periodicals were added to the periodical section.

Loan of books and Journals from other Libraries under Inter library loan system have been numerous and the assistance of these libraries is greatly appreciated. The indexing in the form of weekly Library Bulletin of the Journals received in the Library, was continued as before. The cataloguing of books newly purchased have been made upto date. Efforts are made under exchanging programmes to complete the incomplete sets of the journals by acquiring the required material. This year we could acquire 15 issues of the periodicals to complete our sets.

The re-organization work of cataloguing of books is brought nearly to its completion. The work of preparing the list of duplicate and issues of periodicals short with us, is also about to be completed.

LIBRARY STATISTICS.

A. *Readers :—*

(i) Number of visitors in the Library, for reference only	..	990
(ii) Number of readers for loan of books	..	181

B. *Loan of books and periodicals :—*

(i) Number of books and periodicals issued to our staff	..	1,716
(ii) Number of books and periodicals issued under Inter Library Loan, to other Libraries.		251
(iii) Number of books and periodicals obtained for our staff, from other Libraries.		104

Addition of the Library Material during the year :—

Total Number of books (Acc. No. 9610-9829)	..	209
Total number of bound volumes of periodicals (Acc. Nos. 7116-7661).		545
Total number of current periodicals subscribed	..	163
Total number of current periodicals as gratis	..	132
Total number of current periodicals in exchange	..	30
Total number of periodicals in the current list	..	325
Total number of reports of scientific institutions received in the Library.		80

XVI. ACADEMIC COURSES AND TRAINING OF HEALTH PERSONNEL.

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

M.Sc. and Ph.D. in Microbiology, Bacteriology, Biochemistry (including Nutrition), Zoology, Organic Chemistry and Applied Biology.

M.Sc. (Med.) and Ph.D. in Pathology, Bacteriology, Parasitology and Pharmacology.

The following are post-graduate teachers recognised 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) Dr. (Smt.) A. Venkataraman.
- (9) Shri K. G. Anantanarayanan.
- (10) Dr. S. S. Rao.
- (11) Dr. M. V. R. Rao (upto 19th September 1961).
- (12) Dr. K. D. Kulkarni.
- (13) Dr. S. D. Ambegaokar.
- (14) Dr. R. B. M. Colah.

The Institute is also recognised by the College of Physicians and Surgeons of Bombay for training candidates for (a) F.C.P.S. Examination in Pathology and Pharmacology and (b) D.P.B. Examination of the College. The following officers of the Institute are recognised as teachers of the College :—

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

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

- (1) The Gujarat University.
- (2) The M. S. University of Baroda.
- (3) The Poona University.
- (4) The Sardar Vallabhbhai Vidyapeeth.

During the period under review 51 Science Graduates who had their names registered at this Institute were afforded facilities for prosecuting their post-graduate studies. Their Department-wise analysis is given below :—

Department/Section.				M. Sc.	Ph. D.
(1) Biochemistry	..	..	..	2	1
(2) Chemotherapy	..	..	..	5	4
(3) Clinical Pathology	..	..	..	6	1
(4) Entomology	..	..	..	1	4
(5) Immunology	..	..	..	7	..
(6) Media	..	..	..	1	..
(7) Nutrition	..	..	..	2	2
(8) Pharmacology	..	..	..	3	4
(9) Virology	..	..	..	5	2
(10) Blood Bank	..	..	..	1	..

The undermentioned post-graduate students obtained their degrees as mentioned against their names during the year :—

Post-graduate Student.	Department.	Degree.
(1) Shri M. K. Habbu	.. Immunology	.. Ph.D.
(2) Shri A. K. Joshee	.. Entomology	.. Ph.D.
(3) Shri M. V. Panse	.. Pharmacology	.. Ph.D.
(4) Shri D. V. Mehta	.. Chemotherapy	.. M.Sc.
(5) Kumari V. N. Waknis	.. Immunology	.. M.Sc.
(6) Kumari S. L. Shah	.. Immunology	.. M.Sc.
(7) Kumari S. H. Aswani	.. Clinical-Pathology	.. M.Sc.
(8) Kumari U. Tonse	.. Pharmacology	.. M.Sc.

Medical Laboratory Technician Training Course.—During the year under review, eighteen candidates were admitted in the third batch of this training course for the year 1960-61 and the fifteen candidates mentioned below who completed their course successfully were awarded the certificates :—

- | | |
|----------------------------|---------------------------|
| (1) Kumari V. J. Kothari. | (9) Kumari L. N. Pathare. |
| (2) Shri V. M. Merchant. | (10) Shri M. S. Mayadeo. |
| (3) Smt. M. B. Phanse. | (11) Shri K. K. Vora. |
| (4) Kumari R. Verghese. | (12) Shri J. D. Jadhav. |
| (5) Kumari M. H. Advani. | (13) Shri S. M. Pathare. |
| (6) Kumari M. Santakumari. | (14) Shri S. D. Gajjar. |
| (7) Kumari S. M. Shanbhag. | (15) Kumari S. R. Shroff. |
| (8) Kumari V.P. Kalokhe. | |

A fourth batch of 14 candidates has started training for the current session from 10th July 1961.

Short-term Training.

Type of Trainees.	Clinical Pathology.	Entomology.	Pharmacology.	Chemotherapy.	Biochemistry.	Immunology.	Bacteriology.	Media.	Blood Bank.	Animal House.	Virology.	
By admission.	10	1	8	7	4	3	5	3	1	....	....	42*
Others ..	4	1	1	....	....	....	....	2	1	2	1	12†
Total ..	14	2	9	7	4	3	5	5	2	2	1	54

* List of Candidates deputed by Pharmaceutical Concerns :—

PHARMACOLOGY.

- | | |
|----------------------------|--|
| 1. Shri V. S. Chandavarkar | .. Fairdeal Corporation (Private) Ltd., Bombay. |
| 2. Shri A. C. Parikh .. | .. Indo-Pharma Pharmaceutical Works, Bombay-14. |
| 3. Shri V. Prakasha Rao .. | .. Shetty Pharmaceuticals and Biologicals Ltd., Hyderabad. |
| 4. Shri J. G. Trivedi .. | .. Durgs Laboratory, Gujarat State, Baroda. |

CHEMOTHERAPY.

- | | |
|--------------------------|--|
| 1. Shri R. N. Gidwani .. | .. Messrs. Hygiene Research Institute, Bombay. |
|--------------------------|--|

CLINICAL PATHOLOGY.

- | | |
|------------------------|---|
| 1. Shri B. B. Tambe .. | .. K. B. Haji Bachooali Free Ophthalmic Hospital, Bombay. |
|------------------------|---|

† List of Trainees deputed by other Government Departments and other Institutions :—

CLINICAL PATHOLOGY.		DEPARTMENT.	ANIMAL HOUSE.		DEPARTMENT.
1.	Dr. N. G. Gadgil	.. Western Railway, Bombay.	1.	Shri K. L. Rao	.. Rajasthan College of Veterinary Sciences and Animal Husbandry, Bikaner.
2.	Dr. J. K. Sen	.. Western Railway, Rajkot.			
3.	Shri V. D. Desai	.. Chemitex Industries, Baroda.	2.	Shri M. C. Shrivastav Officer I/c Small Animals.	College of Veterinary Science and Animal Husbandry cum Livestock Research Institute, Mhow (M.P.)
4.	Dr. M. K. P. Siddiqui.	Western Railway, Dohad.			
BLOOD BANK.			PHARMACOLOGY.		
1.	Shri H. N. Abhyankar, Laboratory Technician.	Civil Hospital, Dhulia.	1.	Shri P. G. Kharia	.. Department of Pharmacy, University of Saugar.
ENTOMOLOGY.			MEDIA SECTION.		
1.	Shri D. M. Ranapurkar.	Director, Public Health, Poona.	1.	Shri V. S. Sabnis, Laboratory Technician.	C. P. R. Hospital, Kolhapur.
VIROLOGY.					
1.	Dr. P. C. Bansal	.. Anatomy Medical College, Nagpur.	2.	Shri S. S. Randive, Pharmacist.	Mahatma Gandhi Memorial Hospital, Bombay-12.

XVII. Grants.

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.	
				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 to 25th November 1961. (Senior Research Fellow).	400 per mensem.	
2	Do. do. ..	Do. do.	Shri P. A. Malik, M.Sc., from 5th June 1959 to 28th February 1961. (Junior Research Fellow).	250 per mensem.	
3	Do. do. ..	For carrying out Research on "Cofactors in Protein Biosynthesis."	Dr. Mrs. Ranjan Bhatt ..	400 per mensem.	
4	Do. do. ..	For "Studies on Proteins and certain B. Vitamins Inter-relationship". (Nutrition).	Kumari Afzal Murid (upto 31st August 1961).	250 per mensem.	50
5	Unichem Laboratories, Bombay..	Indigenous Drugs ..	Shri N. B. Oza, M.Sc., from 1st July 1960 ..	250 per mensem.	
6	Do. ..	Pharmacology ..	Kumari S. Vasantha, M.Sc., from 23rd September 1960 to 10th August 1961.	250 per mensem.	
7	Haffkine Institute Diamond Jubilee Celebrations Committee, Bombay. (Sponsored by M/s. Unichem Laboratories.)	For carrying out Research in the Department of Chemotherapy.	Vacant.	250 per mensem.	
8	Do. do. ..	For carrying out Research in Synthetic Drugs.	Shri P. R. Mankad, M.Sc., from 1st June 1961.	250 per mensem.	
9	Haffkine Institute Diamond Jubilee Celebrations Committee, Bombay. (Sponsored by M/s. Dumex Ltd.)	For carrying out Research Work in Bacteriology.	Shri M. V. Panso, M.Sc., from 10th January 1959 to 15th June 1961.	250 per mensem.	

10	Government of India Research Training Scholarship.	Research	For carrying out Research in Organic Chemistry.	Shri B. S. Rathore, M.Sc., from 9th October 1959 to 31st December 1961.	200 per mensem.
11	Do.	do.	.. For carrying out Research in Microbiology.	Shri G. P. Kamat, M.Sc., from 9th March 1960.	200 per mensem.
12	Do.	do.	.. For carrying out Research in Biochemistry.	Mrs. S. M. Gadgil (Kum. S. S. Fatharpekar), M.Sc., from 15th November 1960.	200 per mensem.
13	Government of Maharashtra Research Training Scholarship.		For studies in Anticoagulant Action of Cobra Venom.	Kumari V. N. Waknis, B.Sc., from 1st July 1959 to 30th June 1961.	150 per mensem.
14	Do.	do.	.. For Studies in Immunology	.. Kumari S. D. Vernekar, B.Sc., from 16th January 1961.	150 per mensem.
15	National Research Fellowship	..	Studies in the Nucleases in the Venoms of Cobra and Russell's Vipar.	Dr. R. W. P. Master, M.Sc., Ph. D., from 1st June 1960.	400 per mensem.
16	Government of Maharashtra Research Training Scholarship.		For carrying out Virus Survey on Encephalitis.	Kumari Rayna Mendes, M.Sc., from 11th November 1959.	250 per mensem.
17	Haffkine Institute Diamond Jubilee Celebrations Committee, Bombay.		....	Dr. (Kum.) R. J. Irani, Senior Research Fellow, from 24th February 1961.	500 per mensem.
18	Do.	do.	..	 Shri A. B. Rajadhyaksha, M.Sc., Junior Research Fellow, from 20th February 1961.	300 per mensem.
19	Do.	do.	..	 Shri M. D. Gadgil, Junior Research Fellow, from 1st March 1961.	300 per mensem.
20	Do.	do.	..	 Kumari B. A. Ver, M.Sc., Junior Research Fellow, from 1st March 1961.	300 per mensem.
21	Do.	do.	..	 Dr. A. N. Inamdar, Junior Research Fellow, from 15th March 1961.	350 per mensem.
22	Colombo Plan Fellowship	..	For carrying out Research Work in Bacteriology.	Shri P. M. Adhikary, B.Sc., from 6th June 1959.	175 per mensem.

Name of I. C. M. R. Enquiries, (1961).		Grant. Rs.
1	Drug Research Unit under Dr. N. K. Dutta ..	14,000
2	Nutritive value of foodstuffs under Dr. S. D. Ambegaonkar	13,425
3	Adaptation of rabies street virus under Dr. A. N. D. Nanavati.	6,800
4	Isolation of Cholera toxin and assessment of its value in Immunity to cholera, under Director, Haffkine Institute.	3,200
5	Preparation of type specific antisera against Coxsackie and ECHO Viruses under Dr. A. N. D. Nanavati in collaboration with Dr. P. V. Gharpure.	11,050
6	Clinical trials with hyperimmune rabies serum under Dr. A. N. D. Nanavati.	3,000
7	Susceptibility of <i>Rattus rattus</i> to plague under Dr. P. J. Deoras.	10,525
8	Project for the manufacture of Virus Vaccine against Kyasanur Forest Disease under Director, Haffkine Institute.	40,000

XVIII. Critics Club.

During the year 1961, forty-seven meetings were held under the auspices of the Critics Clubs, out of which five were addressed by Scientists from outside. The following is the list of speakers and the subjects :—

- | | |
|--|--|
| (1) Shri A. S. Narsimham | .. Syphilis and its laboratory diagnosis. |
| (2) Shri N. G. Mehta | .. The role of magnesium in biological processes. |
| (3) Dr. R. W. P. Master | .. Enzymes of polynucleotide metabolism in snake venoms. |
| (4) Kumari M. N. Guttikar | .. Nutritive value of some commonly consumed food-stuffs. |
| (5) Shri K. M. Meherhomji | .. Enterioviruses among healthy individuals of Bombay. |
| (6) Shri P. A. Malik | .. Assay of insulin by paper chromatography in some of the commercial preparations of insulin. |
| (7) | Send off to Dr. A. K. Hazra on his retirement. |
| (8) Dr. N. K. Dutta | .. The role of cholera toxin in the pathogenesis of cholera. |
| (9) Dr. Lloyd E. Rozeboom, Professor of Medical Entomology at John Hopkins University, Baltimore, U.S.A. | Some aspects of disease epidemiology pertaining to insects. |

- (10) Shri A. S. Narsimham .. The temperature factor in plague.
- (11) Kumari S. S. Fatterpekar .. Variation in the amino acid composition during the germination of seeds of *Lens esculenta* and preliminary work on the identification and estimation of amino acids by butter paper chromatography.
- (12) Dr. K. Ganapathi .. The effect of cultural conditions on the growth of bacteria.
- (13) Kumari N. Kaushik .. Antigenic analysis of *Clostridium welchii* type culture filtrate and common antigens with other clostridia.
- (14) Shri G. O. Chaturvedi .. Feeding mechanism in *Xenopsylla cheopis*.
- (15) Dr. T. D. Patel (Guest speaker). Blood Banks in U.S.A.
- (16) Shri R. S. Karbhari .. Role of Vi-antigen in typhoid immunisation.
- (17) Shri V. G. Vaidya .. Functions of mitochondria.
- (18) Dr. (Kumari) Mariam George. Some observations on the antigen requirements for tanned cell hemagglutination.
- (19) Dr. A. N. D. Nanavati, a member of the successful Annapurna III expedition was felicitated.
- (20) Kumari M. Savitri .. The growth characteristics of adenoviruses in monkey kidney tissue culture.
- (21) Dr. K. D. Kulkarni .. Chemotherapy of cancer.
- (22) Dr. B. G. Modi .. Radio isotopes in diagnosis, therapy and research.
- (23) Dr. K. K. Govind Menon .. The physiological mechanism of ketosis.
- (24) Shri C. S. Kashyap .. Review on stability of vitamin B12 (some aspects).
- (25) Dr. Samuel J. Ajil, Director of Research, the Albert Einstein Medical Centre, Philadelphia. Plague toxin.
- (26) Shri V. G. Fadnis .. Phenylketonuria, an inborn error of metabolism.
- (27) Kumari S. L. Shah .. The nature of the reactive groups in horse antibody gamma globulin.
- (28) Kumari M. S. Kotnis .. School feeding on a planned basis.
- (29) Kumari B. Ver .. A review of viral nucleic acids.

- (30) A film show on "Librium" Roche product was shown.
- (31) Shri B. S. Rathore and Kumari A. Bundeally. Studies in the synthesis and antitubercular activity of thioureas and allied derivatives.
- (32) Dr. A. B. Vaidya .. An evaluation of histopathological diagnosis of needle biopsies of liver.
- (33) Kumari U. Tonse .. Studies on oral antidiabetic drugs.
- (34) Dr. George Burden, consultant W.H.O. Vector control division. The present trends in insect control measures.
- (35) Dr. K. K. Govind Menon .. Propionic acid metabolism and active carbondioxide.
- (36) Dr. (Kumari) R. J. Irani .. Occurrence of sialic acid in *P. pestis*.
- (37) Shri H. K. Soni .. Plasma banking for anti-haemophilic factor.
- (38) Dr. (Kumari) Mariam George. Cell migration as an *in vitro* model for delayed hypersensitivity.
- (39) Shri R. B. Desai .. Tetanus toxin production in peptic digest of beef medium.
- (40) Kumari M. N. Guttikar .. Dietary fats and atherosclerosis.
- (41) Dr. Kumari H. Patil .. Some factors in the aetiology of atherosclerosis.
- (42) Dr. A. N. D. Nanavati .. Laboratory evaluation of K.F.D. Vaccine.
- (43) Dr. S. A. Vasavada .. Some aspects of throid hormone metabolism.
- (44) Shri G. Bhaskaran .. Endocrine control of reproduction in the house fly *M. nebula*.
- (45) A meeting was held to wish the Director Dr. H. I. Jhala a successful trip abroad.
- (46) Kumari V. K. Gokhale .. Antistreptolysin levels in normal persons and in the various diseases in Indians.
- (47) Academician Rudnew of Moscow. Advances in Soviet Medicine.

XVIX. BUSINESS MANAGEMENT.

GENERAL.

(a) The supplies of the biologicals and drugs this year exceeded those of all the previous years. Though this placed quite a strain on the business side of the Institute, all the sections concerning purchase, raw material storage, accounts, costing, physical verification, finished products storage, despatch, and recovery of bills, rose to the occasion and rendered creditable service. Proposals to increase the staff to cope with the increased work are before Government.

At a very short notice, we were called upon to arrange for the distribution of isonicotinic acid hydrazide tablets for the tuberculosis campaign of the Government of Maharashtra. This has been carried out smoothly.

For the first time, the Institute leased a patent (for Tolbutamide) to a private manufacturer.

Classes were conducted in the Institute to train ministerial staff in various subjects like purchase, storekeeping, Government Accounts, Commercial Accounts etc. The departmental examination for the last year's students in these subjects was also held.

The purchase section had to implement Government orders regarding economy. Better purchase procedures were introduced. Stores Department reorganised the godowns. However, the acute difficulty of storage space persists. The necessary proposals for increasing the storage space are pending with Government. In the Cost Accounts Section, the cost of the Institute's products for 1959-60 and the commercial accounts for the year 1960-61 were worked out. The net surplus of over Rs. Nine lakhs was obtained after all invisible expenses like interest, depreciation, pension contribution, etc., have been accounted for. The Physical Verification Section gave special attention to deadstock. Also, it rendered help to Stores in godown reorganisation. The Finished Products Section took over further manufactured items from the departments. Here also, the difficulties of storage space, particularly cold storage, persisted. The Despatch Section had to bear the brunt of the record supplies in the year, particularly during the cholera epidemic and the floods. The Bill Recovery Section could not cope with the sudden expansion of the supplies. However, the total amount recovered showed improvement over that of the last year.

The financial picture of the Institute for the year 1960-61 is given below :—

FINANCIAL POSITION.

Our Position as on 31st March, 1961. (1960-61).

	Rs.	1960-61 Rs.	Rs.	1959-60 Rs.
<i>What we have—</i>				
1. Land and Buildings ..	40,29,552		39,94,116	
2. Equipments ..	26,87,194		23,77,395	
3. Library books ..	4,34,399		4,01,567	
4. Live Stock (excluding gift).	1,36,111		1,06,638	
5. Stock and Stores ..	20,64,170		15,11,384	
6. Amounts to be received.	18,77,071		14,54,310	
7. Cash and other balances.	7,96,185		2,84,796	
		1,20,24,682		1,01,30,206
<i>What we owe—</i>				
1. Depreciation fund ..	12,42,498		10,52,243	
2. Amount to be paid ..	12,58,742		5,32,657	
3. Miscellaneous deposits ..	2,20,367		1,45,851	
		27,21,607		17,30,751
		93,03,075		83,99,455
<i>Surplus to be distributed between the Government and the Institute—</i>				
1. Net Surplus (after providing for all expenses).		9,36,545		7,89,441
<i>What remains—</i>				
(Capital)		83,66,530		76,10,014

What we earned and spent in 1960-61.

	Rs.	1960-61 Rs.	Rs.	1959-60 Rs.
<i>What we earned—</i>				
1. From selling biologicals and drugs.	55,30,103		49,77,213	
2. From analytical tests ..	1,09,051		1,15,333	
3. Miscellaneous sources ..	27,193		41,036	
4. Value of Closing Stock ..	20,64,170		15,11,384	
		77,30,517		66,44,966

What we spent—

1. On our employees ..	14,85,854	18,17,234
2. On Raw Materials ..	25,46,726	17,81,063
3. On other purchases and Services.	3,54,317	3,04,208
4. Value of Opening Stock.	15,11,384	15,95,420
5. On Provision for Pension, Depreciation, Interest, etc.	8,95,691	8,57,600
	67,93,972	58,55,525

Surplus to be distributed between the Government and Institute—

1. Net surplus (after providing for all expenses).	9,36,545	7,89,441
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How the surplus will be Distributed—

1. 50 per cent. to the Government.	Nil.	3,94,721
2. 50 per cent. to the Institute's Development Fund.	Nil.	3,94,720

This year, the value of exports came to Rs. 2,08,864 as against Rs. 66, 679 for the year 1960.

2. *Promotions.*—Shri S. J. Kajrekar, Cashier, is promoted to the post of Accounts Superintendent in place of Shri A. R. Dhavilkar, promoted as Office Superintendent. Shri A. S. Samant, Assistant Accountant, is promoted as Cashier in place of Shri S. J. Kajrekar.

3. *Training.*—Shri B. D. Wadekar returned in the first week of April 1961 after completing his training in Cost Accounting for 4½ months at the Institute of Cost and Works Accountants of India, Calcutta.

4. *Routine Activities.*

1. Items of Local Purchase ordered	3,201
2. Items of imports ordered	1,520
3. Receipt Vouchers prepared	4,707
4. Indents received by Stores from Departments ..	13,945
5. Parties supplying stores material	556
6. Bills passed of stores supplies	6,230
7. Institutions and other customers served	6,840
8. Approved Chemists served	112
9. Indents executed from customers	18,125
10. Bills issued to customers	19,863
11. Physical Verifications of Deadstock Items	24,595
12. Physical Verification of Stores Items	1,379

XX. *List of Distinguished Visitors.*

Prof. K. Tadorovic	..	Belgrade, Yugoslavia.
Dr. R. W. Gerard	..	Mental Health Research Institute, U. S. A.
Dr. R. F. Fargubarson	..	Medical Research Council, Canada, Banting Institute, 100 College St. Toronto.
Dr. Richard W. Fay	..	Director of Experimental Sanitation, World Health Organisation, Geneva, Switzerland.
Prof. Robert H. Burris	..	Prof. of Biochemistry, University of Wisconsin, Madison 6, Wisconsin, U. S. A.
Dr. Louis J. Oliveri	..	Lab. of Parasitic Diseases, National Institute of Health, Bethesda, Maryland, U. S. A.
Shri Sri Prakasa ..	..	Governor of Maharashtra.
Dr. Mendreq Marchetti	..	Under Secretary to Public Health, Argentina, S.A.
Dr. F. G. Pirusky	..	Director, Microbiological National Institute, Buenos Aires, Argentina, S. A.
Dr. M. Soliar, M. D.	..	Swiss Federal Office of Public Health, Switzerland.
Prof. U. Lansee, M. D. and Mrs. Lansee.	..	Director, Swiss Federal Office of Public Health, Switzerland.
Prof. Moehlman	..	Germany, G.D.R.
Prof. Shields Warrens	..	Harvard University, U. S. A.
Dr. S. Simsiroglou	..	Director of Rural Health School W. H. O., Fellow Farsala, Greece.
Shri K. K. Moghe	..	Secretary to the Government of Maharashtra.
Dr. Areu Karidsen and delegates.	..	Director of F. A. O. Dairy Training Centre, Denmark.
Dr. Einer O. Peterson	..	Assoc. Director, Denmark.
Lt. M. S. Kohli ..	..	Leader, Indian Annapurna III Expedition.
Shri S. K. Wankhede	..	Finance Minister, Government of Maharashtra.
Dr. Samuel J. Ajl	..	Director of Research, Albert Einstein Medical Centre, Philadelphia, U. S. A.
Dr. Juntare Kamahora	..	Director of Research Institute, for Microbial Diseases, Osaka, Japan.
Dr. Burden ..	..	W. H. O., Consultant Permanently with Insects Affecting man U. S. D. A.
Dr. Randir Subba	..	Vice Chancellor, Tribhuwan University, Nepal.
Dr. Albert B. Sabin	..	Cincinnati, Ohio, U. S. A.
Dr. G. L. Sharma	..	Director, Health Services Indo.e (M. P.)
Shri Ram Ratan Gupta	..	Mayor, Kanpur Corporation.
Dr. E. Kjolbye ..	..	Medical Officer of the W. H. O., Regional B. C. G. Assessment Team.
Dr. Ourai Chungcharoen	..	Department of Physiology, Siriraj Hospital, Medical School, Bangkok, Thailand.

- Dr. S. W. Bibile .. Professor of Pharmacology, Faculty of Medicine, Colombo-3.
- Dr. Vek Netranisesh .. Professor of Physiology, Faculty of Medicine Chulalongkon Hospital, Medical School.
- Dr. Jlasan Kudikin .. Secretary, Medical Faculty of University Oadgadrasson, Bandung, Indonesia.
- Dr. Myint Than .. Head of the Department of Pharmacology, Therapeutias Medical College, Mandalay, Burma.
- Dr. Abdul Habib Dil .. Prof. of Pharmacology, Kabul, Afghanistan.
- Dr. S. Launil .. Head of Department of Pharmacology, Djakarta, Indonesia.
- Dr. D. W. Hall .. Tropical Liasion Officer, Post information, Labo, Slough, England.
- Dr. D. C. Jain .. Deputy Director (Food) Officer, of the Regional Director of Food, Bombay.
- Dr. R. Schneeweiss .. President of the International Association of Cereal Chemistry also Director of the Institute of Grains Research, German Democratic Republic.
- Shri J. S. Mathur .. Deputy Director, Ministry of Food and Agriculture, Government of India.
- Dr. Y. Okemos .. The Research Institute for Microbial Diseases, Osaka University, Osaka, Japan.
- Major Arnold M. Reeve .. Assistant Army Attache, American Embassy, New Delhi.
- Capt. K. R. Bəli .. H. Q. Bombay Sub-area, Colaba, Bombay 5.
- His Excellency Mr. L. I. Brezhnev. Chairman of the Presidium of Supreme Soviet of U. S. S. R.
- Her Excellency Mrs. L. I. Brezhnev.
- Dr. Lucian Bernard .. World Health Organisation, New Delhi.
- Prof. Kuitashvili .. Moscow, U. S. S. R.
- Prof. Rudnew .. Moscow, U. S. S. R.

XXI. MISCELLANEOUS.

(a) *Exhibition Activities.*—The previous two years' experience has proved the merit of popularising the scientific work of the Institute on an educational level. It is seen that the Institute stall is always a centre of attraction to the visiting public-people from all walks of life not with a view to merely see the display but with a view to gain some knowledge in the field of public health and personal hygiene. This can be judged from the fact that organisations always make it a point to invite the Haffkine Institute to put up a stall in the exhibition, organised by them.

The Institute this year could participate in the following exhibitions :—

(1) Scientific Exhibition at Ahmedabad on the occasion (from 9th February 1961 to 19th February 1961) of Ahmedabad Civil Hospital Centenary.

(2) Glimpses of Wonder and Beauty Exhibition (Tourism Exhibition) at Bombay (From 5th March 1961 to 2nd May 1961).

(3) Health and Psychological Exhibition at Khar, Bombay. (From 17th December 1961 to 20th December 1961).

Posters, life-size photographs, coloured panels, cut-outs, and layouts and actual samples of drugs formed part of the exhibits. Emphasis was put more on the preventive side than on therapeutic side. Blood-donation activity was also emphasised in particular.

(b) *The Haffkine Institute Co-operative Credit Society Ltd., Parel.*—The society has continued its satisfactory progress during Silver Jubilee Year. The total strength of the members is 529. The subscribed capital as on 30th June 1961 was Rs. 2,14,343·88 nP. (Showing an increase of Rs. 20,452·00 over that of the previous year). The society continued its function of advancing loans to members. The loans advanced during the current years amounts to Rs. 1,72,978·42. The society is registered as an agent under the existing rules of the following agencies. (1) Janata Policies under the Life Insurance Corporation of India, and General Life Insurance. The society has made a business of about Rs. 400,00 in insurance. (2) It continued its function in small saving scheme.

The society having completed 25 years of its service, celebrated its silver Jubilee in the month of February 1961, under the presidentship of Honourable Shri H. J. H. Taleyarkhan, Minister of Public Health.

His Excellency Shri Sri Prakasa was the Chief Guest on the occasion. He was very much pleased with the general working of the Haffkine Institute Co-operation Credit Society and urged other non-members of the Society to become members of the Society.

The Society has invested in Government Security Bombay, Municipal Debentures, Treasury Savings Deposits, National Savings Certificate, the amount of Rs. 41,967·07. The Society runs also a grain shop and a stores for the benefit of the members of the staff and has transferred a business of Rs. 1,26,790·00 nP. by way of sales.

The appropriation of profits for the year 1960-61 is as under :—

	Rs.	nP.
Reserve Fund 25 per cent	2,487	54
Dividend Equi. Fund	150	00
Charity Fund	50	00
Dividend at 4-1/5 per cent	8,450	00
Bonus to staff	354	00
Contribution to Education Fund of the Maharashtra State Co-operative Union as per Co-operative Act.	124	37
Balance	149	05
Total ..	11,764	96

(c) *Welfare Activities.*—(1) Haffkine Institute Sports Club progressed satisfactorily with its increased multiple games activities. The membership increased from 300 to 580. All the Departments participated in the activities of Sports Club. The Cricket Team participated in E. Merck tournaments. Badmington, Table Tennis, Volley Ball were in full swing and received a very good response from the members. Matches were arranged for all these games. Many members showed particular interest for Indian games. Matches in these games were also arranged. This year we have arranged an educational-cum-sports trip to Pimpri to play friendly matches with Hindustan Antibiotics Sports Club. We arranged on a sport day an embroidery, handicraft exhibition inaugurated by Shri Vijay Merchant. Dr. A. N. D. Nanavati and Lt., M. S. Kohli were given a warm welcome for their successful expedition on Annapurna peak. The annual day was celebrated in collaboration with Silver Jubilee.

(2) *Welfare Centre.*—Library as a Welfare activity for the benefit of members of the staff about 1,800 books added to the Library. The membership of this Library at present is about 200. Books and magazines which are added to the Library are on increase day by day. This activity is very useful to the members in developing literary talents and the members are taking full advantage of the Library.

(3) *Medical Treatment : Dispensary.*—The dispensary of the Institute has become popular these days. This is evident from the increased number in the patients.

The treatment given here is purely of outdoor type. It has been possible to mitigate the burden of pecuniary expenses to the patients. This has been done in the form of 50 per cent reimbursement of the cost of the medicine purchased from outside. It is a disquieting feature to note that more and more cases of tuberculosis are being detected these days. This speaks for itself for the socio-economic condition of the sufferers. It calls for better housing and nutrition.

(d) *Supervisory Training.*—This is the second year of this additional activity of supervisory training, in this Institute. The training was introduced at various levels of Supervisors, including the junior laboratory assistants. It is heartening to note that there is growing awareness of the need for such a training amongst the Supervisors of this organisation and during group discussions a large number of them showed productivity consciousness.

XXII. LIST OF RESEARCH PAPERS PUBLISHED FROM HAFFKINE INSTITUTE DURING THE YEAR 1961.

BACTERIOLOGY.

- Bhagwat, Prabha, D, Joshi, Leela M., Kirtikar Mridula W., Savitri, M. and Purandare, N. M. Bacteriophage typing of salmonella typhi and Salmonell Paratyphi A strains. Indian Journal of Pathology and Bacteriology, 4 ; 83-86, 1961 (Work carried out at G. S. Medical College, Parel, Bombay-12 and forwarded from here).
- Ganapathi, K. Twenty years of antibiotics—a review. Indian Journal of Physiology and Pharmacology, 5 ; 91-112, 1961.
- Ganpathi, K. Regulatory mechanisms in microorganisms: their molecular basis. Journal of Scientific and Industrial Research, 20A ; 569-576, 1961.
- Hazra, A. K. Prophylaxis of tetanus. Indian Journal of Medical Sciences, 15 147-151, 1961.
- Habbu, M. K ; Mhatre, H. K. and Govekar, G. M. Modified medium for the production of Pertussis vaccine. Current science, 30 ; 263-264, 1961.
- Sant, M. V. Bacteriophage types of Salmonella typhi and Salmonella paratyphi-A encountered in Bombay City. Indian Journal of Pathology and Bacteriology, 4 ; 87-88, 1961.
- Sant, M. V. and Nair Yesodhara-Prevalent serological types of urinary and other E. coli in Bombay ; Preliminary note ; Indian Journal of Medical Sciences, 15 ; 642-649 ; 1961.
- Sant, M. V. and Rege, S. R. Mycological flora or otomycosis in Bombay. Journal of Postgraduate Medicine ; 7 ; 154-157, 1961.

BIOCHEMISTRY.

- Bharucha, E. D., Joshi, R. N., Venkatraman, A. Estimation of serum transaminases in the clinical laboratory. Indian Journal of Medical Sciences, 15 ; 206-210, 1961.
- Durgakeri, U. S., Bellare, R. A. Determination of Manganese in clinical material and normal blood and serum manganese levels. Journal of Scientific and Industrial Research, 20C ; 314-317, 1961.
- Master, R. W. P., and Rao, S. S. Identification of Enzymes and toxins in venoms of Indian cobra and Russell's viper after starch gel electrophoresis. Journal of Biological Chemistry, 236, 1986-1990, 1961.
- Mehta, C. J. Protein metabolism in uremia. Proceedings of Symposium on proteins (August 14-16, 1960) held at Central Food Technological Research Institute, Mysore, published by Chemical Research Committee and Society of Biological Chemists, India, 244-247, 1961.

Shah, Surbala, L. and Rao, S. S. Study of proteinprotein interactions in serum under the influence of heat. Proceedings of symposium on proteins (August 14-16, 1960) held at Central Food Technological Research Institute, Mysore published by Chemical research committee and Society of Biological chemists, India ; 31-36, 1961.

Waknis Vijaya, N.; Master, R. W. P., and Rao, S. S. Use of ion exchangers in the separation of proteins of Cobra venom. Proceedings of symposium on proteins (August 14-16, 1960) held at Central Food Technological Research Institute, Mysore, published by Chemical Research Committee and Society of Biological Chemists, India ; 23-30, 1961.

Venkataraman, A. Studies on estimation of serum proteins III. A simple laboratory micromethod for the determination of "True" albumin alpha, beta and gamma globulins in 1 ML. of serum. Indian Journal of Medical Science, 15 ; 211-215, 1961.

BLOOD.

Shahani, R. T. Shah, Neela and Sabnis, S. S. Studies in immunization using blood group substances prepared from meconium. Indian Journal of Pathology and Bacteriology, 4 ; 214-225, 1961.

CHEMOTHERAPY.

Kulkarni, B. S. Chemotherapy of Tuberculosis : Part VII-Synthesis of some new N-(2)-Thiazolyl-N'-p-alkoxyphenylthiureas. Journal of Scientific and Industrial Research, 20C ; 205-207, 1961.

Kulkarni, K. D. and Shrisat, M. V. Chemistry of Thiazoles-Synthesis of 2-Acet-sulphanilimido-3-acetsulphanilyl 1-5-alkylthiazolines. Journal of Scientific and Industrial Research, 20B ; 398-399, 1961.

Patki, V. M. and Shirsat, M. V. Chemotherapy of intestinal infections. Part III-Estimation of N4-acyl derivatives of sulphonamides in animal tissues. Journal of Scientific and Industrial Research, 20C ; 18-20, 1961.

Patki, V. M. and Shirsat, M. V. Chemotherapy of intestinal infections : Part IV-absorption, excretion and deacylation of N⁴-Aliphatic acyl derivatives of sulphadiazine. Journal of Scientific and Industrial Research, 20C ; 181-185, 1961.

Rathore, B. S. ; Mulziani, Z. and Deliwala, C. V. Chemotherapy of Tuberculosis : Part VIII-synthesis of some new N-Aryl-N'-2 pyrimidylthiureas. Journal of Scientific and Industrial Research, 20C ; 266-268, 1961.

ENTOMOLOGY.

Deoras, P. J. and Joshi, A. K. A note on the feeding mechanism of *Xenopsella cheopis*. Current Science, 30 ; 465-466, 1961.

MMUNOLOGY.

Martins, A. B. and Jhals, H. I. The relationship between the classical antibody response and the tuberculin type antibody response. I, the effect of prior stimulation with antigenic tuberculin on the subsequent antibody response to tubercle Bacilli. Indian Journal of Pathology and Bacteriology, 4 ; 15-25 ; 1961.

Martins, A. B. and Jhala, H. I. The relationship between the classical antibody response and the tuberculin type antibody response II. The effect of prior induction of tuberculin hypersensitivity on the subsequent antibody response to antigenic tuberculin. Indian Journal of Pathology and Bacteriology, 4 ; 51-61, 1961.

PATHOLOGY.

Joshi, R. N. and Sant, M. V. Infantile and childhood cirrhosis ; biochemical and histological aspects. Indian Journal of Pathology and Bacteriology, 4 ; 231-234, 1961.

PHARMACOLOGY.

Bhatt, J. G., Brindle, H. and Macdonald, A. D. The chemical assay of digitalis. The Journal of Pharmacy and Pharmacology, 13 ; 283-289, 1961 (work carried out at the University of Manchester and forwarded from here).

Bhatt, J. G., Biological and Chemical evaluations of *Digitalis purpurea*. Indian Journal of Physiology and Pharmacology, 5 ; 211-217, 1961. (Work carried out at the University of Manchester and forwarded from here).

Nayak, K. P. and Dutta, N. K. Role of essential oils and allied drugs in experimental cholera of the rabbit. Indian Journal of Medical Research, 49 ; 51-54, 1961.

Panse, M. V. and Dutta, N. K. Excretion of toxin with stools of cholera patients. Journal of infectious Diseases, 109, 81-84, 1961.

Sastry, M. S. Comparative chemical study of the two varieties of Galangal. Indian Journal of Pharmacy, 23 ; 76-77, 1961.

Sastry, M. S. and Dutta, N. K. A method for preparing tincture *saussurea*. Indian Journal of Pharmacy, 23 ; 247-249, 1961.

VIROLOGY.

Meherhomji, K. M. and Gharpure, P. V. Incidence of enteroviruses among healthy individuals of Bombay. Indian Journal of Microbiology, 1 ; 135-142, 1961.

MISCELLANEOUS.

Deoras, P. J. A study of Scorpions ; their distribution, incidence and control in Maharashtra. Probe, 1 ; 45-54, 1961.

Ganapathi, K. An evaluation of the Antibiotic era. Published in " Science and Health " by World Federation of Scientific Workers, London, 175-186, 1961.

Ganapathi, K. Development of antibiotics industry in India. Chemical Industry News, 4 ; 129-135, 1961.

Gharpure, P. V. and Jhala, H. I. The Polio problem in India. Ahmedabad Civil Hospital Centenary publication, 27-31, 1961.

Jhala, H. I. Progress of Science (Medicine) Medical Bulletin, 7 ; 19-26, 1961.

Jhala, H. I. Guest editorial, Antibiotics and Steroids. Medical Digest, 29 ; 285-287, 1961.

