
ANNUAL REPORT
OF THE
HAFFKINE INSTITUTE

1993-96



HAFFKINE INSTITUTE
PAREL, MUMBAI 400 012
INDIA

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(1993-94)

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CHAPTER - I

INTRODUCTION

The Governing Council of Haffkine Institute chaired by the Hon'ble Minister for Public Health and Medical Education, Government of Maharashtra, met once during the year. While the Executive Committee and the Teachers Council met several times to provide guidelines for the smooth functioning of the Institute.

Plague happens to be one of the oldest diseases known to mankind. In the year 1994, a suspected outbreak of plague was reported in Latur and Beed districts of Maharashtra. A team of scientists from Haffkine Institute visited the affected areas and collected the clinical information and blood samples of rodents, canine and human individuals. The sera samples were screened for both bacterial isolation and serological diagnosis using F1 antigen. The results showed no evidence of plague.

The following are the highlights of the various activities of various departments of this Institute for the years from 1993 to 1996.

Bacteriology

The Department of Bacteriology is conducting the genetic studies on *R. plasmid* mediated antibiotic resistance in *S. typhi*. They also undertook the studies on antibacterial activities of the extracts of indigenous plants.

Biochemistry

The Department of Biochemistry continued the studies on the protective damage in animal tissues and biochemical characterisation and mechanism of action of the glycaemia causing factor purified from *B. pertussis*. Studies were also undertaken on oral hypoglycaemia agents from Indian medicinal plants. The testing activities concerning clinical investigations of blood, urine and CSF samples referred by various city hospitals, private practitioners and the Medical Officer of the Institute were carried out in the department. The department participated in the DMLT Training Course conducted by the Institute.

Chemotherapy

Synthesis and testing of biological properties of newly synthesised organic compounds are the principal activities of the Department of Chemotherapy. These compounds are tested for their antibacterial and antitubercular activities.

Clinical Pathology and Immunology

The Clinical Pathology and Immunology Department continued their research on a regulation of immune response to mycobacteria; specifically the study of T cell subset differentiation after ip and id immunisation with *M. vaccae*. Further, the projects on study of network interactions in regulation of immune response against mycobacteria and study of immunological properties of porins of *S. typhi* which were initiated in 1991-92, were continued. The staff participated in the integrated Bombay University teaching programme for M.Sc. (Microbiology) and M.D. (Pathology). The department participated in the DMLT Training Course conducted by the Institute.

Pharmacology

The Pharmacology Department continued their investigations with indigenous plant extracts especially with reference to mosquito repellent and larvicidal activities. Few compounds have shown some promising activity. The work is continued.

Human Pharmacology and Bio-availability, Radiation Biology and Epidemiology

This department has diverse activities. These include testing of various drugs for their bioequivalence, assessment of herbal compounds for the antibacterial as well as antimycotic potentials in suitable vehicles such as detergent or ointment base. The department also conducted epidemiological studies during various outbreaks of communicable diseases to identify the causative organisms and to suggest various ways for the prevention and control of these diseases.

Toxicology

For past several years, Department of Toxicology has been actively engaged in toxicological testing of commercial samples referred by government and commercial organisations. The samples included drugs, cosmetics, pesticides, chemicals, painted containers, plastics, etc.

Virology

Department of Virology is recognised as a Viral Hepatitis Surveillance Centre for the states of Maharashtra and Goa, by WHO/ NICD. The department had earlier studied the antihepatotoxic activity of *Phyllanthus niruri* plant extract and its active constituents, in experimentally induced hepatitis B virus infection in the Langur monkey model (*Prestatitics entellus*). The activities of the department are now focussed on HIV and associated diseases. The work related to polio, rabies and herpes is being continued.

Zoonosis

Department of Zoonosis continued its research activities concerning the prevalence, epidemiology and serological aspects of dengue, malaria, filariasis, dracunculiasis and plague. An important project funded by ICMR was initiated to develop a rapid and sensitive ELISA test for detection of snake venom antigen. Another project sponsored by University Grants Commission specifically for women scientists was also undertaken to study the immunodiagnosis and vector control of dracunculiasis.

Recently the department has undertaken various bio-environmental control measures for vector borne diseases. The department is also engaged in carrying out active surveillance of plague for past several decades. In addition to this, a number of commercial formulations, both synthetic and indigenous, were examined for their biological efficacy on important pests.

The department maintains a number of snakes and scorpions in its snake farm. The venom extracted from these is used for research as well as for production of anti snake sera. A research study on scorpion venom and its analysis is undertaken in collaboration with Hammersmith Hospital, London. This might prove useful in preparation of synthetic vaccine for field use.

ACADEMIC ACTIVITIES, HONOURS & AWARDS

A research paper entitled "Synthesis of 2-(N-substituted-Glycylamino)-4-substituted benzoylthiazoles as potential antitubercular and antimicrobial agents" by A.K. Manian, B.G. Khadse & S.R. Sengupta, published in Indian Drugs 30 (7), 324-326, 1993, was selected as the best research paper by Indian Drug Manufacturers Association. The award constituted of Rs.2,500/- cash prize and a certificate of merit. This was delivered at the hands of Mr. Eduardo Falero, Union State Minister for Petroleum, Chemicals and Fertilizers.

Dr.(Mrs.) R.A. Deshmukh, Department of Virology, participated in the following workshops and seminars :

1. Health care for HIV positive and AIDS patients organised jointly by British Deputy High Commission, Bombay Municipal Corporation and Haffkine Institute at Mumbai, March 3-11, 1993.
2. Prevention of Rabies in the Indian Subcontinent organised by Pasteur Mereiux Serums and Vaccines, at Jakarta, Indonesia, May 1-4, 1993
3. Vaccines : New Generation Immunological Adjuvants, organised by NATO Advanced Studies Institute at Cape Sounion Beach, Greece, June 24 - July 5, 1994.
4. Indo French Symposium on Immunomodulation, organised by National Institute of Immunology, New Delhi, December 10-13, 1995.

Ninad Parulkar, student of the Department of Virology presented the paper entitled "Study of MDR mycobacteria in HIV Seropositive Pulmonary Tuberculosis Patients" for Dr. Dhalas oration and was awarded the first prize.

Department of Zoonosis participated in organising a National Symposium on Venoms and Toxins in collaboration with Institute of Immuno Haematology (ICMR), at Mumbai, April 12-13, 1994.

Dr. B.D. Sathe, Department of Zoonosis, participated in the following workshops and symposia:

1. Surveillance and Control of Plague and Leptospirosis, at Bangalore, May 20-25, 1996.
 2. National Workshop on Bio-environmental Management of Vector Control, at NICD, Delhi, March 25-28, 1996. Field study at Alibag, Raigad District, Maharashtra, March 29 - April 3, 1996.
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CHAPTER-II

RESEARCH PROGRESS

Bacteriology

The Department was engaged in the following research projects:

1. *Studies on multiple drug resistance in enterobacteriaceae*

104 clinical isolates belonging to Enterobacteriaceae family were identified and characterised in terms of drug resistance. 87.5% of the isolates exhibited multiple drug resistance owing to the presence of an R-plasmid. It was interesting to find that these plasmids were neither 'curable', nor 'transferable' by conjugation, whenever the isolate exhibited resistance to Ciprofloxacin, a fluoroquinolone.

2. *Antibacterial activity of Amikacin - Cefotaxime combination against Ciprofloxacin resistant isolates.*

75 multiple drug resistant isolates belonging to Enterobacteriaceae family and exhibiting resistance to Ciprofloxacin, the fourth generation fluoro-quinolone were subjected to a study to identify synergistic combination that could help combat the possible impending disaster posed by Ciprofloxacin resistant pathogens.

Gentamycin - Cefotaxime, Amikacin - Ceftazidime, and Amikacin - Cefotaxime (aminoglycoside - β lactam combinations) exhibited good synergistic activity against these isolates, Amikacin - Cefotaxime combination in a ratio of 1:2 to 1:4 proving to be the best by the checker board assay.

It was found that while the individual drugs at half the MIC (256 $\mu\text{g/ml}$) were unable to exert continued antibacterial activity for 24 hours, the two drugs in a combination of 32:128 $\mu\text{g/ml}$ brought about complete inhibition of the resistant organisms.

Biochemistry

1. Studies on the effect of *B. pertussis* preparation on hyperglycaemia and associated responses induced by catecholamines

The catecholamines such as epinephrine, norepinephrine are known to cause several biochemical effects such as hyperglycaemia, lipolysis, increase in serum FFA, increase in blood lactate, enhanced secretion of glycogen and inhibition of insulin secretion. *B. pertussis* (B.P.) preparations are found to reverse the hyperglycaemia observed in Alloxan induced diabetes in experimental animals.

However, the detailed biochemical mechanisms involved in the reversal of epinephrine induced hyperglycaemia and associated responses by *B. pertussis* extract are not known.

The studies are therefore carried out in mouse tissue with respect to the following mechanisms :-

a. In liver :

- | | |
|---|------------------------|
| i) Hyperglycaemia due to glycogenolysis in liver which is cAMP mediated | Serine dehydratase. |
| ii) Gluconeogenesis | Alanine transaminase |
| iii) Lipolysis - enzyme lipase | Aspartate transaminase |

b. In pancreas :

Effect of B.P. extract on cAMP levels.

c. Serum insulin levels

Standardization of liver glycogen :

Liver glycogen was estimated by the combined method of Montgomery (1957) and Trevelyan and Harrison (1952). The method consists of boiling the tissue in 30% KOH, precipitation of glycogen by 95% ethyl alcohol and estimation by Anthrone's Reagent.

The liver glycogen in saline control was found to be 2.809 ± 0.08 mg/gm tissue in overnight fasted mice. Administration of epinephrine (0.4 mg/kg b.wt.) intraperitoneally causes breakdown of glycogen

to the level of 0.409 ± 0.027 mg/kg tissue ($n=10$) at the end of 30 minutes. The reversal of epinephrine induced glycogen breakdown by our extract is to be studied.

Standardization of enzyme serine dehydratase from mouse liver

Serine dehydratase is a glyconeogenic enzyme which uses the amino-acid serine as its substrate and converts it to pyruvate, which through a number of enzymatic steps can be used to form glucose by the cell.

Serine dehydratase enzyme was estimated by the method of Suda and Nakagawa (1970).

- i) Saline control values obtained were 0.17 ± 0.0036 $\mu\text{g/mg}$ in 18 hours fasted mice.
- ii) On administration of B.P. extract control values were slightly lower than normal 0.12 ± 0.0058 $\mu\text{g/mg}$ protein ($n = 10$)
- iii) Increase in the enzyme was observed at the end of 60 minutes after epinephrine administration i.e. 0.24 ± 0.0051 $\mu\text{g/mg}$ protein ($n = 10$).

The reversal of the effect of epinephrine by *B. pertussis* extract is to be studied.

Estimation of Insulin from mouse serum :

Insulin was estimated using the RIA kit (Brit, India). The blood was collected from retro-orbital sinus and the separated serum was used for estimation.

Epinephrine was administered intraperitoneally at the dose of 0.4 mg/kg b.wt. and insulin levels estimated at the end of 30 minutes.

B. pertussis extract was injected intravenously at the dose of 1mg/kg b.wt and insulin estimated at the end of 6 hours. In normal mice, epinephrine caused a marked hyperglycaemia which in turn gave rise to a slight elevation in blood insulin level. In pertussis sensitized mice however significant lowering of blood sugar was observed along with an increase in the insulin levels indicating that the injection of epinephrine did augment rather than prevent insulin secretion.

The remaining groups of gluconeogenic enzyme serine dehydratase and Aspartate transaminase and Alanine transaminase are being estimated.

Work to be completed :

Enzyme parameters such as lipase, phosphorylase A and cyclic AMP from liver tissue will be studied in saline control, *B. pertussis* extract treated, epinephrine treated and *B. pertussis* extract epinephrine treated groups.

2. Studies on oral hypoglycemic agents from some Indian medicinal plants

Objectives :

- i) Screening of about 10-15 Indian medicinal plants for the evaluation of hypoglycemic activity.
- ii) Isolation of active principle.
- iii) Confirmation of hypoglycemic activity in experimental animals.
- iv) One month study of chronic toxicity.

Summary of work carried out :

During the study period following plants were investigated; *Trigonella* sp. (Methi), *Cephalandra* sp. (Tondli), *Carum* sp. (Shahjira), *Cyamopsis* sp., (Guar), *Carum* sp., (Kalajira) *Trichosanthes* sp. (Padval), *Eleusine* sp. and *Zoa* sp.

The methanolic extract of each medicinal plant was prepared with Soxhlet apparatus followed by water extraction.

The standardization of blood sugar was carried out by *O. toluidine* method. The normal fasting blood sugar was found between 65-110 mg%. The percentage reduction in fasting blood sugar in normal fasting mice after 2 hrs. and 4 hrs. was between 5 to 7 mg%.

The screening of eight medicinal plants for hypoglycemic activity was done in 5 normal fasting mice.

The extract was administered orally at the dose of 500 mg/kg b.wt. and the percentage reduction in fasting blood sugar was estimated at 2nd hr and 4th hr.

The methanolic extracts of Shahjira, and Maka, gave 25.17% and 31.63 % reductions while water extracts of Shahjira, Guar and Maka gave 36.19%, 25.67% and 25.59% reductions, which are considerable for the investigation of active ingredient.

Work to be completed :

The screening of about five medicinal plants will be carried out.

The isolation of active principles would be carried out by chromatographic techniques.

The hypoglycemic activity will be confirmed in experimental animals.

3. Studies on Hepatoprotective activity of some indigenous plants**Objectives :**

- i) Evaluation of hepatoprotective activity of about 5-6 medicinal plants
- ii) Induction of hepatic damage in the animal model by administration of hepatotoxic agent like Carbon tetrachloride (CCl_4).
- iii) Preparation of different extracts (water ext; methanol extract) of plant materials and testing for hepatoprotective activity.
- iv) Isolation of active principle, if possible.
- v) Confirmation of activity in experimental animals.
- vi) Testing the effect of active principles on various related biochemical parameters.

Summary of work carried out :

Standardization of Alkaline Phosphatase (ALP) by Kind and King's method, Serum Glutamate oxaloacetate transaminase (SGOT) by Reitman & Frankel's method & Serum Glutamate Pyruvate transaminase (SGPT) by Reitman & Frankel's method was done.

The normal values in 24 hrs fasted mice were found to be approximately :

Serum ALP	12 - 20 KA
Serum SGOT	65 - 85 IU/L
Serum SGPT	70 - 120 IU/L

Chemical induction of Liver damage

Carbon tetrachloride was administered intraperitoneally at a dose of 0.01 mg/kg b.w. (50% solution in paraffin oil). The serum ALP, SGOT and SGPT values were found to be elevated.

ALP	30 KA
SGOT	115 IU/L
SGPT	270 IU/L

Screening of Medicinal Plants for Hepatoprotective activity

Screening of following three plants for hepatoprotective activity was carried out.

Phyllanthus emblica (dried fruit)

Berberis aristata (Root bark)

Andrographis paniculata (Leaves)

Extraction of plant material :

Soxhlet apparatus was used for methanolic extraction of plant material and water extract was prepared by soaking the plant material in warm water.

The animals were intoxicated by single intraperitoneal injection of CCl_4 (0.01 ml per kg b.w. 50% soln in paraffin oil). The plant extracts were dissolved in water and given orally to the animals at the dose of 500 mg/kg, 30 mins. before CCl_4 intoxication. After CCl_4 intoxication animals were starved for 24 hrs. and then blood was collected from retro orbital sinus. The serum was allowed to separate and the various estimations were carried out. Of the plants studied, extracts of *Berberis aristata* and *Andrographis paniculata* brought about considerable reduction in the values of SGPT, SGOT and ALP as compared to the CCl_4 group. Therefore, further studies are being planned with these two plants.

Work to be completed :

Further studies with *Berberis* sp. and *Andrographis* sp. using additional biochemical parameters.

Screening of 2-3 more plants for hepatoprotective activity.

4. Studies on Oral hypoglycaemic agents from some Indian Medicinal Plants.

This includes :-

- a. Screening of a series of plant extracts for their hypoglycaemic activity - Totally 12 indigenous plant (water and methanolic) extracts were screened for their hypoglycaemic activity in normal mice.
- b. To select those which have shown maximum activity and then to isolate the active principles from the crude extracts. The following 4 plants have shown hypoglycaemic activity in normal mice; methanolic extract of *Zea mays* (Maka styles), *-Carum carvi* (Shahjeera seeds) and *Guazum tomentosa* (Nagarmotha tubers) have shown 28.55% ($p < 0.01$) reduction in blood sugars of fasting normal mice at the end of 4 hours at the dose level of 500 mg/kg whereas water extracts (500 mg/kg) of *Zea mays*, *Helecters isora* (Murud shinga fruit) and *Centella asiatica* (Brahmi leaves) have shown 22.3% ($p < 0.01$), 31.20% ($p < 0.01$) and 24.68% ($p < 0.01$) reduction in blood sugar at the end of 4 hours respectively.
- c. To study the hypoglycaemic effect of the active principle in normal and diabetic animals and subacute toxicity study of the same. Isolated fractions from methanolic extracts of Shahjeera seeds and maka styles did not show any considerable hypoglycaemic effect. Hence the methanolic extract as such was taken for further study. Methanolic extract of Maka style has shown a significant hypoglycaemic effect in alloxan diabetic mice; 40.49% of reduction in blood sugars at the end of 72 hours at the dose of 500 mg/kg and also significantly inhibited hyperglycaemia induced by oral glucose load 1.5 g/kg. Blood sugar levels were 194 mg% in glucose treated animals whereas extract treated animals have shown 157 mg% at the end of ½ hour. In subacute toxicity the same extract was found to be devoid of mortality or toxic symptoms for 1 month at the dose of 100 mg/kg. The blood sugar lowering effect was 25% ($p < 0.01$). The food intake and weight gain was normal.

5. Studies on hepatoprotective activity of some indigenous plants. These include -

- a. Induction of hepatic damage in rats by administration of hepatotoxic agents like CCl_4 . The rats were intoxicated by a single intraperitoneal injection of CCl_4 (50% solution in paraffin oil) 0.1 ml/100 g body weight. SGPT levels were estimated at the end of 24 hours and 72 hours.
- b. Selection of medicinal plants, extraction and demonstration of hepatoprotective effect. The following 4 plants were selected and studied.
 1. *Andrographis peniculata* (Kirayat) - leaves
 2. *Phyllanthus emblica* (Amla) - fruits
 3. *Berberis aristata* (Daru-halad) - bark
 4. *Lawsonia alba* (Mehndi) - leaves

Methanol and water extract of Mehndi leaves lowered the SGPT levels significantly at the dose of 500 mg/kg.

	SGPT levels in I.U.	
	14 hrs.	48 hrs.
Control (CCl_4 treated)	301.4	141.4
Treated (extract)		
M.E.	256.3	98.9
W.E.	170.0	45.5
Normal control	42.7	

- c. Study of the above extracts on various biochemical parameters in CCl_4 treated rats. Both the extracts reduced the levels of SGPT, ALP, M.D.A. and increased CAT levels, thus showing the marked effect against induction of lipid peroxidation and hepatocytolysis. It has been observed that separation of these fractions did not help in increasing the hepatoprotective activity.

6. **Studies on the effect of *Bordetella pertussis* preparation on hyperglycaemia and associated responses induced by catecholamines. Biochemical mechanism involved in the reversal of epinephrine induced hyperglycaemia and associated responses by *B. pertussis* extract with respect to liver, pancreas and adipose tissue in mice were studied.**

B. pertussis extract significantly lowered the liver gluconeogenic enzyme serine dehydratase compared to normal as well as in epinephrine treated mice. However, Alanine transaminase levels in over night fasted mice (18 hrs.) were not affected significantly. Enzyme Aspartate transaminase on administration of epinephrine initially lowered at the end of 1 hour and then increased at 2 hours. Probably this is due to hyperglycaemia which in turn caused insulin secretion. This shows rapid utilisation of glucose by stimulating glycolytic and T.C.A. pathway. The increased concentration of T.C.A. pathway metabolites such as succinate, maleate have been reported to be competitive inhibitors of enzyme Aspartate transaminase. Hence lowering of Aspartate transaminase at the end of one hour could be the effect of insulin and hyperglycaemia. *B. pertussis* extract lowered the enzyme Aspartate transaminase significantly in normal and epinephrine treated mice. *B. pertussis* extract was administered to mice which were made severely diabetic by treating them with alloxan at the dose of 75 mg/kg. The mortality, weight loss, persistent high blood sugar levels and negligible serum insulin levels confirmed animals to be diabetic. It was observed that lowering of gluconeogenic enzymes by *B. pertussis* extract significantly reversed the hyperglycaemia and other metabolic changes in the liver induced by epinephrine. This could be due to insulin release as well as by an independent action.

Chemotherapy

Research Activities :

The department is mainly engaged in the synthesis and testing of biological values of new organic compounds. These compounds are synthesised for testing antitubercular, antimalarial, antifungal and antibacterial activities.

1. Antibacterial Agents :

2-(substituted aryl)-4-(N,N-dialkyl ureido) phenyl thiazoles.

In the due course of establishing new antibacterial agents, the synthetic work carried out was as follows :-

m-Nitro α -bromo acetophenone was condensed with substituted thioamides to give substituted thiazoles which were then reduced to give corresponding amino derivatives. This was then condensed with N,N-dialkyl carbamoyl chloride to give the target compounds. About 14 compounds were synthesised in this series. All the compounds in this series were checked for their purity by elemental analysis and instrumental analysis, such as IR, NMR and Mass spectra. They were subjected to *in vitro* antibacterial testing by tube dilution method against *S. aureus*, *E. coli* and *S. typhi* at 50, 100, 200 μ g/ml. Some of these compounds have been found to be active against *S. typhi* & *S. aureus* in the range of 50-100 μ g/ml. Ampicillin was used as a standard drug.

2. Antifungal Agents :

a. 5,6-disubstituted 1,N,N-diethyl thiocarbamido benzothiazoles

2-mercapto 5,6-disubstituted benzothiazoles were condensed with N,N-dialkyl carbamoyl chloride in 1,4 dioxane and triethyl amine. About 16 compounds were synthesised. These were characterized by IR, NMR, Mass Spectra and Micro analysis.

The compounds were tested for *in vitro* antifungal activity against *T. rubrum*, *T. mentagrophytes* and *C. albicans* strains. The compounds have shown activity in the range of 50-100 μ g/ml.

b. 5,6-disubstituted 2-N,N-dialkyl thiocarbamido benzimidazoles

2-mercapto 5,6-disubstituted benzimidazoles were condensed with N,N dialkyl carbamoyl chloride. About 20 compounds were synthesised. After characterization by spectral and micro-analysis all the compounds were subjected to *in vitro* antifungal testing against *C. albicans*, *T. rubrum* and *T. mentagrophytes*. Few of the compounds have shown antifungal activity at the range of 50-100 µg/ml.

3. Antitubercular and Antibacterial Agents :

a. 6-Substituted-2-/4'-substituted benzoyl-(2'-amino carbonyl methylthio)-thiazolyl benzothiazoles) :

In this series nearly thirteen compounds were synthesised and tested against H₃₇Rv strain of *M. tuberculosis*. All the compounds have shown moderate activity at the concentration of 1.56 to 100 µg/ml. Few of the compounds have shown activity against *S. aureus*, *S. typhi* and *E. coli* at the concentration of 50-200 µg/ml.

b. 5,6-Substituted-2-/4'-substituted benzoyl-(2'-amino carbonyl methylthio)-thiazolyl benzothiazoles) :

In this series, benzimidazole moiety was combined through a thioglycylamino linkage to various substituted thiazoles. The intermediates, 5,6-disubstituted-2-mercapto benzimidazoles were prepared by the known literature methods. Totally 20 compounds were synthesised and subjected to antitubercular and antibacterial screening. Most of the compounds were found to be active against tubercular bacilli at the concentration of 1.56 - 50 µg/ml. Few of the compounds have shown activity against *S. aureus*, *S. typhi* and *E. coli* at the concentration of 20 µg/ml.

4. Antifungal Agents :

4-(difluorophenyl)-2-substituted benzyl-5-substituted thiazole

These compounds were synthesised by reacting 2,4-difluorophenacyl chloride with substituted benzyl thioamides in boiling ethanol. All the compounds were investigated for activity against various fungi like *T. rubrum*, *T. mentagrophytes* and *C. albicans*. They have shown moderate activity i.e. in the range 50-100 µg/ml. Miconazole was taken as a standard compound.

5. Antibacterial Agents :

2-(Substituted phenyl/substituted phenylamino)-4-(2',4'-dichloro-5'-fluoro phenyl)-thiazoles :

Overall ten new compounds in the above series were prepared, and characterised by their elemental and spectroscopic analysis. They were subjected to antibacterial testing by tube dilution method against *S. aureus*, *E. coli* and *S. typhi*. Ampicillin was used as a standard for comparison.

6. Antitubercular Agents :

5-Chloro, 6-fluoro-2-(substituted anilino) benzothiazoles :

In this series nearly ten compounds were synthesised and tested against H37Rv strain of *M. tuberculosis*. INH was used as a standard for comparison.

A. Microanalytical section :

In all 130 new compounds synthesised were analysed for elemental analysis. 25 Commercial compounds were analysed for carbon, hydrogen and 30 commercial compounds were analysed for nitrogen. 100 samples were analysed for carbon, hydrogen and nitrogen estimation.

B. Microbiological Screening :

1. Anti T.B. compounds tested against H37Rv organism - (Total compounds 21 : 18 commercial and 3 from HITRT students)
2. Antibacterial compounds tested - Against *S. aureus* (3750) and *S. typhi* (786). 80 samples from HITRT students and 31 samples of commercial origin.
3. Antifungal compounds tested against *C. albicans* and *T. mentagrophytes* and *T. rubrum* : 50 samples from HITRT students and 29 commercial samples.

The department also helped the Research students from other research Organizations and Pharmaceutical colleges for their antibacterial, antifungal testing and microanalysis of Carbon, Hydrogen and Nitrogen.

During 1994-95 about 125 new organic compounds were synthesised and characterised by their elemental and spectroscopic data. These compounds were subjected to various biological screenings.

7. Antibacterial Agents :

a. 2-/2'(hydroxy/methoxy)-5' of 3'5'-(un-substituted-halo/dihalo-1'- benzamido/quinoxalines) :

In this series about twenty compounds were synthesised by condensing aminoquinoxalines with substituted salicyclic acid chloride.

These compounds were tested for their *in vitro* antibacterial activity against *S. aureus*. Among the series of twenty compounds, eighteen compounds exhibited antibacterial activity.

b. 8-(Substituted) or -7,8-(disubstituted)-alloxazines :

These were synthesised by the condensation of substituted o-phenylenediamine with alloxan in presence of boric acid or hydrochloric acid. They were further oxidised to corresponding alloxazine - 10-N-oxide.

These compounds were tested for antibacterial activity against *S. aureus* and *S. typhi*. The compound 7-chloro-8-(n-propylthio)-alloxazine exhibited the highest activity against *S. aureus* (10 µg/ml) and *S. typhi* (20 µg/ml).

8. Antimalarial Agents :

2,6,(7)-disubstituted/2,6,7-(tri-substituted-quinoxalines) :

This series was synthesised by molecular modification on the aromatic and heterocyclic part of the quinoxaline moiety by incorporating the active linkage at 6(7) position and chlorine, hydroxy or sulfanilamido group at 2 position.

About nineteen compounds were screened for their antimalarial activity employing rodent malarial strain of *P. berghei* in mice. Out of nineteen compounds seven compounds displayed antimalarial activity at a dosage of 160 mg/kg body weight of mice.

9. Larvicidal Agents :

5,6-disubstituted-2-(N,N-dialkyl thiocarbamido benzothiazoles)

A series of 5,6-disubstituted 2-N,N-(dialkyl thio carbamido) benzothiazole was synthesised by condensation of 6-chloro-2-mercapto benzothiazole with N-N-diethyl carbamoyl chloride in 1,4-dioxane. These compounds were screened for their *in vitro* larvicidal activity against *Culex-p-fatigans*. (Filial vector) species of mosquito by WHO-Tech; Pyrethrum (0.2%) was used as standard for screening.

The compounds synthesised herein have been found to be active against *Culex-p-fatigans*.

A. Microanalytical section :

In all 125 new organic synthetic compounds synthesised were analysed for C,H,N. Commercial compounds were analysed for 'C' 'N' estimation.

B. Microbiological screening :

Total Microbial Screening of Compounds in 1994-1995

1.	Anti T.B. compound testing for research students (HITRT)		3
2.	Anti T.B. compound testing (commercial)		18
3.	Antibacterial compound testing (HITRT)		10
4.	Antibacterial compound testing (commercial).....		4
5.	Antifungal compound testing (HITRT)		10
6.	Antifungal compound testing (commercial).....		3

Clinical Pathology & Immunology

Clinical Pathology

General Departmental activities :

Clinicopathological Investigations :

The department received specimens from the various hospitals and agencies (*Appendix II*) for investigation. The services offered (*Appendix IIA*) cover the following general areas :

- a) Routine haematological examination
- b) Cytology of various body fluids
- c) Histopathological examination of biopsies and surgical specimens as well as of tissues from animal experiments.
- d) Diagnostic bacteriology and serology.

Training :

The DMLT training course was conducted.

The staff participated in the integrated Bombay University teaching programme for M.Sc. (Microbiology), M.D. (Micro)

Immunology :

1. Study of network interaction in regulation of Immune response to a Mycobacterial antigen :

The objective of the project was to investigate the role of interactions between lymphoid cells.

Chronic GVH disease was induced in (57 B1/6 0 03HO) F1 mice by injecting 5×10^7 spleen cells from normal C₃H mice I.V. Mice harbouring GVHD for 3 months failed to mount a DTH and lymphoproliferative response to a randomly selected antigen, viz. vaccine of killed *M. vaccae* delivered by ID route. However, the spleen cells of the mice did respond to Con A. Repeated id immunizations of these animals led to a progressive decrease in their responsiveness. Effector *T. cells* generated after 2nd ID immunization of normal mice with *M. vaccae* when cultured to 36 hours, secreted lymphokines. GVHD of one weeks duration showed no such response. This implied that repeated immunization with antigen in mice having GVHD led to loss of clones recognizing the specific antigen. Animals treated with pulse therapy of recognizing the specific antigen. Animals treated with pulse therapy of ip cyclosporin A for 5 days starting one day before each id. immunization resulted into prevention of clonal loss, observed with each id immunization.

It was concluded that chronic GVHD induced loss of T cell responsiveness was due to clonal loss because of inappropriate activation of CD₄ T cells by cross reacting self antigens, environment antigens and idiotypes, in the context of abnormal levels of IL4 and IL10 generated by parental CD₄ T cell recognising antigens of F1.

2. Study of Immunological properties of porins of *S. typhi* :

Porins of *S. typhi* were characterized further. The protein of PI 4.85 was identified to be the porin recognized by T. cells. Pretreatment with porins enhanced the ability of mice to mount a DTH response to a unrelated antigen such as *M. vaccae*.

Preliminary evidence indicates that porins also enhance anti-65 KD antibody responses of mice treated with *M. vaccae*.

3. Study of T cell subset differentiation after ip and id immunisation with *M. vaccae* :

Role of CD5⁺ (B1) cells in CD4 TH cell subset differentiation.

Intradermal (id) immunization with Killed *M. vaccae* showed excellent DTH and lymphoproliferative response and a poor antibody response against 65 KDa antigen of *M. vaccae*. Ip immunization generated reverse response. One week old splenic effector T cells from id and ip primed mice cultured for 36 hours with antigen showed secretion of all the 4 lymphokines i.e. IL-2, IL-4, IL-10 and g-IFN thus indicating development of TH0 type response. However ip primed T effectors secreted higher amounts of IL-10¹.

Irradiated splenic cells functioned as excellent APCs supporting a good lymphoproliferation compared to peritoneal cells. Poly I-Poly C treatment of animals induced them to mount a DTH and lymphoproliferative response on ip immunization.

4 Study of Network Interaction in regulation of Immune Response to a Mycobacterial antigen.

In the earlier studies, route of immunization was observed to play a significant role in deciding the T cell response to immunization with a killed Mycobacterial vaccine. Immunization by IP route with a killed vaccine of *M. vaccae* induced non-responsiveness. It was shown the IP immunization resulted in activation of both CD⁺ CD⁺T⁺ cells and that CD⁺ T⁺ cells could compete with simultaneously primed CD⁺ T⁺ cells for IL-2 and thus abrogate the response of the latter. The question of CD⁺ T⁺ cell activation and expansion on ip immunization was investigated in

the context of expansion of IE and a MMTV derived superantigen.

It was confirmed from this study that in endogenous or exogenous infections MMTV plays a significant role in the activation of CD8⁺ T cells by class II presented antigens.

Loss of responsiveness observed in mice with repeated immunization was probably due to activation induced cell death (AICD).

A known model of superantigen induced AICD was then employed to investigate if in chronic GVHD there is excessive AICD. Administration of a single dose of SEB (25 mg/mouse) induced loss of SEB responding clones in both normal F1 and those having chronic GVHD. However the extent of loss was greater in mice with chronic GVHD, confirming that in chronic GVHD, AICD was excessive. It was further confirmed that APCs of mice with chronic GVHD due to its abnormal antigen presentation were inducing greater AICD.

This work was supported by a grant from Dept. of Science and Technology.

5. Study of T-cell response in patients suffering from Tuberculosis

Protective immunity against mycobacterial infection is mediated by interactions among various T-cell population and activated macrophages. Moreover, immune functions at the site of disease is thought to be differently regulated than in the peripheral blood. In our laboratory, studies are undertaken to evaluate *M. tuberculosis* specific proliferative response of T-cells isolated from different sites. Our studies have demonstrated differences in the *M. tuberculosis* antigen specific response at the local and regional sites.

6 Study of adaptive immune mechanism responsible for protection against *Yersinia pestis*.

Adaptive immune responses responsible for protection against *Y. pestis* infection were studied with the help of an animal model system in which humoral and cell-mediated immune responses could be generated separately using different protocols and the protection afforded by either was assayed.

The study showed that CMI does not provide significant protection against bubonic plague and it was confirmed that humoral immunity is the adaptive immune mechanism responsible for protection against plague in mice.

Pharmacology

1. Investigation of Indigenous plants for mosquito larvicidal, insecticidal and biological activity.

The following plants were collected locally and studied for mosquito larvicidal activity.

- i) *Thevatia Nerifolia* Flowers (Pila-kanher)
- ii) *Azadirachta Indica*, Bark (Neem)
- iii) *Lawsonia Interemis* Leaves (Mehandi)
- iv) *Ricinus Communis* Leaves (Erand)
- i) *Thevatia Nerifolia* :

Flowers of *Thevatia Nerifolia* were collected from Haffkine Campus. They were shade dried and powdered using villey mill and subjected to soxhlet extraction with benzene and methanol. The extracts were made solvent free using water bath and evaluated for mosquito larvicidal activity. (First and Second stage larvae).

It was observed that benzene extract showed promising results (0.1, 0.15 and 0.20% resulted into 56,100 and 100% mortality respectively). Methanolic and water extract did not show any promising larvicidal activity.

Benzene extract was subjected to silica-gel column Chromatography for franctionation.

Following solvent system were used to get different fractions.

Solvent System	Fraction
Hexane	I
Hexane : Ethyl acetate (95 : 5)	II
Hexane : Ethyl acetate (85 : 15)	III
Hexane : Ethyl acetate (50 : 50)	IV
Methanol :	V

All the above fractions were subjected for mosquito larvicidal activity. Promising activity was not located among the C.C. fractions. However, these extracts and fractions were sent to Zoonosis Department for testing the growth-retarding/antifeedent activity.

ii) *Azadirachta Indica*, Bark (Neem)

Bark of *Azadirachta Indica* was collected locally and cut into small pieces and then powdered to uniform mesh. Powder was extracted with benzene and methanol in soxhlet apparatus and finally with water. Extracts were made solvent free using water bath.

Mosquito larvicidal activity of extracts was tested by Zoonosis Department. Out of three extracts only methanolic extract showed 80% mortality at 0.4% concentration.

Neem tree bark is reported to have a antifeedent/growth-retarding activity. (I, Ara *et al.*, Phytochemistry, 1988, 27, 1801). Therefore methanolic extract and following column chromatographic fractions were given to Zoonosis Department for above mentioned activity. Results of these tests are still to be communicated. Silica gel column chromatography was carried out and following fractions were collected.

Solvent System	Fraction
Chloroform	I
Ethyl acetate : Methanol (95 : 5)	II
Ethyl acetate : Methanol (85 : 15)	III
Ethyl acetate : Methanol (75 : 25)	IV
Ethyl acetate : Methanol (50 : 50)	V

Lawsonia intermis and *Ricinus Communis* were found inactive.

Work to be completed :

Purification of activity guided compound from *Azadirchta indica* bark and other plants.

Human Pharmacology & Bio-availability, Radiation Biology & Epidemiology

1. Epidemiological studies in Multiple Drug Resistant Enteric Infection in and around Bombay.

Objectives :

- A. To isolate causative organism from Blood culture in cases of Pyrexia of Unknown Organic (PUO)
- B. To identify biochemistry and serologically the isolates.
- C. To characterize isolates with phage and serotyping.
- D. To study antibiotic sensitivity pattern of such isolates.
- E. To find MIC against battery of conventionally used 3rd generation Cephalosporins and quinolones.
- F. Follow up studies to verify changing patterns of drug resistance in isolates.

Summary of work carried out :

Nearly 1000 samples of blood were collected from Dombivli, Thane and Mumbai from cases of PUQ attending various hospitals. 100 isolates of *S. typhi* were identified using Poly 'O', 'Vi', antigen. These were multiple drug resistant.

It is noteworthy that all the isolates are sensitive to latest quinolones and cephalosporins. The resistance is 'R plasmid' mediated and seems to be wearing off in the last 2 years.

Work to be completed :

Serotyping and phage typing of these isolates will be carried out. The results are to be compiled, analysed and published.

It appears from the results that a 0.5 percent concentration of Trichloson, Tri-chloro carbonilide (TCC) has an effective antibacterial action.

Research Activity :

A. Antimycotic action of some herbal ingredients.

Various herbal extracts, with a citation in the literature, were screened for *in vitro* antimycotic action employing standard and Clinically isolated strains. Petroleum ether extract of myristica, lemon grass and cixeol from cojuput oil appear to be fungistatic.

The studies are in progress to assess bacteriostatic action of these extracts.

B. Multiple Drug Resistant Salm Typhi :

The study which has commenced as a follow up of 'Dombivli Fever' in 1990 is being continued. The chosen areas were Mumbai, Thane and Dombivli.

It appears that the notion that resistance of strains was plasmid mediated seems to weal off recently. However, the multiple drug resistance still continues. The drugs of choice were cephalosporin and quinolone groups.

The study is continued further.

Routine Testing Activities :

Manufacturers	Formulations Tested
IPCA Laboratories	Ipcacillin, Cotrimol
Mc Leod Pharma	Rifampicin, Isoniazid
IPCA Laboratories	Cotrimol Liquid
Gepach Pharma	Inj. Ceftriaxone.
Indoco Remedies	Rifampicin, Isoniazid

Out of these Inj. Ceftriaxone was studied for the first time. Microbiological assay was standardised in a laboratory after assessing antibacterial activity in suitable test organisms. Thus sensitive *E. coli* ATCC strain was employed for the purpose. An Indian formulation was compared with formulations of Russian and German origin. The results were comparable.

2. Study of antimycotic activity of some indigenous plant material.

Objectives :

- A. To study mycotic infection prevalence in various city hospitals.
- B. To isolate causative organism by culturing techniques.
- C. To prepare extracts of herbal materials cited in the literature.
- D. To study MIC of above extracts in comparison with standard antimycotic drugs.

Summary of the work carried out :

A total of 150 cases, clinically suspected to have superficial fungal infections were studied. Laboratory diagnosis was established using results of direct microscopic examination and cultivation. 84 cases were confirmed as of fungal infections on the basis of direct microscopy. The most prevalent organism being *T. rubrum* (58.33 %) followed by *T. mentagrophytes* (8.3 %) *C. albicans* (8.3%) *T. tonsurans* (2.7 %) *T. violaceum* (2.7%) and *E. floccosum* (1.3%).

Antifungal activity of plant extracts.

Petroleum ether extract of *M. fragrans* (seeds) was found to have good fungistatic activity against *T. rubrum*, *T. mentagrophytis*, *T. violaceum* and *T. tonsurans*. Lemon juice was also found effective against all dermatophytes. This explains the fact that many herbal antibiotic agents are prescribed as pastes made in lemon juice.

Work to be carried out :

Substantivity and dilution tests are to be carried out to assess antibacterial activity against various standard and clinical strains.

Testing Activity :

Following samples were accepted for Bioequivalence and other Testing during the year 1993-94.

A. Bioequivalence :

Bioequivalence of three formulation of an antitubercular combination such as Rifampicin and Isonex was carried out. Results were equivocal.

B. Substantivity testing of antibacterial soap :

Antibacterial substantivity and Serial dilution test of marketed brands of antibacterial soaps was carried out to assess its efficacy.

Research Activities :

3. Antimycotic potentials of some Indian Herbal Extracts :

The studies were continued further, the results thereof are presented in Table I.

4. Epidemiological studies on Multiple 6 Drug resistant Enteric Infection in and around city of Bombay :

The studies were continued further. The results are presented in Table II

5. Substantivity testing of some commercially available antibacterial soaps in the Indian Market :

Antibacterial activity of various soaps was assessed both by *in vivo* and *in vitro* methodology as per ISI guidelines. *In vitro* assay compared of serial dilution test while *in vivo* efficacy was assessed by substantivity testing in human volunteers. Soaps with incorporated herbal components were also compared by same methods. Results are shown in Table III.

6. Epidemiological Investigations of suspected Plague outbreaks in Maharashtra :

Epidemiological team visited affected area in Beed and Latur districts in Maharashtra. Clinical data in detail was scrutinised. Sera samples of Rodents, canine and human individuals were screened by haemagglutination assay using F1 antigen kit. The results showed no evidence of plague.

Toxicology

1. *In vitro* system for screening and evaluating pesticide toxicity.

Objectives :

The demand for less toxic but potent pesticides has resulted in the research and development of newer pesticides. Testing of newer developed pesticides for toxicity involves animal experimentation which are elaborate, expensive and many times objected by anti vivisectionists. Animals experimentation can not be entirely substituted, if one desires to extrapolate to near human situation. However, one can look for tests that do not involve live whole animals specially for screening potential toxic pesticides in order to avoid unnecessary animal experimentation and to eliminate extremely toxic pesticides before detailed further animal studies are envisaged.

Red blood cells have been used for studying the haemolytic effect by different drugs and chemicals.

The present study was undertaken to determine the effects of various pesticides (cholinesterase inhibitors) on red cell and determine the order of lethality (lysing) with various concentrations. This would reflect on the degree of toxicity and will be compared with the existing acute animal toxicity (LD₅₀). This method, if proved sensitive and comparable with animal experimentation data with regard to LD₅₀, will help in screening potentially toxic pesticides before elaborate animal experimentation could be undertaken. The method could, if found suitable, also be applied for residue analysis in foods. Preliminary work in screening the species variation and sensitivity was carried out with Malathion 50 EC. Pesticides that were included in the present study Ethion, Malathion, Dimethoate and Fenitrothion.

Summary of work carried out :

- a. Effect of Malathion 50 EC at various concentration on red cells of rabbits.
- b. Effect of Malathion 50 EC red cells of different species of animals and man.

-
- c. Scanned the optimum wave length for spectrometric assay.
 - d. Detailed analysis with Melathion 50 EC, Dimethoate 30 EC, Fenitrothion 50 Ec and Ethion 50 EC in chemical solution were carried out using rabbit red cell at 400 nm.
 - e. Analysis of malathion residues in biological tissues - blood (plasma) were attempted. Plasma spiked with malathion in various concentration were analysed. Results indicated that analysis could be done on plasma samples containing malathion.
 - f. Analysis of blood (plasma) spiked with Ethion and Chlordane and Fenitrothion were carried out. Results indicate that analysis with Ethion and chlordane could be done with plasma containing the pesticide.

Work to be carried out :

Analysis of residues in other biological samples.

5. The comparative acute oral toxicity studies of pesticide derived from the plants with the synthetic pesticide.

Pesticides are being widely used in agricultural practices in order to increase the food production and also in eradication of certain vector borne diseases. Among the pesticides that are being most widely used are chemically synthesised pesticides. Although, these are very potent in their efficacy, are also extremely toxic to various animal species including the humans. Their use also results in air and water pollution. Their residues remain in the soil and contaminate the environment. The present emphasis is on using the pesticides derived from the plants as these are supposedly less toxic. During the year 1993-94, we selected the pesticides derived from the plants, namely, methanol and Ethyl acetate extracts of seeds of *Annona squamosa* and alcoholic extract of seeds of *Pongamia glabra*, while for the comparison, a synthetic pesticide, Quinol-phos was selected. Acute oral toxicities of these were carried out in mice and rats. The results of the study are as follows.

Sr. No.	Type of pesticide	Results		
		Lower Unit	LD50	Higher Unit
1.	Methanol extract seeds of <i>Annone sqamosa</i>	mice	Oral LD50	15,135 mg/kg
		rats	Oral LD50	15,135 mg/kg
2.	Ethyl acetate extract of seeds of <i>Annona sqamosa</i>	mice	Oral LD50	15,285 mg/kg
		rats	Oral LD50	15,285 mg/kg
3.	Alcoholic extract of seeds of <i>Pongamia glabra</i>	mice	8082 - 8308 - 8541 mg/kg	
		rats	3518.5 - 5418.6 - 8344.6 mg/kg	
4.	Quinol-phos.	mice	21.1 - 25.1 - 29.9 mg/kg	
		rats	32.1 - 39.6 - 48.7 mg/kg	

The results show that synthetic pesticide, Quinol phos is extremely toxic than the ones derived from the plants. Among the pesticides derived from the plants, alcoholic extract of the seeds of *Pongamia glabra* was more toxic to mice and rats than the methanol and Ethyl acetate extracts of the seeds of *Annona sqamosa*. The further work on this line is in progress.

Virology

The Department of Virology receives samples for serological studies for viruses. Its immunization clinic renders services to common public. In all 874 patients attended the clinic. During 1993 and 1994, for vaccination (Appendix V, V-A & V-B). Vaccines such as antirabies, typhoid, cholera, plague, polio, diphtheria pertusis and tetanus etc. are administered.

In the rabies research unit two autopsy samples were processed for rabies virus isolation *in vivo*. Serological and isolation studies were carried out for patients referred by various hospitals for CMV, HSV, HIV etc. (Appendix V, V-A & V-B)

The department is a WHO/NICD recognised Viral Hepatitis Surveillance Centre for Maharashtra and Goa. There were very few epidemics of viral hepatitis in Maharashtra in the said period. The routine surveillance work could not be carried out because of paucity of ELISA kits, which were not provided by NICD.

As usual the annual virology course was conducted by the department. The department arranged 12 lectures and 9 practicals for M.D. and M.Sc. (Microbiology) students of Bombay University.

Immunization Clinic

Total seven hundred and twenty one patients received treatment with various vaccines in the immunization clinic. The data for individual vaccine is shown in Appendix V. The vaccines included tissue culture antirabies vaccine, Semple ARV, plague, cholera, typhoid, triple, polio and tetanus toxoid. Antirabies antibodies testing was done for two patients by suckling mouse test, recommended by WHO.

The Department conducted the Annual Virology Course for the M.D. & M.Sc. (Micro) students of Bombay University. Total 13 lectures and 8 practicals were carried out.

Routine Activities

The Department carried out testing for various viruses, such as HIV, CMV, HSV, Hepatitis B by commercially available ELISA kits (Appendix V, V-A & V-B). Rabies virus isolation from the patient's brain specimen was undertaken.

Specialized Testing

Testing of the virucidal activity of the domestic water purifiers submitted by Godfrey Phillips (I) Ltd. was carried out in the department.

- i. Water filter unit No.1 : The Ecomaster model PCR-100
- ii. Water filter Unit No.2 : The Ditech Model CT-1

The above water filter/purifier units were tested for their virucidal/ultrafiltration action (if any) on the following enteroviruses.

- i. Polio I, Polio II, Polio III
- ii. Coxsackie B3, Coxsackie B5

The different dilutions of viruses were suspended in Millipore filtered, distilled water and passed through the filter units.

The filtered water was inoculated on the monolayer of Vero cell line and the tissue cultures were observed for 72 hrs for cytopathic effects (CPE).

Positive control Vero cells were inoculated with the same virus dilutions and observed for CPE for 72 hrs.

Normal cells were kept as negative controls. These experiments were repeated thrice.

It was observed that unit I showed virucidal action against all test viruses, while the unit II has virucidal activity against all test viruses except polio II, with the titre of $10^{6.3}$ per 0.1 at the dilution of 10^{-7} .

Hepatitis Awareness Programme

Hepatitis awareness programme was initiated in collaboration with M/s. Fulford India Ltd., to create awareness and initiate a sense of urgency in diagnosis and treatment of Hepatitis in the population and to highlight the high incidence of Hepatitis among the health care workers by conducting screening of the sera for various markers of Hepatitis.

Four groups of persons working in health care areas and other settings viz.: J.J. Hospital (434), O.N.G.C. Staff (91), Raj Bhavan Staff (169) and Central Railway Staff (169), were screened for hepatitis B surface antigen (HBsAg) by commercially available kits.

Out of 434 persons from J.J. Hospital 12 (2.7%) were positive for HBsAg. Four persons (2.9%) from Raj Bhavan Staff tested sero positive for HBsAg, while 4 out of 91 O.N.G.C. persons (4.5%) showed presence

of HBsAg in their blood. Out of 119 persons from Central Railway Hospital 5 persons (4%) showed presence of HBsAg (Appendix V-C).

All these samples were also screened for enzymes like SGOT & SGPTI. All these samples will also be screened for HBe and HBc antibodies.

Research Progress

1. Viral Hepatitis Surveillance

Dual infection of HBV and HIV in patients suffering from Pulmonary Tuberculosis.

HBV and HIV are remarkably similar in their modes of transmission in their sharing of reverse transcriptase in their ancestral origins and common genetic elements. Both viruses are hypermutable and exist in quasi species due primarily to errors in reverse transcription, though there is severe restriction in the replicative competence of most HBV mutants, they differ in lack of an integrase in HBV and in their pathogenesis in infected hosts. Most persons infected with HBV recover completely while recovery from HIV is rare if ever. HBV infection is highly preventable by vaccine while HIV vaccine is still a dream. AIDS and hepatitis B infection represents an extreme example among the viruses affecting mankind in their close similarities but distinct differences.

With this background, it was decided to study the dual infection with these viruses in patients suffering from Pulmonary Tuberculosis. Total 500 Pulmonary Tuberculosis patients were screened for HIV using commercially available ELISA Kits. One hundred and eighteen (23.6%) were detected to be positive. Out of these 118 patients, 42 patients were screened for HBsAg (ELISA). Two (4.76%) patients were found to be positive for HBsAg. Remaining 76 HIV positive and all HIV negative cases will be screened for prevalence of HBsAg.

Study of seroprevalence of HBsAg in patients attending Kasturba Infectious Disease Hospital was undertaken. Total 75 patients (57 male and 18 female) were screened for HBsAg. Of these 27 male (47.3%) and 7 female (38.8%) showed the presence of HBsAg. Overall 34 persons (45.33%) showed the presence of HBsAg.

2. Pre-exposure antirabies vaccination programme for eight hundred and forty four students of six Government Veterinary Colleges in Maharashtra :

Marcel Merieux Foundation in cooperation with the World Health Organization and the Office International Des Epizooties (OIE) launched a major operation for free antirabies vaccination for all veterinary students in India.

For Maharashtra state the Department of Virology, which is a WHO reference centre for rabies was selected as the coordinating centre. The Officer in Charge of the department travelled extensively over a period of one and half month and vaccinated 844 students from six veterinary colleges situated at Mumbai, Nagpur, Akola, Udgir, Shirwal and Parbhani. She also delivered lectures on "Rabies and its Prevention" at various colleges during this period. This activity was under taken in the honour of the "Year of Pasteur", 1995 being the death centenary year of the great Microbiologist Louis Pasteur.

3. Study of MDR mycobacteria in HIV seropositive pulmonary tuberculosis patients.

This study has been planned to evaluate the drug resistance of mycobacterial isolates from pulmonary tuberculosis patients.

During the years, 500 Pulmonary Tuberculosis patients have been screened for presence of HIV I and II antibodies by commercial Elisa. Sputum samples were screened for acid fast bacteria by Zeil Nelson technique and isolated on Lowenstein Jensen's media. Identification of *M. tuberculosis* was done by biochemical tests. Drug sensitivity testing was carried out using a standard inoculum on to LJ medium slopes containing different concentrations of 5 anti TB drugs viz.: rifampicin, isoniazid, ethambutol, streptomycin and ethonamide.

Out of 500 patients screened 118 (23.6%) were HIV seropositive (Group I) and 382 were seronegative (Group II). Among the two groups 90 and 315 patients yielded mycobacterial cultures on LJ media respectively. Drug sensitivity testing revealed 23% and 12% isolates to be resistant to all the three first line drugs viz. rifampicin, isoniazid and ethambutol in seropositive and seronegative groups respectively. From this study it is evident that MDR Mycobacterial infection has shown a marked increase to the first line of anti TB drugs in HIV seropositive pulmonary tuberculosis patients.

4. Incidence and association of HIV and STDs (HSV₂, CMV, Syphilis Gonorrhoea) in 200 Pts. belonging to high risk groups attending STD clinic in Central Mumbai (1993)

Present study involves two hundred persons attending STD clinic in Kamathipura area of Central Mumbai. These persons will be investigated for HIV I and II, HSV₂, CMV, IgG and IgM antibodies by ELISA. They will be also investigated for syphilis and gonorrhoea. HSV and CMV will be isolated. *In vitro* in tissue cultures from the lesions and urine sample respectively. The control group of 150 antenatal patients will also be investigated for the same markers.

5. Evaluation of safety and efficacy of verorab vaccine in pregnancy :

Rabies is a fatal viral disease. There is no curative or ameliorative therapy available and therefore vaccination is the only means of saving lives of exposed person, if carried out immediately after infection.

Protection with active immunization is therefore of utmost importance. In determining the need for active immunization during pregnancy and lactation the potential benefits and risks should be considered, but the likelihood of consequences of exposure due to animal bite outweighs any possible adverse effects of vaccination with newer tissue culture vaccines. As per WHO recommendation stray animal bites irrespective of the status of the animal need to be vaccinated. Post exposure vaccination during pregnancy is an unusual situation. We have studied 7 pregnant women (two in first trimester, two in 2nd trimester and three in third trimester of pregnancy) for safety and efficacy of Verorab vaccine (prepared in kidney cell line of vero monkey) after obtaining the written consent of the patients.

Out of 7 women studied, for two women, the antirabies antibodies in the cord blood by seroneutralization technique in mice (SNMT) and found it to be protective. All the 7 women and their neonates were followed upto a period of one year after the last dose. No adverse effects were observed in the vaccines. No teratogenic effects were seen in children born to these women.

6. Pharmacovigilance studies of Verorab vaccine in 878 patients and 773 veterinary students

Rabies which is a uniformly fatal disease can be prevented with prophylactic vaccination. In developing countries like India, there are more than 25,000 annual deaths caused by this virus. With advancement of

biotechnology in preparing newer and safer cell culture vaccines, the disadvantages of neurological complications with conventional vaccines have been overcome. Adverse reactions are known to vary depending on geographical environment and ethnic background of the population, so it was decided to carry out post marketing surveillance programme. A total of 878 patients received post exposure treatment including seven pregnant women, and a total of 773 veterinary students from Maharashtra received pre-exposure vaccination. Out of 878 patients adverse reaction was recorded in 29 patients (3.3%), 5 patients (15.22%) experienced one time local reaction, 15 patients (51.22%) experienced systemic reaction and 9 (31.03%) had both systemic and local reaction. In 773 veterinary students no adverse reaction was noted. No patient developed rabies after post exposure treatment.

7. Incidence and association of HIV and STD (HSV2, CMV, syphilis and gonorrhoea) in 200 persons belonging to high risk group attending STD clinic in Central Mumbai (1994)

Human immunodeficiency virus (HIV) infection and other sexually transmitted diseases (STDs) are among most common causes of illness with health, social and economic consequences. According to UNAIDS estimation there are 3.1 million and 8.4 AIDS millions cases in India and worldwide respectively.

A cross sectional study among high risk population attending STD clinic in Central Mumbai was undertaken to study the association between sexually transmitted diseases and HIV seropositivity. A total of 200 persons of either sexes and of all age groups were screened between 1996, their detailed clinical history and specific reference to previous STDs and high risk behaviours were recorded. All sera were screened for antibodies against CMV and HSV2 (IgM and IgG) by commercially available ELISA. Serodiagnosis was carried out for syphilis and for *Neisseria gonorrhoea* (isolation of gonococci) was performed. Out of 200 persons screened, 84 (42%) tested positive for HIV I & II antibodies, 144 (72%) had antibodies for HSV2 & 158 (79%) were seropositive for CMV. Seventy six (38%) persons were suffering from syphilis and 52.26% had gonococcal infection. Viral isolation of HSV and CMV was carried out in tissue culture, yielding a 26.39% and 17.72% positivity respectively. From our study so far, it is evident that apart from HIV infection, the high risk population also suffers from multiple sexually transmitted diseases. Presently the control group comprising 200 normal persons is being investigated for above mentioned markers.

Zoonosis

The Department evaluated over 50 products based on synthetic derivatives, plant extracts and Ayurvedic preparations for their antimalarial, antithelmintic and insecticidal properties. Evaluation of pesticide formulations for their bio-efficacy was continued and 12 formulations were tested during these year.

A new research project was initiated in the department to investigate the role of various snail species as intermediate hosts for parasitic diseases. Following the discovery of their role in transmission of angiostrongyliasis in Mumbai, a survey of prevalence of various species of snails is being conducted. I.C.M.R. studies initiated last year to develop ELISA test for the detection of cobra venom antigen in experimental animals were continued.

A study has been instituted to assess the potency of lyophilised venom maintained in the laboratory for long durations.

Colonies of various species of insects of public health importance alongwith strains of parasites were maintained. At the venomous animals unit, snakes of the species *Naja naja*, *Viper russeli*, *Bungarus carculeus* and *Echis carinatus* and scorpions of the species *Buthus tamulus* and *Palamnacus gravimanus* were maintained. Appendix VI, VI-A, VI-B provide the details of quantity of venom produced and supplied to various institutions.

Plague surveillance programme was continued. Rats were collected from different areas of Greater Mumbai and brought to the laboratory for identification and examination for plague. In all 2,74,539 rats were received during the year and 89,155 rats were examined for plague. None of the rats revealed evidence of plague infection.

Dr. D.M. Renapurkar was invited to participate in the workshop on "Resurgence of malaria in Mumbai" and presented a paper on "The Biology of Malaria Vector *Anopheles stephensi*".

Research Activities

1. Malaria

Evaluation of antimalarial activity of synthetic drugs and medicinal plants.

The work on *in vitro* cultivation of malaria parasites and *in vitro* screening of antimalarial drugs was suspended as the malaria laboratory was being renovated. Screening of antimalarial drugs was carried out by using *P. berghi* mouse model. In all 31 synthetic drugs and five indigenous plant extracts were screened. Of these, fifteen were submitted by the University Department of Chemical Technology, twelve by Indian Institute of Technology, Powai and four were obtained from the Mumbai College of Pharmacy. Of the synthetic derivatives screened, 5 compounds revealed antimalarial activity. Of the plants investigated, only one plant extract showed antimalarial properties. Further studies are being planned with some of these plants to investigate their synergistic effect with the known antimalarials like chloroquine, pyrimethamine etc.

2. Helminthiasis

Studies on antihelmintic activity of synthetic derivatives.

Antihelmintic activity of synthetic derivatives was studied against *Hymenolepis nana* and *Ancylostoma caninum*. Fifteen synthetic derivatives were screened for antihelmintic activity against *Hymenolepis nana* in mice. Two drugs showed antihelmintic properties. Ten compounds were tested against *Ancylostoma caninum* by *in vitro* technique. Two of these compounds showed antihelmintic activity *in vitro*..

3. Dracunculiasis

Studies on Dracunculiasis

Guineaworm studies are being pursued with following objectives: .

1. To develop alternative method for cyclops control.
2. To develop serological methods for detection of infection during the pre-patent period.

Control of dracunculiasis requires the control of cyclops, the intermediate host for the worm. The use of insecticides for cyclops control is hazardous as it contaminates drinking water. Therefore continued search

for a safer and cheaper cyclopicide becomes necessary. In order to find out an alternative cyclopicide, plant sources were examined for cyclopicidal agents.

The plants screened were *Caesalpinia bonducells*, *Trigonella foenum*, *Citrullus eslocynthus*, *Enicostema axillare*, *Azadirachta indica*, *Acorus calamus* and *Embelia ribes*. These were screened against *Mesocyclops leuckarti* reared in laboratory. Extracts of various parts of plants were obtained by using organic solvents. Among the extracts investigated *A. squamosa*, *P. pinnata*, *Enicostema axillare*, *Embelia ribes* and *Acorus calamus* were observed to possess cyclopicidal properties. Study of ovicidal activity of five of these plants revealed that extracts of *Embelia ribes* possess noticeable ovicidal activity.

Further studies will be carried out with fractions of the plants extracts showing cyclopicidal activity.

4. Vector Studies :

Survey of snail population :

Monthly collection of snails from selected study areas was carried out from March 93 onwards. So far following species have been collected.

1. *Achantina fulica* (land snail)
2. *Eurychlymus platychlymus* (land snail)
3. *Laevicaulis alte* (land slug)
4. *Indoplanorbis exustus* (pond snail)
5. *Lymnea species* (pond snail)

In the snails studied by using standard parasitological methods, the presence of cercarial species was not found. The parasites collected were mainly *A. cantonensis* from *Achatina fulica* and *Laevicaulis alte* species.

Screening of molluscicides :

Molluscicidal activity of plant *Jatropha curcuss* (Mogali Erand) was studied by W.H.O. standard method against *Indoplanorbis exustus*. LC₅₀ value and LC₉₀ value were determined by plotting mortality against

concentrations on probit paper. These are as below :

a. For methanol extract of *Jatropha curcuss*

LC₅₀ = 97 µg/ml

LC₉₀ = 127 µg/ml

b. For benzene extract of *Jatropha curcuss*

LC₅₀ = 90 µg/ml

LC₉₀ = 148 µg/ml

5. Venom Studies :

Development of sensitive ELISA test for detection of snake venom antigens :

ICMR has entrusted a project to develop a rapid and sensitive ELISA test for the detection of snake venom antigen. Accordingly we have developed an ELISA test for detection of cobra venom. For this purpose monospecific antisera against *Naja naja* venom were developed in the rabbit by injecting four doses of *Naja naja* venom at weekly intervals. The wells of polystyrene plate were coated with different concentrations of crude *Naja naja* venom. The dilutions of sera employed were 1:16; 1:32; 1:64; 1:128; 1:256 and 1:512. These were incubated for 3 hours at 37°C. This was followed by the incubation with antirabbit IgG peroxidase and addition of ortho-phenylene diamine dihydrochloride substrate. The ODs were measured at 490 nm on ELISA reader. The gradual increase in OD was observed in all wells ranging from 5 µg to 500 µg of antigen. The test is in the process of development and efforts will be made to improve its sensitivity by carrying out fractionation of venom and using the most potent fraction.

In another study toxicity of lyophilised venom stored for 15 years was investigated. This was compared with recently obtained lyophilised venom. LD₅₀ & LD₉₀ were observed to be 14.0 µg/mouse and 13.5 µg/mouse and 17.5 µg/mouse and 15.5 µg/mouse respectively for old and recent cobra venoms.

The neutralising capacity of old and new venoms was estimated by mixing a fixed dose of 2 LD₅₀, 5 LD₅₀ & 10 LD₅₀ of cobra venom with varying doses of polyvalent antivenin. The neutralising capacity of old and new venom was found to be quite similar. Complete neutralisation was observed at 10 LD₅₀ level.

6. Protozoan parasites

Malaria

Research on malaria is being pursued with the following specific objectives :-

1. Establish isolates of *Plasmodium* species in laboratory for chemotherapeutic and immunological investigation.
2. Assessment of sensitivity of *Plasmodium* isolates to antimalarial agents *in vitro*. Also screening of synthetic derivatives and indigenous drugs for antimalarial activity *in vitro* and *in vivo* system.
3. To undertake the development of DNA probes for diagnosis of malaria and other parasitic diseases.

7. Plague

Plague is essentially a disease of rodents caused by the bacillus *Yersinia Pestis* and transmitted to man by agency of a flea *Xenopsylla cheopis*.

It is a typical example of a zoonotic infection where natural reservoir exists in the common and wild rodents. Human out-break of plague generally followed epizootics and deaths among rodents.

In the recent suspected outbreak of plague in Gujarat, Maharashtra, and other parts of the Country in 1994, it is proved again that continuous surveillance is necessary in future to control plague in India.

8. Testing Activities

Insecticidal Testing

Nearly 40 antimalarial synthetic and indigineous plant extracts were screened against *Plasmodium berghei* in mice. The compounds were received from Chemotherapy Department, Mumbai College of Pharmacy, University Department of Chemical Technology (UDCT) and K.N. Kundanani College of Pharmacy.

Also, 12 synthetic antihelmintic drugs received from UDCT were screened against *Hymenolopis nana* in mice.

The bioefficacy test was conducted using different insects under laboratory conditions to evaluate the efficacy of commercial insecticides submitted by various organisations. During 1994-95, 15 various samples of insecticides were received from their insecticidal testing.

Twenty three antimalarial synthetic drugs were tested against *Plasmodium berghei* in mice. All drugs were received from Chemotherapy Department. Eight antihelmintic drugs were screened against *Hymenolepis nana* in mice, received from K.N. Kundanani College of Pharmacy.

Out of twenty three commercial samples received from various institutions, only one rodenticide was tested against domestic and wild rats. Other insecticides were screened against household insects viz. mosquitoes, houseflies, cockroaches and fleas.

9. Snake Farm :

The various species of poisonous snakes and scorpion were maintained for obtaining their venom and carrying out research (Appendix VI).

The Department of Zoonosis was a seat of attraction for students, scientists and laymen. There were regular lectures with demonstration programmes for educating the people about the identification of snakes and first aid measures in snake bite cases. Students from medical and science faculties visit the snake farm regularly.

CHAPTER-III

GENERAL ACTIVITIES

TESTING

One of the prime functions of the Institute is to conduct various tests on products submitted by the prohibition and Excise department of the Government of Maharashtra, and samples such as drugs, biologicals, food additives, disinfectants, pesticides, cosmetics, plastics, etc. (Appendix VII, VII-A, VII-B).

Aims & Objectives :

1. To carry out analysis of Drugs & Cosmetics in accordance with Drugs & Cosmetics Act., 1940 and Drugs & Cosmetics rule, 1945 on behalf of Manufacturer, when they do not have facilities for sophisticated analysis.
2. To carry out analysis of Drugs & Cosmetics referred by other Government Department, Public Corporate bodies like Municipal Corporation, Zilla Parishad etc., to assess the quality of Drugs & Cosmetics.
3. To analyses the Drugs & Cosmetics sent by any other party for assessing the quality of Drugs & Cosmetics.
4. To analyse the alcoholic beverages like Indian Made Foreign liquors (I.M.F.L.), beer, Toddy etc.
5. To analyse the denaturants (such as Benzene, Acetone, Crotonaldehyde, Diethylphthalate, Ethyl acetate, ethyl ether, light caoutchoucine, pyridine bases, toluene, diethylamine, etc.) to be added for preparing ordinary denatured spirit (O.D.S.) and special Denatured spirit (S.D.S.) sent by State Excise Department of Government of Maharashtra.

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6. To analyse the samples of special denatured spirit (S.D.S.), ordinary denatured spirit (O.D.S.) French polish, Thinner, Ganja, Bhang etc., sent by State Excise Department of Government of Maharashtra.
 7. To extend the expertise to State Excise Department of Maharashtra Government in respect of above referred activities.
 8. Being a member of Denaturant and Technical Advisory Committee for the State of Maharashtra, Dr. H.K. Soni and S.S. Jain attended the meeting whenever called.

TRAINING

The Institute offers various courses and training programmes for medical and paramedical personnel (Appendix VII). A list of students registered during the year 1993-96 for the different degrees/courses and students who have successfully completed their thesis and obtained their degrees are given in gives the list of recognised University teachers at the Institute (Appendix VII-A, VII-B, VII-C, VII-D, VII-E, VII-F).

Sponsoring Research Bodies :

The Department of Science & Technology, Indian Council of Medical Research Department of Public Health, Central Council of Research in Ayurvedic, Government of India, and Maharashtra Council on science and Technology, Education & Employment Department, Government of Maharashtra, financed some of the research projects. The Institute is thankful and greatfully acknowleldges their financial support.

Library

The Library caters not only to the needs of students and faculty of this Institute but its collection is also extensively used by the students, teachers and scientists of other organizations and industries.

The Library continued to collect books, periodicals, monographs etc. on biomedical sciences and related fields.

During the years under report, apart from the regular routine activities, the Library undertook the project of setting up a Local Area Network (LAN) with a single CD ROM drive for the easy and speedy search and retrieval of information. The LAN was successfully installed and was made accessible to five users at a time from Sept. 1995. The Library then subscribed to Medline and Life sciences data bases on CD-ROM and Current Contents with abstracts on floppy diskettes, enabling the users to have quick and easy access to information. This CD-ROM search facility was extensively used by the staff & students of this Institute. This facility was also extended to the external visitors of this Library.

The Library imparted practical training to two students of SHPT School of Librarianship, SNDT University, Mumbai as a part of their degree (B.L.I.Sc.) programme. The training covered all the routine activities and manual and automated searches for the users.

In addition to this activities, the Library loaned text-books to the students of Std.Vth to XIIth and degree courses (except professional courses), under the facility called "**Book Bank**", to the children of Class-III and Class-IV employees of this Institute.

The statistical data of the Library collection and activities in given in the Appendix IX.

Instrumentation Cell

Instrumentation cell is manned by a single officer. He continued to look after the maintenance of Electronic Instruments in the Institute and after the upkeep of Central Instrument Room under its control. He also contributed in formulations of technical specifications necessary for purchase of new equipment and assisted various departments in technical assessment of the quotations received.

During 1995-96, he made arrangements to shift Central Instrument Room to a new location having larger area of 750 sq.ft. After carrying out necessary civil and electrical modifications in the room, a 15 ton Split Air-conditioning system was purchased and installed in the room.

He was also successful in development and fabrication of a Temperature Display-Monitor-Alarm module for an U.S.A. make CO₂ Incubator at about one-third cost of the original module.

Statistics

The section consists of a statistician. The statistician helped research scientists and research students in various statistical aspects of the bio-medical experiments. The design (plan) of experiment, data collection, analysis of data and interpretation of results etc. were done with the help of statistician. The statistician was also involved in various administrative and non-scientific activities of the Institute like budgeting and correspondence with the Government of Maharashtra in the Five Year Plan work etc.

The statistician has planned to carry out research on the bio-statistical principles & methodology used in bio-medical research. He also intends to increase relevance to statistical theory to bio-medicine and to promote better understanding of the use and interpretation of bio-statistics among scientific community. Keeping this in view a teaching programme has been designed for the Institute.

Dispensary

Haffkine Institute is running a part-time Dispensary for the Staff and families of Haffkine Institute in the premises of Haffkine Campus between 5 and 6 p.m. on every working day. Medical Officer-in-charge of Dispensary gives free treatment, Medical advice and Medical Certificate to all the employees. Also passes their routine Medical bills submitted for reimbursement.

In the year 1994-95, total 3,168 patients and in 1995-96 total 2,616 patients had taken the benefit of Dispensary.

CHAPTER-IV
APPENDICES
Bacteriology
Appendix - I

	Test Samples	Number of Samples		
		1993-94	1994-95	1995-96
1.	Water analysis	51	45	23
2.	Disinfectants/Biocides	10	06	15
3.	Candle filters	05	06	08
4.	Water purifying units	09	15	03
5.	Water storage tanks	06	03	01
6.	Antibiotic sensitivity	01	09	Nil
7.	Bacterial/Fungal (Counts/Identification)	06	Nil	01
8.	Media, Paints, Food samples etc. for bacterial count	Nil	32	09
9.	Miscellaneous	55	84	58
TOTAL		143	200	118

Biochemistry

Appendix - II

Clinical Samples :

Name of the body fluid	No. of Tests
Boood	291
Urine	27
Special Tests	94
Total	412

Appendix - IIA

Clinical Samples :

Name of the body fluid	No. of Tests
Boood	551
Urine	48
Special Tests	81
Total	680

Clinical Pathology

Appendix - III

Hospitals and Institutions making use of the service of Clinical Pathology Department for 1993-94.

Mumbai area

Cama & Albless Hospital

St. George's Hospital

Jagjivanram Hospital

Central Railway Hospital

Byculla Nair Charitable Hospital

K.E.M. Hospital

M.G.M. Hospital

B.J. Wadia Hospital for Children

Greater Mumbai Municipal Dispensaries

E.S.I.S. Hospital, Andheri

E.S.I.S. Hospitals,

From Maharashtra

Civil Hospital, Thane

Civil Hospital, Alibag, Raigad

Civil Hospital, Sawantwadi

I.S.P. Hospital, Nasik

Civil Hospital, Dhulia

Civil Hospital, Nasik

Civil Hospital, Thane

Civil Hospital, Ratnagiri

Clinical Pathology

Appendix - IIIA

The routine investigation carried out during the year 1993-94 are enumerated below :

	Tests
A. Histopathology	347
B. Haematology	1164
C. Cytology for malignant cells	22
D. Clinical Pathology	
Urine for routine examination	275
Stool for routine examination	191
Semen examination	1
Immunological Pregnancy Test	18
Immunological pregnancy tests	13
Biological (Rat-Test) for pregnancy	Nil
E. Bacteriology	
Direct smear for Tubercle Bacilli	1
Culture for Tubercle bacilli	28
Animal inoculation for Tubercle bacilli	3
C.S.F. culture	13
Urine culture	184
Stool culture	32
Blood culture	28
Sputum culture	28
Tetanus culture	405
Aspirated fluid culture	15
Throat swab culture	4
Diphtherial culture & smear	1
Pleural fluid culture	6
Antibiotic sensitivity tests	203

Tests	
Pus culture	73
Weil Fleix test	39
Brucellosis test	48
V.D.R.L. Test	5
Widal Test	57
Paul Bunnel Test	43
Ear Swab culture	3

Clinical Pathology

Appendix - IIIB

Hospitals and Institutions making use of the service of Clinical Pathology Department for 1994-95.

Mumbai area

Cama & Albless Hospital

St. George's Hospital

Jagjivanram Hospital

B.Y.L. Nair Hospital

K.E.M. Hospital

M.G.M. Hospital

K.B. Bhatia Hospital

B.J. Wadia Hospital for Children

Greater Mumbai Municipal Dispensaries

E.S.I.S. Hospital, Andheri

E.S.I.S. Hospital, Kandivali,

E.S.I.S. Hospital, Worli.

From Maharashtra

E.S.I.S. Hospital, Thane

E.S.I.S. Hospital, Ulhasnagar

Civil Hospital, Alibag, Raigad

Civil Hospital, Sawantwadi

Rural Hospital, Talasari, Dist. Thane.

Clinical Pathology

Appendix - IIIC

The routine investigation carried out during the year 1994-95 are enumerated below :

	Tests
A. Histopathology	170
B. Haematology	2947
C. Cytology for malignant cells	06
D. Clinical Pathology	
Urine for routine examination	663
Stool for routine examination	465
Semen examination	Nil
C.S.F. routine cell count	Nil
Immunological pregnancy tests	13
Biological (Rat-Test) for pregnancy	Nil
E. Bacteriology	
Direct smear for Tubercle Bacilli	--
Culture for Tubercle bacilli	39
Animal inoculation for Tubercle bacilli	2
Smear and culture for C. diphtheria	--
Culture of theatre swabs for Anaerobes	218
Urine culture	125
Pus Culture	69
Sputum culture	12
Diphtherial culture & smear	--
Stool culture	16
Stool culture (cholera)	--
Blood culture	15
Antibiotic sensitivity tests	114

	Tests
Aspirated fluid culture	12
C.S.F. culture	5
Miscellaneous	15
Throat swab culture	3
<u>Serology</u>	
Widal tests	58
Weil Felix tests	49
Brucellosis tests	54
V.D.R.L. tests	4
Paul Bunnel Tests	44

Clinical Pathology

Appendix - IIID

Hospitals and Institutions making use of the service of Clinical Pathology Department for 1995-96.

Mumbai area

E.S.I.S. Hospital, Andheri
E.S.I.S. Hospital, Kandivali,
E.S.I.S. Hospital, Worli.
Cama & Albless Hospital
St. George's Hospital
Central Railway Hospital
B.Y.L. Nair Hospital
M.G.M. Hospital
K.B. Bhatia Hospital
B.J. Wadia Hospital for Children
J.J. Hospital
Greater Mumbai Municipal Dispensaries

From Maharashtra

E.S.I.S. Hospital, Thane
E.S.I.S. Hospital, Ulhasnagar
E.S.I.S. Hospital, Navi Mumbai
Civil Hospital, Alibag, Raigad
Civil Hospital, Ratnagiri
Municipal Hospital, Kalyan
Shri Sainath Hospital, Shirdi
K.M.C. Hospital, Dombivali
Devrukh Hospital, Sindhudurga District
Civil Hospital, Thane

Clinical Pathology

Appendix - III E

The routine investigation carried out during the year are enumerated below :

	Tests
A. Histopathology	365
B. Haematology	2054
C. Cytology for malignant cells	04
D. Clinical Pathology	.
Urine for routine examination	445
Stool for routine examination	280
Semen examination	Nil
C.S.F. routine cell count	Nil
Immunological pregnancy tests	04
Biological (Rat-Test) for pregnancy	Nil
E. Bacteriology	
Direct smear for Tubercle Bacilli	--
Culture for Tubercle bacilli	55
Animal inoculation for Tubercle bacilli	02
Smear and culture for C. diphtheria	--
Culture of theatre swabs for Anaerobes	267
Urine culture	141
Pus Culture	98
Sputum culture	28
Diphtherial culture & smear	1
Stool culture	9
Stool culture (cholera)	--
Blood culture	14
Antibiotic sensitivity tests	138
Aspirated fluid culture	12
C.S.F. culture	5
Miscellaneous	8
Throat swab culture	8
<u>Serology</u>	
Widal tests	54
Weil Felix tests	38
Brucellosis tests	41
V.D.R.L. tests	1
Paul Bunnell Tests	31

Toxicology

Appendix - IV

Sr. No.	Classification of Sample	Type of Study	No. of tests.
1.	Drugs & related Samples	i) Oral LD50 in mice ii) Primary skin irritation iii) Undue toxicity	1 2 1
2.	Insecticide and insect repellent	i) Oral LD50 in rats ii) Primary skin irritation iii) Mucous membrane irritation	2 1 2
3.	Chemicals	i) Oral LD50 in mice ii) LC50 in fish iii) Mucous membrane irritation	4 3 2
4.	Plastics	i) Biological tests	1
5.	Painted containers	i) Test for Painted container Biological test.	1
TOTAL :			20

Toxicology Appendix - IVA

Sr. No.	Type of Study	Results		
A.	Acute oral toxicity (LD50) in mice			
1.	Linoxyl CS 40	LD50 > 10,000 mg/kg		
2.	Lubripharma	LD50 > 15,000 mg/kg		
3.	NAF 18	LD50 > 10,000 mg/kg		
		Lower limit	LD50	Higher limit
4.	Unicide MBA	706	946	1268 mg/kg
5.	Unicide MBX	1203	1470	1796 mg/kg
B.	Acute Oral Toxicity (LD50) in rats.			
1.	Odomos super gel	4112	4400	4708 mg/kg
2.	Odomos mosquito repellent	3182	3500	3850 mg/kg
C.	Acute toxicity (LC50) in fish			
1.	Unicide MBA	LC50 - 225 ppm		
2.	Unicide MBX	LC50 - 160 ppm		
3.	NAF - 18	LC50 - 255 ppm		
D.	Primary skin irritation study in rabbits.			
1.	Silicon Oil	mild irritation		
2.	Silicon Oil	mild irritation		
3.	Odomos Super Gel	mild irritation		
E.	Mucous membrane irritation study in rabbits.			
1.	Odomos mosquito repellent gel	mild irritation		
2.	Odomos Super gel	moderate irritation		
3.	Unicide MBA	moderate irritation		
4.	Unicide MBX	moderate irritation		
F)	Test for painted container.			
1.	Painted container	No mortality or signs of toxicity in mice.		
G.	Test for plastic container.			
1.	Plastic	Complies with USP test for plastics		
H.	Undue toxicity test.			
1.	Voice Prosthesis	Complies with undue toxicity test.		

Toxicology
Appendix IVB

Sr. No.	Classification of Sample	Type of Study	No. of tests.
1.	Drugs & related samples	Primary skin irritation study in rabbits.	1
		Intra-cutaneous sensitisation in guinea pigs	1
2.	Pesticides & insects repellents	LD50 studies in rats	29
		LD50 study in rabbits	2
		MLD study in chicken	1
		MLD study in pigeons	1
		LC50 study in fish	1
		Primary skin irritation in rabbits	5
		Mucous membrane irritation study in rabbits	5
3.	Chemicals	LD50 study in mice	3
		LD50 study in rats.	2
		Primary skin irritation study in rabbits	2
		Mucous membrane irritation study in rabbits	1
TOTAL :			34

Toxicology

Appendix - IVC

Sr. No.	Type of Study	Results
A.	Acute oral toxicity (LD50) in mice	
1.	Finit Aerosol Spray	LD50 - > 11,801 mg/kg
2.	Magnaflock LT-31	Lower limit LD50 Higher limit 3226 mg/kg 3300mg/kg 3376mg/kg
3.	Bestat 16-cab	LD50 > 15,000 mg/kg
B.	Acute toxicity in rats :-	
1.	Colourchem Product A-002-94	Lower limit LD50 Higher limit 6273mg/kg 6800mg/kg 7371mg/kg
2.	Colourchem Product A-001-94	LD50 - > 10,000 mg/kg
3.	Finit Aerosol Spray	LD50 - > 11,801 mg/kg
4.	Odomos super clear No.60.	LD50 - > 7,500 mg/kg
5.	Odomos Repellent cream-161	LD50 - > 7,500 mg/kg
6.	Autan insect repellent Gel	LD50 - > 7,500 mg/kg
7.	Odostick - 188	Lower limit LD50 Higher limit 4957mg/kg 5800mg/kg 6786mg/kg
8.	Odostick - 203	4487mg/kg 5200mg/kg 6027mg/kg
9.	Odostick - 223	LD50 - > 7,500 mg/kg
10.	Odostick - 235	LD50 - > 7,500 mg/kg
11.	Quinal Phos Technical	Lower limit LD50 Higher limit 32.2 mg/kg 39.6 mg/kg 48.7 mg/kg
C.	Acute dermal toxicity in rabbits :	
1.	Finit Aerosol Spray	LD50 - 11,801 mg/kg
2.	Quinol Phos Technical 70% a.e.	Lower limit LD50 Higher limit 218mg/kg 333.35mg/kg 510.35mg/kg
D.	Primary skin irritation in rabbits :	
1.	Finit aerosol spray	mild irritation
2.	Ventrosil DM - 350	No irritation
3.	Latex gloves	No irritation
4.	Odostick - 188	mild irritation

-
- | | |
|-------------------|-----------------|
| 5. Odostick - 203 | mild irritation |
| 6. Odostick - 223 | mild irritation |
| 7. Odomos - 235 | mild irritation |
| 8. Hicryl SK-660 | mild irritation |
- E. Mucous membrane irritation in female rabbits :
- | | |
|------------------------|-----------------|
| 1. Finit Aerosol Spray | mild irritation |
| 2. Ventrosil DM - 350 | No irritation |
| 3. Odostick - 188 | mild irritation |
| 4. Odostick - 203 | mild irritation |
| 5. Odostick - 223 | mild irritation |
| 6. Odostick - 235 | mild irritation |
- F. Acute oral toxicity in chicken :
- | | |
|------------------------|----------------------|
| 1. Finit Aerosol Spray | MLD - > 11,801 mg/kg |
|------------------------|----------------------|
- G. Acute oral toxicity in pigeons :
- | | |
|------------------------|-----------------------|
| 1. Finit Aerosol Spray | MLD - > 11,801 mg/kg. |
|------------------------|-----------------------|
- H. Acute toxicity in fish :
- | | |
|------------------------|-----------------|
| 1. Finit Aerosol Spray | LC50 - 20.8 ppm |
|------------------------|-----------------|
- I. Intra-cutaneous sensitisation in guinea pigs :
- | | |
|-----------------|-------------------|
| 1. Latex gloves | No sensitisation. |
|-----------------|-------------------|

Toxicology

Appendix - IVD

Sr. No.	Classification of Sample	Type of Study	No. of tests.
1.	Drugs & related samples	LD50 studies in mice	1
		LD50 study in rats	1
		LD50 study in rabbits	1
		LC50 study in fish	1
		Intra-cutaneous sensitisation in guinea pigs.	2
		Primary skin irritation study in rabbits	4
3.	Chemicals	LD50 study in mice	5
		LD50 study in rats.	4
		LC50 studies in fish	4
		Primary skin irritation study in rabbits	10
		Mucous membrane irritation study in rabbits	3
		Total :-	36

Toxicology

Appendix - IVE

Sr. No.	Type of Study	Results
A.	Acute oral toxicity (LD50) in mice	
1.	Filspray	LD50 - > 9,500 mg/kg
2.	Simethicon, I.P.	LD50 > 14,835 mg/kg
3.	Polyelectrolyte	LD50 > 5,000 mg/kg
4.	Food Machine grease	LD50 > 10,000 mg/kg
5.	Zinc Borate	LD50 > 10,000 mg/kg
6.	Wudsav	Lower limit LD50 Higher limit 2333.33mg/kg 2800mg/kg 3360mg/kg
B.	Acute oral toxicity in rats :-	
1.	Biowet	Lower limit LD50 Higher limit 3676.5mg/kg 5000mg/kg 6800mg/kg
2.	Fixol NF	LD50 > 10,600 mg/kg
3.	Garrytex 110 L	LD50 > 10,400 mg/kg
4.	Hyper N	LD50 > 12,200 mg/kg
5.	Polyelectrolyte	LD50 > 5,000 mg/kg
C.	Acute dermal toxicity in rabbits :	
1.	Polyelectrolyte	LD50 > 5,000 mg/kg
D.	Primary skin irritation in rabbits :	
1.	Hicryl F-7	mild irritation
2.	Providone Iodine (topical solution)	No irritation
3.	Providone Iodine (Ointment)	mild irritation
4.	Filspray	moderate irritation
5.	Hocut B-60 CN 5% emulsion	No irritation
6.	Silicon Oil	No irritation
7.	Biowet	mild irritation
8.	Fixol NE	mild irritation
9.	Garrytex - 110 L	mild irritation
10.	Hyper N	No irritation
11.	Food machine grease	mild irritation
12.	Surgical gloves	No irritation
13.	Zinc Borate	mild irritation

-
- | | |
|-------------------------------------|-----------------|
| 14. Wudsav | mild irritation |
| 15. Providone iodine surgicle sorub | mild irritation |
- E. Mucous membrane irritation in female rabbits :
- | | |
|--------------------------|-----------------|
| 1. Food machinery grease | mild irritation |
| 2. Zinc Borate | mild irritation |
| 3. Wudsav | mild irritation |
- F. Acute toxicity (LC50) in fish :
- | | |
|---------------------|-------------------|
| 1. Biowet | LC50 - 6.2 ppm. |
| 2. Fixol NF. | LC50 - 1696 ppm. |
| 3. Garrytex 110 L | LC50 - 37.44 ppm. |
| 4. Hyper N | LC50 - 1000 ppm. |
| 5. Poly electrolyte | LC50 - 330 ppm. |
- I. Intra-cutaneous sensitisation in guinea pigs :
- | | |
|--------------------|-------------------|
| 1. Silicone Oil | No sensitisation. |
| 2. Surgical gloves | No sensitisation. |

Virology
Appendix - V : 1993-94

I. Immunization clinic vaccine	Total No.
Verorab	
PCEC	151
ARV	189
Polio	59
Triple	48
T.T.	38
D.T.	0
Typhoid	12
MMR	1
Cholera	14
Verorab	361
Total :-	874

II. The following serological test were carried out for the viruses mentioned.

1. Cytomegalavirus	4
2. Herpes Simplex virus	11
3. Human immuno deficiency virus	2
Total :-	17

Virology Department
Appendix - VA : 1994-95

I) Immunization clinic vaccine	Total No.
Verorab	400
Semple ARV	87
Polio	41
Triple	37
T.T.	25
Typhoid	6
Cholera	8
Plague	117

Total :- 721

II) Clinical Virology Testing

1. H.I.V.	5
2. C.M.V.	3
3. H.S.V.	6
4. HBsAg	83
5. Rabies antibody Detection by SMNT.	2

Total :- 99

Virology
Appendix - VB : 1995-96

I) Immunization clinic vaccine	Total No.
Rabipur	1
Sample ARV	82
Polio	41
Triple	29
T.T.	37
D.T.	6
Typhoid	2
Cholera	2
Plague	2
Total :-	202

II) Clinical Virology Testing	
H.I.V.	1
C.M.V.	4
H.S.V.	16
HBsAg	700
Rabies virus	1
Total :-	722

Virology
Appendix - VC

Results of HBsAg testing by ELISA in four groups :

	Rajbhavan Hospital	O.N.G.C.	Central Railway Hospital Byculla	J.J.Hospital
No.of Samples	169	91	119	434
Positive	4 (2.9%)	4 (4.5%)	5 (4%)	12 (2.7%)
Negative	165	87	114	422

Zoonosis
Appendix - VI : 1993-94

Snake Farm :

Snake Species	Procurements in Numbers	Venom Production in gm.	Supply in gm.
A: Snakes			
Cobra	76	59.60	169.87
R. Viper	61	14.22	25.54
Krait	26	2.41	7.23
Echis	202	-	8.73
Total	365	76.23	211.37
B: Scorpions			
Red	21,089	6.39	2.92
Black	-	-	-
Total	21,089	6.39	2.92

C : No. of visitors for snake farm

1.	Students	-	4613
2.	Staff of Scientific Institutions	-	1394
3.	Distinguished Visitors	-	1
4.	Foreign guests	-	40
5.	Thursday visitors	-	217
6.	Others	-	237
Total		-	6502

D : Identification of snakes :

There were 7 enquiries regarding identification of snakes from Hospitals and individuals during the year 1993-94.

Zoonosis
Appendix - VIA : 1994-95

Snake Farm :

Snake Species	Procurements in Numbers	Venom Production in gm.	Supply in gm.
A: Snakes			
Cobra	61	73.64	115.23
R. Viper	55	13.30	14.04
Krait	23	1.61	1.66
Echis	220	0.05	5.05
Total	359	88.60	135.98
B: Scorpions			
Red	11,366	4.56	2.04
Black	-	-	-
Total	11,366	4.56	2.04

C : No. of visitors for snake farm

1.	Students	-	3510
2.	Staff of Scientific Institutions	-	1426
3.	Distinguished Visitors	-	56
4.	Foreign guests	-	10
5.	Thursday visitors	-	10
6.	Others	-	138
Total		-	5150

D : Identification of snakes :

There were 17 enquiries regarding identification of snakes from Hospitals and individuals during the year 1994-95.

Zoonosis
Appendix - VIB : 1995-96

Snake Farm :

Snake Species	Procurements in Numbers	Venom Production in gm.	Supply in gm.
A: Snakes			
Cobra	59	44.11	10.50
R. Viper	52	16.82	4.66
Krait	9	0.92	0.65
Echis	2,377	11.04	7.00
Total	2,497	72.89	22.81
B: Scorpions			
Red	13,121	5.81	1.31
Black	-	-	-
Total	13,122	5.81	1.31

C : No. of visitors for snake farm

1.	Students	-	3244
2.	Staff of Scientific Institutions	-	1095
3.	Distinguished Visitors	-	-
4.	Foreign guests	-	26
5.	Thursday visitors	-	75
6.	Others	-	127
Total		-	4,567

D : Identification of snakes & Scorpions :

There were 12 enquiries regarding identification of snakes and 1 enquiry for scorpion from Hospitals and individuals during the year 1995-96

Testing Unit

Appendix - VII

Table showing the nature and number of samples tested received from Excise Department from 1st April 1993 to 31st March 1994.

Tests	Number
Denaturants etc. (O.D.S., S.D.S., French Polish etc.)	1714
I.M.F.L. & Samples	2240
Toddy Samples (Toddy, Ganja, Bhang etc.)	2735

Appendix - VIIA

Testing Unit

Table showing the nature and number of samples tested received from Excise Department from 1st April 1994 to 31st March 1995.

Tests	Number
I.M.F.L. & Samples	1672
Beer	198
Toddy	1687
Ganja	2
Denaturants O.D.S., S.D.S. French Polish etc.	974
Total :-	4533

Testing Unit
Appendix - VIIB

**Table showing the nature and number of samples tested
received from Excise Department from
1st April 1995 to 31st March 1996.**

Tests	Number
I.M.F.L. & Samples	2974
Beer	661
Toddy	4109
Ganja	45
Bhang	1
Denaturants O.D.S., S.D.S. French Polish etc.	1404
Total :-	9194

TRAINING
Appendix - VIII

POST GRADUATE COURSES OFFERED (1993-96)

M.Sc. (By Research)-	Microbiology, Biochemistry, Zoology, Organic Chemistry, Applied Biology.
M.Sc.(By Papers)	- Microbiology, Biochemistry, Zoology, Organic Chemistry and Applied Biology,
Pharmacology and Pharmaceutical Chemistry.	
M.D.	- Pathology and Microbiology
D.M.L.T. Technology.	- Diploma in Medical Laboratory Technology.

Appendix - VIIIA
TRAINEES ADMITTED (1993-96)

	<u>93-94</u>	<u>94-95</u>	<u>95-96</u>
M.Sc. by Papers	5	5	5
D.M.L.T.	20	21	20
Research Fellowship and Scholarship			
Senior Research Fellow	1	1	2
Junior Research Fellow	4	2	4

Appendix VIII B

LIST OF STUDENTS REGISTERED DURING THE YEAR (1993-96)

M.Sc.

1. Mr. Bhide Kedar S.
2. Ms. Balimane Jayashri
3. Ms. Ankolekar Deepti
4. Mr. Parulkar Ninad
5. Ms. Phalak Nanda
6. Ms. Ghatpande Deepa
7. Ms. Mankar Manjusha
8. Mr. Waskar Morris
9. Ms. Das Sharmistha
10. Ms. Rajgopalan Vandana
11. Mr. Kulkarni Viraj

M.Pharm

1. Ms. Sarang Swati
2. Mr. Jagtap Chandan
3. Ms. Wayangankar Sonali
4. Ms. Kharkar Pallavi

M.D.

1. Dr.(Ms.) Dhadwal Neetu.

Ph.D.

1. Mr. Berde Anup
2. Mr. Patil Langmmana

Appendix VIIC

DEGREE AWARDED DURING THE YEAR (1993-96)

Name of the Candidate	Subject	Topic
M.Pharm 1.Ms.Swati M. Sarang	Pharmacology	Acute Toxicity studies of Pesticides obtained from Indigenous plants <i>Azadirachta indica</i> (neem)
M.Sc. 1.Ms. Brinda T. Krishnan	Microbiology	Studies on the Resistance factor Mediated multiple drug resistance in <i>Salmonella typhi</i>
2.Ms. Nayana M. Dabke	Applied Biology	Studies of antifungal activity of some herbal extracts on fungal pathogenes isolated from superficial mycotic infections.
3.Ms. Rajeshri G. Lattu	Microbiology	Studies on antibacterial activity of the extracts of Annantmool (root)
4.Ms. Renu V. Gupta	Applied Biology	Studies in multiple drugs resistant enteric infection in and around Bombay.
5.Ms. Jean J. Castellino	Microbiology	Studies on the synergism between Trimethoprim and piperacillin.
6.Ms. Rachana Thapaliyal	Microbiology	Studies on Multiple drug resistance in Enterobacteriaceae.
7.Mr. Ninad N. Parulkar	Microbiology	Studies of Association of HIV infection and pulmonary Tuberculosis.

Name of the Candidate	Subject	Topic
8. Mr. Kedar B. Bhide	Applied Biology	Studies on snails of vector of parasitic diseases in Bombay and molluscicidal properties of some indigenous plants.
9. Ms. Deepti N. Ankolekar	Microbiology	<i>In vitro</i> evaluation of the antibacterial activity of Amikacin-Cefotaxime combinations against ciprofloxacin resistant coliforms.
10. Ms. Jayashri A. Balimane	Biochemistry	Studies on Hepatoprotective activity of some indigenous plants.
11. Mr. Vilas V. Shinde	Biochemistry	Studies on Oral Hypoglycemic against from some indian medicinal plants.
Ph.D.		
1. Mr. Rajiv K. Mahajan	Applied Biology	Studies on Angiostrongyliasis Evaluation of drugs.
2. Mr. Arvind K. Manian	Organic Chemistry	Synthesis & study of 2,4-Disubstituted thiazoles as potential chemotherapeutic agents.
3. Mr. S. D. Deshmukh	Organic Chemistry	Synthesis & study of Quinoxaline Alloxazine Derivatives as Antimalarial Antibacterial agents.

Name of the Candidate	Subject	Topic
4. Shanthi V.Parmeswar	Biochemistry	Studies on the protective mechanism of Bordetella pertussis extract against oxidative damage in animal tissue.
5. Ms.Smita S. Khetan	Microbiology	Antigen specific Class II Restricted CDB+Suppressors, experimented Artifact or reality.
6. Mrs.Sandhya P.Mainkar	Applied Biology	Studies on culex quinque fasciatus from Bombay with special reference to insecticide resistance.
7. Mr.Vilas R. Lokhande Ph.D. (Tech)	Pharmaceutical Chemistry	Synthesis of Noval Heterocyclic compounds as possible antimicrobial agents.
8. Mr. Gurudatta C.Parkar	Biochemistry	Purification and biochemical characterisation of the hypoglycaemia causing factor from Bordetella pertussis and study of its mechanism of action.
9. Mr. T. Arulmoli	Organic Chemistry	Synthesis and study of Organic Compounds of possible Therapeutic value
10.Mr. Sanjay D. Palav	Organic Chemistry	Synthesis & study of Benzothiazole and substituted thiazoles as possible antifungal and antibacterial agents.

Appendix - VIID

POST GRADUATE TEACHERS (1993-94)

The following Post-graduate Teachers are recognised by the University of Mumbai

Name	Qualification
Dr. S.R. Sengupta	M.D.
Dr. R.S. Kamat	M.D.
Dr. D.M. Renapurkar	M.Sc.,Ph.D.,F.M.A.S.
Dr. V.R. Rao	M.V.Sc.,Ph.D.
Dr. S.V. Gadre	M.Sc.,Ph.D.
Dr. B.G. Khadse	M.Sc.,Ph.D.
Dr. R.P. Bhamaria	M.Sc.,Ph.D.
Dr. S.R. Chavan	M.Sc.,Ph.D.
Dr. S.T. Nikam	M.Sc.,Ph.D.
Dr. B.D. Sathe	M.Sc.,Ph.D.
Dr.(Mrs.) A.C. Desai	M.Sc.,Ph.D.
Dr.(Mrs.) V.R. Kamath	M.Sc.,Ph.D.
Dr. N.G. Chanderkar	M.D.,Ph.D.
Dr. N.K. Sutar	M.Sc.,Ph.D.
Dr.(Mrs.) R.A. Deshmukh	M.D.,Ph.D.
Dr.(Mrs.) Y. Fernandes	M.D., D.P.B.
Dr.(Mrs.) C.H. Pandit	M.D.

Appendix VIIIF

POST GRADUATE TEACHERS (1995-96)

The following Post-graduate Teachers are recognised by the University of Mumbai

Name	Qualification
Dr. V.L. Yemul	M.D.,Ph.D.
Dr. R.S. Kamat	M.D.
Dr. D.M. Renapurkar	M.Sc.,Ph.D.,F.M.A.S.
Dr. V.R. Rao	M.V.Sc.,Ph.D.
Dr. S.V. Gadre	M.Sc.,Ph.D.
Dr. B.G. Khadse	M.Sc.,Ph.D.
Dr. R.P. Bhamaria	M.Sc.,Ph.D.
Dr. S.T. Nikam	M.Sc.,Ph.D.
Dr. B.D. Sathe	M.Sc.,Ph.D.
Dr.(Mrs.) A.C. Desai	M.Sc.,Ph.D.
Dr.(Mrs.) V.R. Kamath	M.Sc.,Ph.D.
Dr. N.G. Chanderkar	M.D.,Ph.D.
Dr. N.K. Sutar	M.Sc.,Ph.D.
Dr.(Mrs.) R.A. Deshmukh	M.D.,Ph.D.
Dr.(Mrs.) Y. Fernandes	M.D., D.P.B.
Dr.(Mrs.) C.H. Pandit	M.D.

Appendix - VIII E

POST GRADUATE TEACHERS (1994-95)

The following Post-graduate Teachers are recognised by the University of Mumbai

Name	Qualification
Dr. V.L. Yemul	M.D.,Ph.D.
Dr. R.S. Kamat	M.D.
Dr. D.M. Renapurkar	M.Sc.,Ph.D.,F.M.A.S.
Dr. V.R. Rao	M.V.Sc.,Ph.D.
Dr. S.V. Gadre	M.Sc.,Ph.D.
Dr. B.G. Khadse	M.Sc.,Ph.D.
Dr. R.P. Bhamaria	M.Sc.,Ph.D.
Dr. S.R. Chavan	M.Sc.,Ph.D.
Dr. S.T. Nikam	M.Sc.,Ph.D.
Dr. B.D. Sathe	M.Sc.,Ph.D.
Dr.(Mrs.) A.C. Desai	M.Sc.,Ph.D.
Dr.(Mrs.) V.R. Kamath	M.Sc.,Ph.D.
Dr. N.G. Chanderkar	M.D.,Ph.D.
Dr. N.K. Sutar	M.Sc.,Ph.D.
Dr.(Mrs.) R.A. Deshmukh	M.D.,Ph.D.
Dr.(Mrs.) Y. Fernandes	M.D., D.P.B.
Dr.(Mrs.) C.H. Pandit	M.D.

Appendix - IX**Library (1993-96)**

The following figures indicate the working of the Library during the year 1994-95

No.of outside readers visiting the Library	No.of Periodicals issued under inter-Library Loan service	Books & Periodicals obtained for our staff from other Libraries	No.of Books added	No. of Photocopies requested	No.of periodicals subscribed per year
12,796	448	66	437	5,648	115

Appendix - X

Papers Published

1. Susceptibility of rats to bromadiolone in Bombay.
Renapurkar, D.M.
Pestology, **17**(10) : 39-43, 1993.
2. Non specific protection in *Litomosoides carinii* using *Sataria cervi* antigen, adjuvants and vaccines.I.
Almeida, A.J., Kamath, V.R. and Renapurkar, D.M.
Ind. J. Expt. Biol., **31**:574-576, 1993.
3. Comparative studies on yield of venom in *Naja naja* and *Bungarus caeruleus* snakes of different length groups.
Tare, T.G. and Renapurkar, D.M.
The Snake, **25** : 73-75, 1993.
4. Mechanism of antioxidant effect of *B. pertussis* extract.
V.P. Shanti and P. Ramkrishnan.
Indian Journal of Biochemistry and Biophysics, **31**(5) : 398-492, 1994.
5. Synthesis of 2-substituted -Anilino/phenyl/Benzyl-5-substituted-4-phenylamido-(3-o-chlorophenyl-5-methylisoxazolyl) thiazoles as potential antitubercular and antimicrobial agents.
Arvind K. Manian, Barsu G. Khadse and Satyaranjan R. Sengupta.
Indian Drug, **31**(9) : 442-444, 1994.
6. Synthesis of -2-(substituted aryl)-4-/P-N,N-Diethyl-ureido) phenyl thiazoles, as potential chemotherapeutic agent.
Vilas R. Lokhande, Barsu G. Khadse and Satyaranjan R. Sengupta
Indian Drugs, **31**(12) : 587-589, 1994.
7. Synthesis and Antibacterial activity of 2-substituted benzyl-4-(P-phenyl sulphonamido)-5-unsubstituted/methyl Thiazoles.
T. Arulmoli and B.G. Khadse
Indian Journal of Pharmaceutical Science, 193-194, Sept.- Oct. 1994.

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8. Molluscicidal properties of *Agave americana*, *Jatropha curcuss*.
K.S. Bhide and B.D. Sathe.
Proceedings of the VIth International Symposium on vectors and
vector borne diseases, held at Bhubaneswar in Nov. 1994.
 9. Observation of potency of lyophilised Cobra venom after storage.
Vijayalaxmi R. Kamath, V.L. Yemul and D.M. Renapurkar.
Proceeding of first National Symposium on Venoms and Toxins,
1994.
 10. Ecology and distribution of *Echis carinatus* snakes in Deogad
Taluka and other areas of Maharashtra State, India.
S.R. Sengupta, T.G. Tare, N.K. Sutar and D.M. Renapurkar.
Journal of Wildness Medicine, 5 : 282-286, 1994.

Appendix - XI

Papers Presented in the Conference

1. Synthesis and study of 2-substituted phenyl/Anilino-4/(m-N,N-dialkyl ureido) Phenyl/Thiazoles as potential antibacterial and antifungal agents.
S.D. Palav, B.G. Khadse.
45th I.P.C.A., Delhi, 23rd to 25th Dec. 1993.
2. Synthesis and antimicrobial activity of 2-substituted phenyl amino-4-(4'-Phenyl sulphonamido)-5-Methyl thiazoles.
T. Arulmoli, B.G. Khadse.
45th I.P.C.A., Delhi, 23rd to 25th Dec. 1993.
3. Synthesis of 8-(Substituted) or 7-8 (disubstituted Alloxazine/ Alloxazine-10-N-Oxide as potential antibacterial/antihelmintic agents.
Suryakant D. Deshmukh, B.G. Khadse,
45th I.P.C.A., Delhi, 23rd to 25th Dec. 1993.
4. Some aspects of the biology of the malaria vector *Anopheles stephensi*.
D.M. Renapurkar
Workshop on Resurgence of Malaria, Bombay, 1993.
5. Aetiopathology of CD4+ T cell lymphopenia
Viraga Haridas,
367th meeting of Teaching Pathologists & Microbiologists, Haffkine Institute, Mumbai, 29th Jan. 1994.
6. Cyclopicidal properties of some indigenous plants.
Saroj Bapna and D.M. Renapurkar.
IXth National Congress of Parasitology, 22nd to 24th Feb. 1994.
7. Repeated immunization of mice with Chronic Graft versus Host Disease causes loss of responsiveness.
Ms. Viraga L. Haridas,
XXIst Annual Conference of Indian Immunological Society, Chandigarh, Sept. 1994.
Receipient of Best Poster Award.

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8. Role of CD5+ (B1) B cells in CD4 + TH cell subset differentiation
Ms. Mangala Sawant
XXIst Annual Conference of Indian Immunological Society,
Chandigarh, Sept. 1994.
 9. Molluscicidal properties of *Jatropha curcuss* (Mogali Erand).
K.S. Bhide and B.D. Sathe.
IVth Symposium on vectors and vector borne diseases,
Bhubaneswar, Nov. 1994.
 10. Study of *Agave americana* (Ghyapat) as indigenous molluscicide
for control of snail as a vector of parasitic diseases.
B.D. Sathe and K.S. Bhide.
IV Symposium on vectors and vector borne diseases,
Bhubaneswar, Nov. 1994.
 11. Evaluating safety and efficacy of Verorab vaccine in pregnancy.
R.A. Deshmukh, V.L. Yemul.
XVth Annual Conference of Indian Association of Veterinary
Microbiologists, Immunologists and Specialists in Infectious
Diseases (IAVMI) & National symposium on Healthy Animals, Sea
Foods, Healthy Man, 27th to 29th Dec. 1994.
 12. Study of MDR Mycobacteria in HIV seropositive pulmonary
tuberculosis patients.
Parulkar, N.N., Deshmukh, R.A., Yemul, V.L.,
Indian Pharmacologica Society XXVIIth Annual Conference, 21st
to 24th Dec. 1994.
 13. Plasma factor : A novel cytokine induced by Rabies virus avian
species.
Deshmukh, R.A., Shirodkar, M.V.N.
Indian Pharmacological Society XXVIIth Annual Conference, 21st
to 24th Dec. 1994.
 14. Animal models for AIDS and vaccine testing
Deshmukh, R.A.
Symposia on "AIDS : the current pandemic",
Indian Pharmacological society XXVIIth Annual Conference,
Seth G.S. Medical College, Mumbai, 23rd Dec. 1994,
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15. Immunodulatory properties of the Salmonella typhi
Ms. Vidula Alurkar.
373rd meeting of the Teaching Pathologists and Microbiologists,
Haffkine Institute, Mumbai, Jan. 1995.
16. Influence of superantigen of Mouse Mammary Tumor Virus on
cell mediated immune response to Mycobacteria.
Viraga Haridas.
379th meeting of Teaching Pathologists & Microbiologists,
Haffkine Institute, Mumbai, 27th Jan. 1996.

Appendix - XII

Papers Sent for Publication

1. Saroj Bapna and D.M. Renapurkar.
"Predation efficacy of *Mesocyclops leuckarti* on first instar mosquito larvae".
Journal of communicable diseases.
2. The Enzymed linked Immunosorbent Assay for detection of Snake venom antigen in rabbits.
V.L. Yemul and Vijayalaxmi R. Kamat.
Journal of Post-graduate Medicine.

