Development of Molecular Strategies for Taming the Microbes

Application For Financial Support Under SAP (DRS)
of

University Grants Commission

June 2011

Department of Microbiology
University of Delhi South Campus
Benito Juarez Road, Dhaula Kuan

New Delhi 110021, India

ANNEXUREI

UNIVERSITY GRANTS COMMISSION

FORMAT FOR INVITING PROPOSAL FOR FRESH INDUCTION
UNDER SAP (DRS)

1.	**Name and address of the University**:	UNIVERSITY OF DELHI SOUTH CAMPUS Benito Juarez Road, New Delhi- 110021
	Year of Establishment:	1973
2.	**Name and address of the Registrar:**	**Mr. R.K.Sinha** University of Delhi Maurice Nagar Delhi-110007
3.	**Name of the eligible department submitting the proposal with detailed address:**	**Department of Microbiology** University of Delhi South Campus Benito Juarez Road, New Delhi-110021 Tel. 91-11-24111933 Fax: 91-11-24115270 E.mail: microsdc@yahoo.co.in
4.	**Name and address of the Head of the Department:**	**Prof. Rani Gupta** Department of Microbiology University of Delhi South Campus Benito Juarez Road, New Delhi110021
5.	**Name and address of the coordinator proposed for the programme:**	**Dr.J.S.Virdi** Department of Microbiology University of Delhi South Campus Benito Juarez Road, New Delhi-110021
6.	**Name and address of the Deputy coordinator proposed for the programme:**	**Dr.Rajeev Kaul** Department of Microbiology University of Delhi South Campus Benito Juarez Road, New Delhi-110021

7. **The Thrust Area(s) of research to be undertaken under the SAP programme**.

Development of molecular strategies for taming the microbes.

8. **Faculty in the department**

Name of the post	Approved strength	In position
Professor	2	2+3*
Associate Professor	3**	1
Assistant Professor	6***	3

* Three positions are upgraded (one Associate and two Assistant Professor)
** One position has been upgraded to Professor and one is vacant
*** Two have been upgraded to Professor and one is vacant

List of faculty members giving Name, Designation, Qualifications, Specialization and number of publications (international & national level) during last 5 years

Name (alphabetical order)	Designation	Qualification	Specialization	Number of publications (last 5 years)
Prof. J.S.Virdi	Professor	M.Sc., Ph.D.	*Microbial Pathogenicity, Water-borne Pathogens*	13
Prof. T. Satyanarayana	Professor	M.Sc., Ph.D.	*Industrial and Environmental Microbiology*	38
Prof. Rani Gupta	Professor & Head	M.Sc., Ph.D.	*Microbial Physiology and Biochemistry, Industrial Microbiology*	16
Prof. R.C. Kuhad	Professor	M.Sc., Ph.D.	*Environmental, Industrial and Food Microbiology*	42
Prof. R.K. Saxena	Professor	M.Sc., Ph.D.	*Microbial Physiology and Regulation, Industrial Microbiology, Microbial,Genetics*	32
Dr. Swati Saha	Associate Professor	M.Sc., Ph.D.	*Microbial Genetics and Recombinant DNA Technology*	3
Dr. Amita Gupta	Assistant Professor	M.Sc., Ph.D.	*Recombinant DNA Technology, Immunoproteomics*	4
Dr. Rajeev Kaul	Assistant Professor	M.V.Sc., Ph.D.	*Virus Pathogenesis*	17
Dr.Yogender Khasa	Assistant Professor	M.Sc., Ph.D.	*Gene Expression, Bioprocess Engineering*	15

Publications (during last five years)

Total publications – 180

List of publications

1. Bhagat N and Virdi JS. The enigma of Yersinia enterocolitica biovar 1A. Critical *Reviews in Microbiology* 37: 25-39, (2010).
2. Mallik S and Virdi JS. Genetic relationships between clinical and non-clinical strains of *Yersinia enterocolitica* biovar 1A as revealed by multilocus enzyme electrophoresis and multilocus restriction typing. *BMC Microbiology* 10:158, (2010).
3. Mallik S and Virdi JS. Whole cell protein profiling reiterate phylogenetic relationships among strains of *Yersinia enterocolitica* biovar 1A as discerned earlier by different genotyping methods. *J Applied Microbiology* 109:946-952, (2010).
4. Bhagat N and Virdi JS. Molecular and biochemical characterization of urease and survival of *Yersinia enterocolitica* biovar 1A in acidic pH *in vitro. BMC Microbiology*, 9: 262, (2009).
5. Gulati PS, and Virdi JS. Multilocus-variable number tandem repeat analysis (MLVA) as a tool to study genetic diversity of *Yersinia enterocolitica* biovar 1A. *J Applied Microbiology*, 107:875-884, (2009).
6. Mittal S, Mallik S, Sharma S and Virdi JS. Characteristics of β-lactamases and their genes (*bla* A and *bla* B) in *Yersinia intermedia* and *Y. frederiksenii*. *BMC Microbiology*, 7: 25, (2007).
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8. Bhagat N and Virdi JS. Distribution of virulence-associated genes in strains of *Yersinia enterocolitica* biovar 1A correlate with clonal groups and not the source of *isolation FEMS Microbiology Letters* 266: 177-186, (2007).
9. Sharma S, Mittal S, Mallik S and Virdi JS Molecular characterization of beta-lactamase genes *bla*A and *bla*B of *Yersinia enterocolitica* biovar 1A. *FEMS Microbiology Letters* 257: 319–327, (2006).
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12. Singh I and Virdi JS. Production of *Yersinia* stable toxin (YST) and distribution of *Yst* genes in biotype 1A strains of *Yersinia enterocolitica*. *J. Medical Microbiology*, 53: 1065-1068, (2004).

13. Sharma S, Ramnani P and Virdi JS. Detection and assay of β–lactamases in clinical and non-clinical strains of *Yersinia enterocolitica* biovar 1A. *J. Antimicrobial Chemotherapy*, 54:401-405, (2004).

14. Singh, B., Kunze, G. and Satyanarayana, T. Developments in biochemical aspects and biotechnological applications of microbial phytases. Biotechnology and Molecular Biology Reviews 6: 69-87, 2011.

15. Singh, B. and Satyanarayana, T. Phytases from thermophilic moulds: Their production, characteristics and multifarious applications. Proc. Biochem.(In Press), 2011.

16. Verma, D. and Satyanarayana, T. An improved protocol for DNA extraction from alkaline soil and sediment samples for constructing metagenomic libraries. Appl. Biochem. Biotechnol. (In Press), 2011.

17. Archana, A. and Satyanarayana, T. Optimization of medium components and cultural variables for enhanced production of acidic high maltose-forming and Ca2+-independent α-amylase 5 by *Bacillus acidicola*. J. Biosc. Bioeng. 111: 550-553, 2011.

18. Yadav, R., Satyanarayana, T. Kotwal, S. and Rayalu, S. Enhanced carbonation reaction using chitosan-based carbonic anhydrase nanoparticles. Curr. Sci. 100: 520 – 524, 2011.

19. Vohra, A., Kaur, P. and Satyanarayana, T. Production, characteristics and applications of the cell-bound phytase of *Pichia anomala*. Antonie van J. Microbiol. 99: 51-55, 2011.

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22. Sharma, A. S. and Satyanarayana, T. High maltose-forming, Ca^{2+}-independent and acid stable α-amylase from a novel acidophilic bacterium *Bacillus acidicola* TSAS1. Biotech Lett. 32: 1503 – 1507, 2010.

23. Kaur, P. and Satyanarayana, T. Improvement in cell-bound phytase activity of *Pichia anomala* by permeabilization and applicability of permeabilized cells in soymilk dephytinization. J. Appl. Microbiol. 108: 2041 – 2049, 2010.

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28. Uma Maheswar Rao, J.L. and Satyanarayana, T. Hyperthermostable, Ca^{2+}-independent and high maltose-forming α–amylase of an extreme thermophile *Geobacillus thermoleovorans*: Cultivation under aerobic and anaerobic conditions and production of enzymes by free and immobilized cells. Applied Biochemistry and Biotechnology 159:464–477, 2009.

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32. Singh, B. and Satyanarayana, T. Phytase production by *Sporotrichum thermophile* in a cost-effective cane molasses medium in submerged fermentation and its application in bread. J. Appl. Microbiol. 105: 1858-1865, 2008.

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48. Singh, B. and Satyanarayana, T. Phytase production by a thermophilic mould *Sporotrichum thermophile* in solid-state fermentation and its application in dephytinization of sesame oil cake. Applied Biochem. Biotechnol. 133 (3): 239-250, 2006.

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53. Rajput R., Sharma R. and Gupta R, Biochemical Characterization of a Thiol-Activated, Oxidation Stable Keratinase from *Bacillus pumilus* KS12. Enzyme Research, 132148, (2010)
54. Sharma R and Gupta R, Extracellular expression of keratinase Ker P from *Pseudomonas aeruginosa* in *E. coli* Biotechnol Lett. DOI 10.1007/s10529-010-0361, (2010)
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9(a). Students intake and pass out in the Department during last 5 years.

Name of the course	**Intake**	**Average no. of students passing out per year**	**Major areas of placement of students**
Post graduate degree **M.Sc.**	*24 students (12 in Part I and 12 in Part II) every year	All	Most of them join for Ph.D. in the national institutes of reputation such as NII, IISc., ICGEB, NCCS and various universities including Delhi University etc. A few go abroad to pursue higher education.
Research degree **i. M. Phil** **ii. Ph. D.**	One student Department at any given time has 25--30 Ph.D. students with annual intake of 5-6 students.	One 5-6 students pass out every year	Many of them go abroad for postdoctoral positions. Some join for teaching assignments at various colleges. A few of them get jobs in industry or elsewhere.

(b) Research and Collaborative projects completed during last 5 years.

National level organization/ agencies		**International level organization/ agencies**	
No. of projects	Amount (Rs. in lacs)	No. of projects	Amount (Rs. in lacs)
14 Completed 14 Ongoing	Rs. 491 lacs (Completed) Rs. 551 lacs (Ongoing)	-	-

10(a) Awards received by the faculty during last 5 years.

Name of the Award	Number of awards	Name of awardee
2010, Senior Innovative Young Biotechnologist Award (Senior-IYBA) by Department of Biotechnology, Ministry of Science and Technology, Govt. of India.	Three	Dr.Amita Gupta

2007, Indian National Science Academy (INSA) Young Scientist Award in the field of Medical Sciences for the year 2006. 2006, Innovative Young Biotechnologist Award (IYBA) 2005 by Department of Biotechnology, Ministry of Science and Technology, Govt. of India.		
Y.S Narayanarao Oration Award for research in Microbiology. Awarded by Indian Council of Medical Research (ICMR).	One	Prof.J.S.Virdi
Dr. V.S. Agnihotrudu memorial award of the Mycological Society of India in 2009 for distinguished contributions to mycology.	One	Prof.T.Satyanarayana
Best Poster Prize from Danisco, Genencore in field of "Mirobes inFood and Fermentation" during the 50th Annual Conference of the Association of Microbiologists of India, held at NCL, Pune, India Best Poster Prize from The American Society for Microbiology during the 51st Annual Conference of the Association of Microbiologists of India, held at Birla Institute of , Technology, Ranchi, India	Two	Prof.R.C.Kohad

(b) Fellows of professional bodies / academies

Prof.T.Satyanarayana is fellow of NAAS, AMI, BRSI and MSI

11. Details of Collaborative Programme (Teaching, Research and extension activities).

(1). Prof.J.S.Virdi

Teaching

(a) Intra and Inter Department:

- Interdisciplinary courses on Immunology and Microbial Pathogenicity to students of other departments *viz*. Plant Molecular Biology & Biotechnology, Biochemistry & Genetics.

- Course on General Virology to students of Biomedical Sciences at Ambedkar Centre for Biomedical Research (ACBR), University of Delhi.
- Course on "Pathogens in the Environment" to students of Environmental Biology, University of Delhi

(b) National organizations**:**

- Course on Immunology & Food-borne Pathogens at Jiwaji University (Gwalior).
- Course on Immunology at Barkatullah University (Bhopal).
- Course on Environmental Pathogens at Indian Agricultural Research Institute (New Delhi).

(c) Non-Government organizations : None
(d) International organizations : None
(e) Other Institutions : None

Research:

(a) Intra and Inter Department:

- Intra departmental collaborative project (Professors. T. Satyanarayana, J.S.Virdi and R.C. Kuhad) on Gram positive aerobic bacteria (*Bacillus*, *Streptomyces* and *Lactobacillus*) funded by Ministry of Environment and Forests.
- Inter departmental collaborative project on Environmental Lactic Acid Bacteria (LAB) with Department of Genetics (Prof. Sheela Srivastava) funded by CSIR.
- Intra departmental collaborative Project (Professors T.R.Rao, J.S.Virdi and R.C. Kuhad) on reducing load of water-borne pathogens by the use of zooplanktons with Department of Zoology funded by Ministry of Environment and Forests.
- Intra departmental collaborative Project (Professors K.S.Rao, J.S.Virdi, Neeta Sehgal and others) on Anthropogenic parameters affecting the river Yamuna ecosystem with Department of Zoology, Botany, Geology and others funded by DST-DU-PURSE programme.

(b) National organizations:

- All India coordinated project on Bacterial Taxonomy (AICOPTAX) funded by Ministry of Environment and Forests.
- Proteomic analysis of arsenite-mediated multiple antibiotic resistance in *Yersinia enterocolitica* with Dr. Atul Johri, School of Life Sciences, JNU, New Delhi.

(c) Non-Government organizations : None

(c) International organizations :

- Helmholtz Centre for Infection Research (HZI) (Prof Chhatwal G. Singh) and Technical University of Braunschweig (Prof. Petra Dersch), Germany, on Mechanism of arsenite-mediated multiple antibiotic resistance in *Yersinia enterocolitica* under DST-DAAD Fellowship programme.

(e) Other Institutions : None

(2). Prof. T.Satyanarayana

Teaching:

(a) Intra Department:	With Prof. Kuhad and Dr. Yogender Khasa (Industrial and Food Microbiology) With Prof. R.C. Kuhad (Environmental Microbiology) With Prof. Rani Gupta (Eukaryotic and Prokaryotic microbes) With Prof. J.S. Virdi / Dr. Amita Gupta (Virology) With all colleagues (Introductory Microbiology for Biochemistry students)
Inter Department:	With Prof. Sheela Srivastava (Microbial genetics and biotechnology)

(3). Prof.Rani Gupta

Research activities
(a) Intra and Inter Department: DU DST PURSE programme with Department of Genetics
(b) National organizations: ICGEB, IIT D, NBRC, Poultry Directorate of Hyderabad

(4.). Prof.R.C.Kohad

a. Intra and inter department	NA
b. National organizations:	* Project entitled "Microbial production of biotech feed by solid state fermentation and recombinant DNA technology" in collaboration with IIT Delhi ** Project entitled "Production of bioethanol from lignocellulosic biomass" in collaboration with IICT Hyderabad, OU Hyderabad, IIT Delhi *** Project entitled "Bioconversion of cellulosics into sugars and ethanol" in collaboration with NCL Pune, RRL Trivendrum, IICB Kolkata
c. Non-governement organization	Project entitled "Microbial production of biotech feed by solid state fermentation and recombinant DNA technology" in collaboration with Ayurvet Pvt. Ltd. Project entitled **"**Evaluation of xylanase and laccase at pilot and mill scale in pulp and paper industry in collaboration with Jay biozyme Technologies, Pune, and CPPRI, Saharanpur.

Project entitled **"**Process development and application of pectinase for retting of plant fibres" in collaboration with Jay biozyme Technologies, Pune.

d. International organization NA
e. Other institutions NA

(5). Dr.Swati Saha

(a) Intra and Inter Department Teaching
Teaching (Intra-department): Recombinant DNA Technology
Microbial Genetics
Teaching (Inter- department): Recombinant DNA Technology

(6). Dr.Rajeev Kaul

(a) Intra and Inter Department Teaching
Teaching (Intra-department): Virlogy
Molecular Biology
Teaching (Inter- department): Virology

12. Details of seminars, conferences etc. organized during last 5 years:

	National		International	
	Organized	Participated/ Attended	Organized	Participated
Conferences / symposium		35		6
Seminar	>100	>100		
Workshop				
Summer Institutes				
Refresher Courses				

13. Details of the Seminars / Conferences attended by the faculty during last 5 years

Amita Gupta

- Presentation at International TB symposium at ICGEB, New Delhi (2009)
- Presentation at Gordon Research Conference on Tuberculosis Drug Development at Oxford, UK (2007)

J.S.Virdi

- Seminar on Intellectual Property – Generation and Protection, Maharishi Dayanand University (Rohtak) May 2011.
- MICROCON - 2011, Panjab University, Chandigarh, Jan 2011.
- Annual Conf. of the Soc. of Biological Chemists of India (SBCI), Indian Institute of Science, Bangalore, Dec 2010.
- National Conference on Medical Biotechnology – Vision 2020. Maharishi Dayanand University (Rohtak) Apr, 2010.
- Indo-German workshop on Molecular Epidemiology of Infectious Diseases, University of Hyderabad, Nov 2008.
- 49th Annual Conf. of Assoc of Microbiologists of India (AMI), University of Delhi, Delhi, Nov 2008.
- Rashtriya Vigyan Sangoshti, Institute of Genomics and Integrative Biology (IGIB), Apr 2008.

Rani Gupta

- Presentation on "Purification and Kinetic comparison of three forms of γ-glutamyl transpeptidase isolated from fermentation broth of *Bacillus licheniformis* ER-15" in International conference on "108th Annual conference of American Society of Microbiology" held at Boston, USA. June 1st -5th, 2008.
- Presentation on "Cloning and Expression of Subtilisin stable γ-glutamyl transpeptidase" National conference on "49th Annual AMI Conference" held at New Delhi, India. November 18th-20th, 2008.
- Presentation on "Keratinase from *Pseudomonas aeruginosa* KS-1 structural and biochemical basis of feather degradation" National conference on "49th Annual AMI Conference" held at New Delhi, India. November 18th-20th, 2008.
- Presentation on "Lipase from *Burkholderia multivorance*: Biochemical characterization and gene sequence analysis" in International conference on "Applied and Environmental Microbiology" held at Connecticut, USA. July 24th-29, 2005.
- Presentation on "Cloning of an alkaline keratinase from *Bacillus licheniformis* RG1 and its expression in E.coli" in International conference on "Applied and Environmental Microbiology" held at Connecticut, USA. July 24th- 29, 2005.
- Presentation on "Enzymatic fat splitting of mustard oil for extraction of major fatty acids" in conference on " Resource development and marketing issues in rapeseed-mustard" held at National Institute of agricultural marketing (NIAM), Jaipur, Rajasthan. March 28th- 29, 2005
- Attended and was also a part of organizing committee of International conference on "Microbial diversity: Current perspectives and potential applications" held at Department of Microbiology, University of Delhi South Campus, New Delhi. , 2005

R.C.Kohad

- One day colloquium on Microbial Technology for Human Benefits at M.D. University, Rohtak
- One day colloquium on Prospects of Biotechnology at DCRUST, Murthal
- One day colloquium on Lignocellulose Biotechnology at UDSC, New Delhi

- 47th Annual International conference of Association of Microbiologists of India, Bhopal, India
- 48th Annual International conference of Association of Microbiologists of India, Chennai, India.
- 49th Annual International conference of Association of Microbiologists of India, Delhi, India.
- 50th Annual International conference of Association of Microbiologists of India, Pune, India.
- 51st Annual International conference of Association of Microbiologists of India, Ranchi, India.
- 3rd International conference on Environmental, industrial and applied microbiology at Lisbon, Portugal.

Swati Saha

- AMI, New Delhi (2009)
- French-Indian inter-academic symposium on infectious diseases (2010)
- SBCI, Bangalore (2010)

Rajeev Kaul

- Rajeev Kaul. Role of Epstein Barr Virus latent antigen in cancer metastasis. Invited lecture at Molecular Virology Meeting in IISc Bangalore, India. Apr 2011.
- Rajeev Kaul. EBV latent antigen in cancer. Guest Lecture at Indian Veterinary Research Institute, Mukteswar Campus, Nainital, India, Mar 2011.
- Rajeev Kaul. Molecular biology of virus mediated cancer. Invited lecture in SAP meeting at Department of Biochemistry, University of Delhi South Campus. New Delhi, India, Mar 2011.
- Rajeev Kaul, Masanao Murakami and Erle S Robertson. Modulation of Necdin functions by EBV latent antigen EBNa3C. 34th Annual International Herpesvirus Workshop, Ithaca, USA, July 2009
- Rajeev Kaul and Erle S Robertson. Induction of inflammation mediator Cycloxygenase-2 leads to lytic reactivation of Epstein Barr Virus in latently infected cells. Poster in 33rd Annual International Herpesvirus Workshop, Estoril, Portugal, July 2008
- Rajeev Kaul and Erle S Robertson. EBV latent antigen EBNA3C and suppressor of metastasis Nm23H1 modulates Necdin regulated functions. Presented in Tumor Virology Meeting, University of Pennsylvania Abramson Cancer Center, Philadelphia, USA. June 27 2008.
- Rajeev Kaul and Erle S Robertson. COX-2 and EBV life cycle. Presented in Tumor Virology program meeting of Abramson cancer center, University of Pennsylvania, Philadelphia, USA. Sep 2007
- Rajeev Kaul, Subhash C Verma and Erle S. Robetson. Proteomics studies on KSHV Latency associated nuclear antigen protein. The Eunice and Irving Leopold Annual

Scientific Symposium and Retreat (University of Pennsylvania Abramson Cancer Center, Philadelphia, USA) March 2007

- Rajeev Kaul and Erle S Robertson. EBV nuclear antigens promote metastasis in mice and can overcome effect of metastasis suppressor Nm23-H1. Presented in Tumor Virology program Meeting, University of Pennsylvania Abramson Cancer Center, Philadelphia, USA. Sep 2006.
- Rajeev Kaul, Masanao Murakami, Tathagata Choudhuri, and Erle S. Robetson. Develop an in vivo animal model for evaluating the role of EBNA proteins and the Nm23H1 on the ability of cell lines to metastasize in mice. Twelfth International Symposium on EBV and Associated Diseases, Boston, USA. July 8-12th, 2006
- Rajeev Kaul, Masanao Murakami, Tathagata Choudhuri, and Erle S. Robetson. EBV nuclear antigens promote metastasis in mice and can overcome effect of metastasis suppressor Nm23-H1. The Eunice and Irving Leopold Annual Scientific Symposium and Retreat (University of Pennsylvania Abramson Cancer Center, Philadelphia, USA) March 2006

14. Any financial assistance received / generated by the Department from other sources during the last 5 years

Year	Name of the funding agency (Indian/ international	Infrastructure	Equipment	Maintenance	Staff	Total
2003--08	Department of Science and Technology (FIST)	Rs.6.5 lacs	Rs.25 lacs	Rs.4.5 lacs		Rs.36 lacs

15(a). Is there a departmental library? (No)
(b) If yes, total no. of books.
(c) Total no. of journals (Indian/Foreign) subscribed annually.

16(a). When the syllabus for different courses in the department were last restructured / revised:

Course year of revision:
U.G.
P.G. M.Phil.

The department revised the B.Sc. (Hons) Microbiology syllabus in 2009. The M.Sc. syllabus was also revised in 2009. Since the University has opted for a semester course, the department has reorganized the syllabus and the examination scheme for M.Sc. and it has been implemented from the academic session of 2009 onwards.

The M.Phil. course in Biotechnology is jointly run by the Departments of Microbiology, Genetics, Biochemistry and Biophysics wherein the students can opt for courses from any of the departments. With the advent of semester system the requirements of theory papers and examination scheme for M.Phil. programme is also being reorganized.

(b) Up to what extent the curriculum reports published by the UGC utilized for courses in the department.

We heavily depend on the curriculum report published by the UGC for Biochemistry and ~75% of courses in our final syllabus are based on curriculum reports published by the UGC.

(c) What other initiatives at the departmental or individual level were taken in the last 5 years to improve teaching and research. Please give a short note.

The department runs an M.Sc. course for the last 25 years. The emphasis is laid down on the excellent training provided to the students. In addition to usual didactic lectures and practical work, several efforts are made to improve teaching and learning by M.Sc. / Ph.D. students such as:

1. Students as a part of their curriculum deliver seminars on the important scientific topics. These seminars comprise two papers for their annual exams, which are evaluated by combined faculty.
2. Students in the final year are required to work on individual research projects under the supervision of different faculties.
3. Students are encouraged to attend national and international conferences to expose them to scientists from various national and international institutions and provide them opportunity to learn the latest in science and to interact with established scientific community.
4. The department regularly organizes seminars by national and international researchers to expose the students to a repertoire of scientific areas and scientific methodology.
5. Scientists from various Indian and international institutions are invited to give the students extended lectures on special topics and hands on practical training.
6. The departmental faculty also presents seminars on their work to make students aware about the research work being carried out in the department by various faculties.
7. Although summer training is not part of the curriculum, students are encouraged to have summer training in other institutions during summer vacation. The faculty members help the students in making these arrangements.

With regard to research, the faculty members continuously strive to improve the research culture and methodology. The faculty members have national as well as international collaborations to leverage the scientific advantage and develop mutually beneficial scientific interactions. Besides, the faculty members attend national and international conferences to create opportunities to learn about new developments and have personal interactions with the scientific community.

17. Whether University will provide academic and financial autonomy to the Department if selected under SAP.

Yes

18. Details of yearwise plan (up to 5 yrs) of work proposed to be done in the major thrust areas.

Dr.Rajeev Kaul

The major focus my group is to study molecular pathogenesis of viral infections associated with cancer. We study Epstein barr virus (EBV) and Hepatitis C virus (HCV) as models to investigate viral causes of cancers.

Epstein Barr virus: Understanding regulation of the switch between latency and lytic replication is a central problem in herpes virology. Lytic reactivation is a critical step in virus life cycle and is important for virus dissemination to new hosts and infection of new cells. We hypothesize that COX-2 mediated pathway play a critical role in regulation of EBV life cycle and EBV mediated malignancies. We plan to study the role of inflammation in life cycle of EBV and how these interaction lead to propagation of its infection and ultimately to the development of an environment of transformation. We will address the mechanism by which modulator of inflammation COX-2 can regulate EBV latency by studying the effect of COX-2 on EBV immediate-early lytic genes BZLF1, BRLF1. We will also investigate the role of COX-2 downstream effector molecules PGE2 and EP cell surface receptors.

Hepatitis C virus: HCV causes an infectious disease affecting the liver which is often asymptomatic, but once established, chronic infection can progress to scarring of the liver (fibrosis), and advanced scarring (cirrhosis) which is generally apparent after many years. We hypothesize that Cox-2 is one of the HCV triggered pathogenic factors with key roles in inflammation, neo-angiogenesis, cell proliferation, and invasion associated with the HCC lesions. We will elucidate the HCV proteins which modulate Cox-2 expression by transcriptional regulation and protein stabilization. We will identify the transcription factors and signaling pathways which play role in modulation of Cox-2 expression by HCV proteins. We will investigate the effect of HCV modulation of Cox-2 expression on downstream targets. This will help us understand HCV pathogenesis and its role in hepatocellular carcinoma (HCC) tumorigenesis. We will use standard molecular biology tools to clone HCV genes and generate their mutants. The Cox-2 regulation studies will be carried out by reporter assays and ubiquitination assays. Mutants of Cox-2 promoter region will be used to identify transcriptional factors and signaling pathways involved in regulation. The functioinal significance of Cox-2 regulation by HCV proteins will be investigated by assaying downstream targets of Cox-2 and cellular phenotype indicator for tumorigenicity and metastasis. This central theme of this project is to elucidate the role of mediator of inflammation Cox-2 in HCV pathogenesis. Understanding the mechanisms governing the modulation of inflammatory molecules by HCV proteins will contribute to understanding of HCV's role in hepatocellular carcinoma. This study is an attempt to investigate a direct link between chronic inflammation characterized by upregulated Cox-2 levels and progression of HCV associated hepatic cancer. The identification of cellular pathways critical for this regulation will also help devise novel strategies for therapeutic intervention in such patients. In subsequent studies, the role of Cox-2 in HCV life cycle, its persistence and survival in the host will be investigated.

Dr.Swati Saha

Our laboratory has two main research focuses- DNA replication and chromatin modifications. We study these events in the protozoan parasite and causative agent of kala-azar Leishmania donovani.

DNA replication: Events leading to origin firing and fork elongation in eukaryotes involve several proteins which are mostly conserved across the various eukaryotic species. Nuclear DNA replication in trypanosomatids like Leishmania has thus far remained a largely uninvestigated area. While several eukaryotic replication protein orthologs have been annotated, many are missing, suggesting that novel replication mechanisms may apply in this group of organisms. The long term aim of our laboratory's research is to identify any novel proteins involved in DNA replication in Leishmania as they may be potential sites of therapeutic intervention.

Chromatin modifications: Post-translational modifications of histones (PTMs) modulate various cellular processes such as transcriptional activation of genes, replication and DNA repair. Over 60 different residues on histones have been detected to have post-translational modifications. While the best characterized histone modifications are acetylations, methylations, and phosphorylations, ubiquitylations and sumoylations of lysine residues have also been reported. Higher eukaryotes have a great number of histone modifying enzymes with a fair amount of functional redundancy. Therefore, analyzing the impact of an individual histone modification becomes more complicated. The relative simplicity of Leishmania in terms of histone modifying enzymes annotated in the genome suggests that it may prove to be a suitable system for studying the effects of individual histone PTMs. Our lab will focus on histone acetylation events over the next few years. The effect of individual histone acetylation events on the regulation of replication and transcription will be analyzed.

Prof.R.C.Kohad

For the next five years, laboratory will be concentrating on various approaches to economize the ethanol production from second generation feedstocks. Moreover similar emphasis will also be given for the development of hyper cellulase and laccase producing recombinants. The laboratory also have planned to produce enzymes from the native and the recombinant enzymes at industrial level and to exploit them in various industrial applications. We have also planned to develop solid state fermentation (SSF) process for bioconversion of wheat straw into animal feed at pilot/commercial scale. Moreover, research will also be focused on evaluation of pectinase in retting of plant fiber at pilot scale and evaluation of xylanase in bleaching of paper pulp at pilot and mill scale. In addition, research will also be conducted to explore the unculturable microbes for various lignocellulolytic enzymes using metagenomic approaches.

Prof.Rani Gupta

We have discovered a novel peptide that interacts with subtilisin-like proteases and increases their robustness by making them bi-catalytic by recruiting an additional di-sulphide reductase activity on them, thereby making it able to act on Proteinase K resistant proteins. Preliminary results show that this subtilisin-peptide combination is able to degrade yeast surrogate prion protein Sup35NM

as well as Alzheimer beta amyloid and CJD fixed tissues. The peptide is also able to destabilize the substrate and is a putative Beta sheet breaker peptide. Taking these preliminary leads ahead we shall mechanistically analyse the di-sulphide reductase activity because of the peptide as well as the beta sheet breaking properties of the peptide alone by combining *in silico* analysis with wet lab studies. The application of this peptide will be further worked out on decreasing the amyloid load both in vitro and in vivo using amyloid specific cell lines and in transgenic animal mouse models in collaboration with National Brain Research Center, Manesar and Case Western Reserve University, Cleveland (Ohio).

Gamma glutamyl transpeptidase (GGT) is a conserved enzyme of the glutathione metabolism pathway and is implicated in maintenance of redox balance in the cell. We wish to study GGT from this physiological perspective of maintenance of redox state in *ggt*$^{-}$ knocked out *E.coli* strains and this study will also be integrated with understanding the beta-amyloid aggregation-deaggregation in the non-mendelian inheritance model of [PSI^{+}] in *Saccharomyces cereviciae.*

Apart from this, as a part of our continuing research on industrially important enzymes, over-expression and genetic modification of existing lipases and keratinases will be another focus.

Prof. J.S.Virdi

2011: Suppression Subtractive Hybridization (SSH) between clinical and non-clinical strains of Yersinia enterocolitica isolated from India to identify genes specific to clinical strains especially those related to iron-acquisition and intraphagosomal survival.
2012: The interaction of two clonal groups of Yersinia enterocolitica with J774 macrophages in vitro and qualitative and quantitative release of selected pro-inflammatory and anti-inflammatory cytokines; changes in NF-κB by gel-shift assay.
2013: Comparative genomics of β-lactamase genes (blaA & blaB) including regulatory sequences of Yersinia enterocolitica and their correlation to MICs, to identify sequences responsible for high expression of β-lactamases. Validation of target sequences by cloning, site-directed mutagenesis and expression analysis.
2014: Detection and analysis of antibiotic resistance of enteric pathogens (Yersinia enterocolitica & E.coli) to newer β-lactams including carbapenems, fluoroquinolones and the macro ides like azithromycin and clarithromycin.
2015: Mechanisms underlying resistance to these antibiotics including the production of ESBLs and the types of resistance gene cassettes present on the integrons.

Prof. T. Satyanarayana

Year 1: - Diversity of carboxydotrophic bacteria and carbon monoxide dehydrogenase (CODH)
- Cloning and expression of α-amylase and amylopullulanase

Year 2: - Purification and characterization of bacterial CODH
- Cloning and expression of xylanase of Geobacillus thermoleovorans

Year 3: - Cloning and expression of phytase of Pichia anomala in Pichia pastoris
- Diversity of carboxydotrophic thermophilic bacteria of hot springs

Year 4: - Production, characterization of CODH of thermophilic bacteria
- Applications of CODH

Year 5: - Generation of xylooligosaccharides from agro-residues using xylanolytic enzymes
- Applicability of xylanases in pulp bleaching

19. Most essential and critical financial needs/facilities which will be required for successful implementation and to attain the objectives setforth. (This should be within the financial limit as per guidelines and according to the list of admissible items (Annexure II). X Plan priority wise list of equipment with estimated cost should be attached.

(Rupees in lacs)

Item	2011	2012	2013	2014	2015	Total
NonRecurring						
Equipments	30	-	-	-	-	30
Building maintenance/ extension of lab/ room upgradation	0.45	0.45	0.45	0.45	0.45	2.25
Recurring						
Chemicals/ consumables/ glassware's	4.5	4.5	4.5	4.5	4.5	22.5
Contingency/ working expenses	0.9	0.9	0.9	0.9	0.9	4.5
Seminars	-	-	1.10	-	1.15	2.25
Hiring services of technical/ industrial / secretarial	1.0	1.0	1.0	1.0	1.0	5.0
Advisory committee meetings	0.1	0.1	0.1	0.1	0.1	0.5
Equipment maintenance	1.6	1.6	1.6	1.6	1.6	8
Total	38.55	8.55	9.65	8.55	9.7	75.0

DETAILS OF EQUIPMENTS

Name of the equipment	Present cost	Brief justification
Tabletop Ultracentrifuge with multiple rotors, Beckmann Coulter	30 lacs	See below

Justification of equipment

Tabletop Ultracentrifuge: Our department is actively engaged in research on various aspects of Microbiology. The major thrust areas being microbial differentiation, production, purification and characterization of industrial enzymes, biofertilizers, fungal differentiation, lignocellulose biodegradation, metal recovery, bioremediation of soils contaminated with oil sludge, microbial diversity and emerging water-borne pathogens. In last few years, the department has recruited several new faculties who are now actively working to establish successful and productive research programs in field of infectious disease biology with a focus on studying microbial pathogenesis. The department seeks to promote these research programs which will help not only in understanding of host-microbial pathogen interaction and development of therapeutic approaches against these pathogens, but more importantly will greatly help our students to get hands on training in use of modern research techniques.

In this regard, we propose to acquire a high speed ultracentrifuge with ability to centrifuge samples at very high speed. The ultracentrifuge will be routinely used for cell fractionation studies to separate sub cellular components of microbes or host cell. This will help in studies involving identification of localization of microbe/ microbial proteins in different sub-cellular fractions. The ultracentrifuge will also be routinely used for preparation of highly pure plasmid DNA which is a basic ingredient as well as requirement of all molecular biology protocols. Most importantly, ultracentrifuge is absolutely required to purify and concentrate virus and virus fractions. We will use ultracentrifuge for purifying viruses for virological studies. Ultracentrifuge will also be used for concentration of recombinant lenti and retrovirus in virus based vector/ gene transfer/ siRNA systems which are latest and important tools to study cellular processes.

20. Annual/ Semester system in examination being followed. Credit system in examination being followed or not.

The University has already opted for the semester system. The various departments including ours are currently discussing the modus operandi for implementing this system. The department is implementing the semester system from the academic session beginning from 2009. The syllabus / examination system/ grading system concerning the semester system is under review / revision.

21. Major ongoing areas where linkages with industries have been established.

Prof.T.Satyanarayana

i. Development of process for the production of Asava and Arishta range of Ayurvedic tonics with Dabur Research Foundation.
ii. Utility of microbial enzymes in baking with Tushar Nutritive Industries, Sonepat.
iii. Applicability of xylanases in pulp bleaching with ABC Paper Mills, Saila Kurd, Punjab.

Prof.R.C.Kuhad

i. Microbial production of biotech feed by solid state fermentation and recombinant DNA technology in collaboration with Ayurvet Pvt. Ltd. Delhi
ii. Evaluation of xylanase and laccase at pilot and mill scale in pulp and paper industry in collaboration with Jay biozyme Technologies, Pune.
iii. Process development and application of pectinase for retting of plant fibres in collaboration with Jay biozyme Technologies, Pune.

22. Research and technology developed by the Department and output which has been used by user departments / organizations / industries in the form of patents, commercial application, fabrication of equipments / facilities, use for knowledge dissemination / development in teaching.

Prof. J.S.Virdi

i. Submitted Indian strains of *Yersinia enterocolitica* to WHO *Yersinia* Reference Laboratory, Pasteur Institute (Paris).

ii. Submitted Indian strains of *Yersinia enterocolitica* to Central Public Health Laboratory (Colindale), Public Health Laboratory Services (London).

iii. Submitted Indian strains of *Yersinia enterocolitica* to National Repository – Microbial Type Culture Collection (MTCC) & Gene Bank, Institute of Microbial Technology (Chandigarh).

iv. Submitted Indian strains to All India Coordinated Research Project (AICRP) on Animal Disease Monitoring and surveillance for validation of A-B ELISA kit for Bovine Brucellosis at Institute of Animal Health & Veterinary Biologicals, Bangalore.

v. Submitted cultures of *Yersinia enterocolitica* for DBT coordinated project for validation of kits for the development of food-borne pathogens.

vi. Submitted Gene sequences (>100) of Indian strains to NCBI databases.

Prof.Rani Gupta

i. Negotiations for the transfer of technology for the patent "A method for the detection of chemical adulterants in synthetic milk and ready to use kit of the detection of synthetic milk" (Application No. 218177(711/del/2004)) are in the final stages though NRDC

Prof.T.Satyanarayan

i. Ideal starch saccharification process using thermostable α-amylase, amylopullulanase and glucoamylase.
ii. Process for development of yeast phytase for application as poultry and fish feed supplement.
iii. Applicability of phytase and amylases in baking.
iv. Participated in developing B.Sc. and M.Sc. Microbiology syllabus of the University.
v. Helped in developing B.Sc. microbiology syllabus of NEHU, Shillong, Sikkim University, Gangtok, and B.Sc. and M.Sc. syllabus of ITM University, Gwalior.

23. Availability of infrastructural facilities for research:

(i) Physical

(ii) Academic and Research

The University of Delhi South Campus has several state of the art life science departments such as microbiology, biochemistry, genetics and plant molecular biology which work with a great deal of synergy. The Department of Microbiology has appropriate space for M.Sc. educational programme as well as for research laboratories for various faculties. The campusalso has an animal house. Moreover, the department has an excellent academic environment for research as substantiated by the publications listed in this application. It may be stated that the M.Sc. course run by the department is highly acclaimed.

23. Major equipment available and in use (costing more than Rs.2,50,000/) within Department and USIC, indicating actual cost and source of each item, year of purchase, whether in operation.

Equipment	Cost	Functional – Yes/No	Year of purchase
Spectrophotometer UV-1700	Rs.2.92 lacs	Yes	2005
-80 deep freezer	Rs4.08 lacs	Yes	2010
Ultrasonic Processor	Rs.2.78 lacs	Yes	2007
Autoclave Horizontal	Rs.6.18 lacs	Yes	2007
Fluorescent microscope	Rs. 7 lacs	Yes	2006
Milli Q System	Rs. 3.23 lacs	Yes	2002
Orbital incubator shaker	Rs.2.95 lacs	Yes	2004
FPLC	Rs.17.95 lacs	Yes	2003
Gel doc system	Rs. 7.09 lacs	No	2006
Refrigerated centrifuge	Rs.10.81 lacs	Yes	2006
Table top centrifuge sigma	Rs.3.17 lacs	Yes	2000
Shaker incubator	Rs.2.88 lacs	Yes	2006
Fermenter 5 liter	Rs.9.80 lacs	Yes	2004

(Prof.Rani Gupta)
Signature & Seal of the Head

Signature & Seal of the Head
of the Institution