

Curriculum vitae

Dr. UTTAM CHAND BANERJEE

Correspondence address

Professor and Head

Department of Pharmaceutical Technology (Biotechnology)

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Personal Details

Nationality : Indian
Date of birth : May 1, 1956
Sex : Male
Marital status : Married

Areas of interest: Biochemical Engineering and Biotechnology (Microbial Technology, Downstream Processing), Biocatalysis and Environmental biotechnology

Professional Details

Research Experience : 30 years
PhD Thesis Guided : Eighteen (Nine fellows are enrolled for PhD)
M.Tech/M Pharm Thesis : Sixty
M.Sc Thesis : Four

Academic Qualification

S.No	Institute/Place	Degree Awarded	Year	Award
1	Visva Bharati University, Shantineketan	B.Sc. (Chemistry Hons.)	1977	I st class
2	Jadavpur University, Kolkata	B.Tech (Biochemical Engineering)	1980	I st class
3	Indian Institute of Technology, Delhi	M.Tech (Biochemical Engineering and Biotechnology)	1982	I st class
4	Institution of Engineers, Kolkata	M.I.E. (Chemical Engineering)	1986	
5	Panjab University, Chandigarh	Ph.D. (Chemical Engineering and Technology)	1991	

Position and Employment

S. No.	Institution Place	Position	From (date)	To (date)
1	Department Pharmaceutical Technology (Biotechnology), National Institute of Pharmaceutical Education and Research, Sector 67, SAS Nagar- 160062, Punjab	Professor and Head	2003	Till date
2	Department of Biotechnology, National Institute of Pharmaceutical Education and Research, Sector 67, SAS Nagar- 160062, Punjab	Professor and Head	2000	2003
3	Institute of Microbial Technology, Chandigarh	Scientist EII	1997	2000
4	Institute of Microbial Technology, Chandigarh	Scientist E1	1990	1997
5	Institute of Microbial Technology, Chandigarh	Scientist C	1987	1990
6	Institute of Microbial Technology, Chandigarh	Scientist B	1984	1987

Honours, Awards and Fellowships

- 2008 awarded **Innocentive Challenge award** 5589410 - Bitterness in Food Products
- 2005 awarded **The Punjab Ratan Award** for the recognition of the distinguished services rendered by him to the people at large.

- 2002 awarded **The Shield for Process Technology by Council of Scientific and industrial Research, New Delhi** for developing an innovative environment friendly process technology for production of **natural streptokinase**, a life-saving thrombolytic drug, and its successful commercialization.
- 1994 awarded **CSIR Technology prize for Biological Sciences and Technology**, for developing a high osmotolerant, ethanol tolerant and genetically modified strain of *Saccharomyces cerevisiae* for the production of **alcohol from molasses**.
- 1992-93 awarded **Long-term** overseas fellowship for one year three months by the **Department of Biotechnology**, Government of India. June 1992-August 1993, and worked with **Prof. M. Moo-Young** at the Department of Chemical Engineering, University of Waterloo, Canada. Specialization **“Biochemical Engineering and Downstream Processing”**.
- 1977 awarded **“National Scholarship of India”**.

Conference organized

Indian Science Congress 2012

Sectional president of New Biology (Including Biochemistry, Biophysics & Molecular Biology and Biotechnology) section, 99th Indian Science Congress, held in Bhubaneswar, January 3 to 7, 2012.

ITECH/SCAPP Programme (Ministry of External Affairs)

Three weeks intensive workshop on “Development, Scale up and Production of Biopharmaceuticals” for three consecutive years (2004-2006) was held in NIPER. This workshop was sponsored by Ministry of External Affairs (TC Division) under the Indian Technical and Economic Cooperation (ITEC) and Special Commonwealth African Assistance Plan (SCAAP) Programs, Government of India.

List of PhD Students

1. Dr. Rajesh Saini, “Studies on the microbial degradation of triphenylmethane dyes”, 1998.
2. Dr. Wamik Azmi, “Biological treatment of textile & dye–stuff with a special emphasis on triphenylmethane dyes”, 1998.
3. Dr. T. T. A .A. Ghani, “Optimization of process parameter for the production of streptokinase by a novel isolate of *Streptococcus* species”, 2001. (Joint Guide)
4. Dr. Navneet Batra, “Optimization of process parameter for the conversion of lactose using thermostable β -galactosidase”, 2002. (Joint Guide)

5. Dr. Purva Vats, "Studies on myo-inositolhexakisphosphate degrading enzyme from a hyper-producing strain of *Aspergillus niger* van Teighem," 2003.
6. Dr. Anirban Banerjee, "Studies on the arylacetonitrilase from *Pseudomonas putida* and its application in the transformation of mandelonitrile to mandelic acid", 2005.
7. Dr. Sawraj Singh, "Studies on the microbial lipase-mediated enantiospecific hydrolysis of methoxyphenyl glycidic acid methyl ester (\pm)MPGM", 2006.
8. Dr. Pankaj Soni, "Studies on the microbial reduction of prochiral ketones to optically active hydroxy compounds", 2006.
9. Dr. M. S. Bhattacharyya, "Studies on the optimization of carbonyl reductase production by *Geotrichum candidum*: application in the synthesis of (S)-(-)-1-(1'-Naphthyl) ethanol from 1-acetonaphthone", 2006.
10. Dr. Harpreet Singh Rai, "Treatment of basic dye bath effluent in anaerobic reactor", 2006. (Joint Guide)
11. Dr. Praveen Kaul, "Reaction engineering aspects of nitrilase from *Alcaligenes faecalis* MT CC126", 2007.
12. Dr. Vineet Agrawal, "Cloning and Characterization of *AnigAP* from *Aspergillus niger* van Teighem MTCC F0101", 2009 (Joint Guide)
13. Dr. Himani Kansal, "Reaction engineering for improved biocatalytic reduction by *Candida viswanathii*", 2009.
14. Dr. Utpal Mohan "Molecular evolution studies using *Pseudomonas aeruginosa* lipase as a model enzyme" May 2009.
15. Dr. Monu Kumari Goyal "Effect of preservatives on the stability of lysozyme" Nov, 2010 (Joint Guide)
16. Dr. Ashwini L. Kamble "Studies on the free and immobilized whole cells of *Rhodococcus erythropolis* for the production of pharmaceutically important amides" Feb, 2011.
17. Dr. Amit Agarwal "Design, synthesis and biological evaluation of 6-aminopurine analogues as potential xanthine oxidase inhibitors" April 2011(Joint Guide).
18. Dr. Amit Singh "Enzymatic synthesis of 3-[5-(4-fluorophenyl)-5(S)-hydroxypentanoyl]-4(S)-4-phenyl-1,3-oxazolidin-2-one: an intermediate for antihyperlipidemic drug ezetimibe". August 2011

Visit Abroad

- **Visited Volketswill in Switzerland** for training in “The optimum utilization of Chemap fermenters” in 1984.
- **Visiting Research Assistant Professor** (June 1992 to Aug., 1993 at the Industrial Biotechnology Centre, Department of Chemical Engineering, University of Waterloo, Ontario, Canada N2L 3G1, with Prof. M. Moo Young.
- **Visited University of Warsaw, Poland** (Oct, 1998) Department of Chemical Engineering, Technical, under a collaborative programme (**Indo-Polish Programme**).
- **Visited Hague, Netherlands** (September 22 – 26th, 2002) for paper presentation “A novel detection technique for determining the nitrile hydrolysing activity using fluorimetry” at the international conference on “High Information Content Screening”, organized by **The Society for Bimolecular Screening**.
- **Visited Shanghai, China to chair a session** and for paper presentation (October 18, 2005) “Highly efficient stereoselective reduction of heteroaryl ketones by a new yeast strain *Candida viswanathii*” **International Symposium on Biocatalysis and Bioprocess Engineering (ISBBE)**.
- **Visited the Department of Chemical Sciences, Cagliari University, Italy for delivering an invited lecture**, Nov 12, 2006 “Role of Biotechnology in the enantioselective synthesis of bioactive compounds”.
- **Visited, Bryant University, Smithfield, Rhodes Island, USA**, 6-11th July, 2008 for attending the Gordon Research Conference and presented a paper on “Lipase catalyzed enantioselective resolution of (R,S)-1-chloro-3(3,4-difluorophenoxy)-2-propanol a key intermediate of drug Lubeluzole in ionic liquids”

Membership of Professional Societies

- **Vice President** Biotech Research Society of India (BRSI)
- **Life Fellow** Indian Institute of Chemical Engineers (LF-IChE)
- **Life Fellow** Society of Environmental Sciences (FSESc)
- **Life Member** National Academy of Sciences, India
- **Life Member** Institution of Engineers (India)
- **Life Member** Association of Microbiologist of India (AMI)
- **Life Member** Indian Science Congress Association
- **Life Member** Indian Pharmaceutical Association
- **Life Member** Society of Biological Chemists
- **Member** New York Academy of Science (NYAS)
- **Executive Member** Indian Association of Pharmaceutical Scientists and Technologists

Editorial committee members of National/ International Journals

1. **Editorial Board Member** of the Open Biotechnology Journal, Benthem Science Publishers Ltd.
2. **Editorial Board Member** of Patents in Biotechnology, Benthem Science Publishers Ltd.
3. **Editorial Board Member** of the Publication of Indian Association of Pharmaceutical Scientists & Technologists.
4. **Editorial Board Member** of International Journal of Biosciences and Technology.

Projects handled/ ongoing projects

S. No.	Title	Funding agency	Total cost
1	Biochemical Engineering Research and Process Development Center, a DBT supported National facility at the Institute of Microbial Technology, Chandigarh	Department of Biotechnology, Ministry of Science and Technology Government of India, New Delhi, 1984-2000	Rs. 10 crore
2	Production of chiral precursor (s)-1-(2-thienyl) ethanol or (s)-n,n-dimethyl-3-hydroxy-3-(2-thienyl)-propanamine through microbial reduction and their use in the synthesis of chiral drugs (+)-duloxetine	Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Govt of India, New Delhi, 2002	Rs.31 lakhs
3	Cloning and Expression of an Acid Phosphatase (PHYB) with High Phytase Activity in Yeast	Council of Scientific and Industrial Research, Govt. of India, New Delhi, 2002	Rs. 10 lakhs
4	Enantioselective synthesis of drugs and drug intermediates for using biotechnological route	Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Govt of India, New Delhi, 2002 onwards	Rs. 1 crore
5	Two years M. Tech. Programme in	Department of	Rs 1.25

	Pharmaceutical Biotechnology	Biotechnology, Ministry of Science and Technology Government of India, New Delhi, 2003	crore
6	Purification and characterization of lipase/s for the synthesis of biologically active and enantiomerically pure isomers obtained through enzymatic kinetic resolution of racemates.	Department of Science and Technology, New Delhi, 2003	Rs 15 lakhs
7	Use of nitrile hydratase for the synthesis of nicotinamide, a nutraceuticals, from 3-cyanopyridine: a biotechnological approach	Department of Biotechnology, Ministry of Science and Technology Government of India, New Delhi, 2005	Rs 24 lakhs
8	Chemoenzymatic synthesis of the new cholesterol-lowering agent ezetimibe (SCH 58235, 1-(4-fluorophenyl)-3-(R)-[3-(4-fluorophenyl)-3-(S)-hydroxypropyl]-4-(S)-(4-hydroxyphenyl) -2-azetidinone)	Department of Biotechnology, Ministry of Science and Technology Government of India, New Delhi, 2006	Rs 36 lakhs
9	Cloning and over expression of gene encoding and NADH-dependent carbonyl reductase from <i>Candida viswanathii</i> involved in stereoselective synthesis of chiral alcohols	Council of Scientific and Industrial Research, New Delhi, 2007	Rs 14 lakhs
10	Development of enantiomerically pure anti-stroke and non-steroidal anti-inflammatory (NSAID) drugs through enzymatic kinetic resolution	Indian Council of Medical Research, 2007	Rs 3.5 lakh
11	Enantioselective enzymatic synthesis of (S)-1-bromo-3-chloro- 2-propanol, an intermediate for the chiral drugs	Council of Scientific and Industrial Research, New Delhi, 2010	Rs. 20 Lakhs
12	Studies on anti-tumor and radioprotective potential of <i>Potentilla fulgens</i> Wall ex Hook. and characterization of its active compounds	Department of Biotechnology, Ministry of Science and Technology Government of India, New Delhi, 2011	Rs. 83 Lakhs

13	Biochemical Engineering and Bioprocess Technology Center at NIPER	Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, Govt of India, New Delhi, 2002	Rs. 3.02 crore
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List of Publications

1. Simultaneous stabilization and by-product generation from distillery waste using different methods of treatment, **U. C. Banerjee**, *Journal of Microbial Biotechnology*, 3(1), 64-73, 1988. IF-
2. Microbial transformation of rifamycin B: A new extracellular oxidase from *Curvularia lunata*, R.M. Vohra, **U. C. Banerjee**, S. Das and S. Dube, *Biotechnology Letters*, 11(12): 851-854, 1989. IMPACT FACTOR: 1.595 (2008)
3. Production of β -glycosidase (cellobiase) by *Curvularia* sp., **U. C. Banerjee**, *Letters in Applied Microbiology*, 10(5): 197-199, 1990. **Impact Factor**: 1.640
4. Effect of oral lead acetate administration on mouse brain, M.R. Bansal, Nidhi Kaushal and **U.C. Banerjee**, *Journal of Trace Elements in Experimental Medicine*, 3: 235-246, 1990.
5. The effect of pretreatment of lignocellulosics in microbial cellulase production, **U.C. Banerjee** and S.N. Mukhopadhyay, *Indian Chemical Engineer*, 32(4):43-46, 1990.
6. Evaluation of agro-residues and grass as carbon source for cellulase production, **U.C. Banerjee** and S.N. Mukhopadhyay, *Journal of Microbial Biotechnology*, 5(2): 19-24, 1990.
7. Production of laccase by *Curvularia* spp. **U.C. Banerjee** and R.M. Vohra, *Folia Microbiologica*, 36(4): 343-346, 1991. . **Factor**: 1.172
8. Production and properties of carboxymethylcellulase (Endo-1,4, β -D-glucanase) from *Curvularia lunata*, **U.C. Banerjee** and S. Chakrabarti, *World Journal Microbiology & Biotechnology*, 8: 423-424, 1992. **Impact Factor**: 0.945 (2008)
9. Immobilized β -glucosidase from *Curvularia lunata*, **U.C. Banerjee**, *Folia Microbiologica*, 37(4): 256-260, 1992. . impact **Factor**: 1.172
10. Biotransformation of rifamycins: Process possibilities, **U.C. Banerjee**, B. Saxena and Yusuf Chisti, *Biotechnology Advances*, 10: 577-595, 1992. **Impact Factor**: 8.250 (2010)
11. Effect of pH and glucose concentration on the production of rifamycin oxidase by *Curvularia lunata* in a batch reactor. **U.C. Banerjee** and J.P. Srivastava, *Journal of Biotechnology*, 28: 229-236, 1993. **Impact Factor**: 2.881
12. Transformation of rifamycin B with soluble rifamycin oxidase from *Curvularia lunata*, **U.C. Banerjee**. *Journal of Biotechnology*, 29:137-143, 1993. **Impact Factor**: 2.881
13. Effect of glucose and carboxymethylcellulose on growth and rifamycin oxidase production by *Curvularia lunata*, **U.C. Banerjee**, *Current Microbiology*, 26: 261-265, 1993. IMPACT FACTOR: 1.33 (2008)

14. Characterization of soluble rifamycin oxidase from *Curvularia lunata* var. *aeria*, **U.C. Banerjee**, *Letters in Applied Microbiology*, 17 :1-3, 1993. **Impact Factor:** 1.640
15. Studies on rifamycin oxidase immobilized on k-carrageenan gel, **U.C. Banerjee**, *Biomaterials, Artificial Cells and Immobilization Biotechnology*, 21(5): 665-674, 1993.
16. Spectrophotometric determination of mycelial biomass, **U. C Banerjee**, Yusuf Chisti and M. Moo-Young, *Biotechnology Techniques*, 7 (4): 313-316, 1993.
17. Transformation of rifamycin B with immobilized rifamycin oxidase of *Curvularia lunata*, **U.C. Banerjee**, *Biotechnology Techniques*, 7(5): 339-344, 1993.
18. Transformation of rifamycin B with growing and resting cells of *Curvularia lunata*, **U.C. Banerjee**, *Enzyme and Microbial Technology*, 15: 1037-1041, 1993. (**impact factor 2.37**).
19. Characterization of rifamycin oxidase immobilized in alginate gels, **U.C. Banerjee**, *Biomaterials, Artificial Cells and Immobilization Biotechnology*, 21(5): 675-683, 1993 .
20. Studies of rifamycin oxidase immobilized on agar gel, **U.C. Banerjee**, *Journal of General and Applied Microbiology*, 39:251-255, 1993.
21. Evaluation of different bio-kinetic parameters of *Curvularia lunata* at different environmental conditions, **U.C. Banerjee**, *Biotechnology Techniques*. 7(9): 635-638, 1993.
22. Effect of stirrer speed, aeration rate and cell concentration on volumetric oxygen transfer coefficient (K_La) in the cultivation of *Curvularia lunata* in a batch reactor, **U. C. Banerjee**, *Biotechnology Techniques* 7(10): 733-738, 1993.
23. A comparative study of the deactivation of β -glucosidase from *Curvularia lunata* immobilized on three matrices. **U.C. Banerjee** and P.R. Patnaik, *Indian Chemical Engineer*, 35 (1-2): 37-39, 1993.
24. Optimization of culture conditions for the production of rifamycin oxidase by *Curvularia lunata*. **U.C. Banerjee**, *World Journal of Microbiology and Biotechnology*, 10: 462-464, 1994. **Impact Factor:** 0.945 (2008)
25. Growth and production of rifamycin oxidase by *Curvularia lunata*, **U.C. Banerjee**, *Folia Microbiologica*, 39(1): 49-52, 1994. . **Factor:** 1.172
26. Disruption of recombinant yeast for the release of β -galactosidase, F. Garrido, **U.C. Banerjee**, Yusuf Chisti and M. Moo-Young, *Bioseparation*, 4: 319-328, 1994.
27. Protein enrichment of corn stover using *Neurospora sitophila*, **U.C. Banerjee**, Yusuf Chisti and M. Moo-Young, *Institute of Chemical Engineers Symposium* Series No. 137: 69-77, 1994.
28. Effect of substrate particle size and alkaline pretreatment on protein enrichment by *Neurospora sitophila*, **U.C. Banerjee**, Yusuf Chisti and M. Moo-Young, *Resources Conservation and Recycling*, 13: 139-146, 1995. **Impact Factor:** 1.987
29. Characterization of L-asparaginase from *Bacillus* sp. isolated from an intertidal marine alga (*Sargassum* sp.), B.R. Mohapatra, R.K. Sani and **U.C. Banerjee**, *Letters in Applied Microbiology*, 21: 380-383, 1995. **Impact Factor:** 1.640
30. Production of levanase by *Rhodotorula* sp. A. Chaudhary, L.K. Gupta, J.K. Gupta and **U. C. Banerjee**, *Folia Microbiologica*, 41(3): 353-356 1996. . **Factor:** 1.172

31. Purification and properties of levanase from *Rhodotorula* sp. Anita Chaudhary, L.K. Gupta, J.K. Gupta and U.C. Banerjee, *Journal of Biotechnology*, 46: 55-61, 1996. **Impact Factor: 2.881**
32. Extracellular amylase production by *Saccharomycopsis capsularis*, and its evaluation for starch saccharification, S.K. Soni, I.K. Sandu, K.S. Bath, U.C. Banerjee and P.R. Patnaik, *Folia Microbiologica*, 41(3): 243-248, 1996. . **Factor: 1.172**
33. A kinetic model for the enzymatic conversion of rifamycin B to rifamycin S by rifamycin oxidase from *Curvularia lunata* U.C. Banerjee and P.R. Patnaik, *Indian Chemical Engineer, Section A*, 38(1): 28-30, 1996.
34. Studies on slime forming organisms of a paper mill-slime production and its control, Anita Chaudhary, L.K. Gupta, J.K. Gupta and U.C. Banerjee, *Journal of Industrial Microbiology and Biotechnology*, 18: 348-352, 1997. **(impact factor 2)**.
35. Production and properties of L-asparaginase from the fungus *Mucor* sp. associated with a marine sponge (*Spirastrella* sp.) B.R. Mohapatra, M. Bapuji and U. C. Banerjee, *Cytobios*, 92: 165-173, 1997.
36. Biodegradation of Triphenylmethane Dyes, W. Azmi, R. Kumar Sani and U.C. Banerjee, *Enzyme and Microbial Technology*, 22: 185-191, 1998. **(Impact factor 2.37)**.
37. Levanases for control of slime in paper manufacture, A. Chaudhary, L.K. Gupta, J.K. Gupta and U.C. Banerjee, *Biotechnology Advances*, 16(5-6): 899-912, 1998. **(Impact Factor: 8.250)**
38. Comparison of static and shake culture in the decolorization of textile dyes and dye effluent by *Phanerochaete chrysosporium*, R.K.Sani, W. Azmi and U.C. Banerjee, *Folia Microbiologica*, 43(1): 85-88 1998. **(impact Factor: 1.172)**
39. Characterization of a fungal amylase from *Mucor* sp. associated with the marine sponge *Spirastrella* sp., B.R. Mohapatra, U.C. Banerjee and M. Bapuji, *Journal Biotechnology*, 60: 113-117, 1998.
40. Decolorization of acid green 20, a textile dyes, by white rot fungus, *Phanerochaete chrysosporium* in low cost medium, Rajesh K. Sani and U.C. Banerjee, *Advances in Environmental Research*, 2(4): 485-490, 1999. **(Impact factor 2.08)**.
41. Decolorization of triphenylmethane dyes and textile and dye-stuff effluents by *Kurthia* sp., R.K. Sani and U.C. Banerjee, *Enzyme and Microbial Technology*, 24: 433-437 1999. **(Impact factor 2.37)**.
42. Thermostable alkaline Protease from *Bacillus brevis* and its Characterization as a Laundry Detergent Additive, U.C. Banerjee, Rajesh K. Sani, Wamik Azmi and Raman Soni, *Process Biochemistry*, 35(1-2): 213-219, 1999. **(Impact factor 2.4)**.
43. Reduction of gentian violet to leucogentian violet by *Kurthia* sp. and assessment of toxicity, Rajesh K. Sani, Ravinder Singh Jolly and U.C. Banerjee, *Advances in Environmental Research*, 3(3): 368-377, 1999. **(Impact factor 2.08)**.
44. Characterisation and some reaction engineering aspects of thermostable extracellular β -galactosidase from a new *Bacillus* sp., R. K. Sani, S. Chakraborti, R. C. Sobti, P. R. Patnaik, and U. C. Banerjee, *Folia Microbiologica*, 44 (4): 367-371, 1999. **(impact Factor: 1.172)**
45. Screening for organisms applicable to the decolorization of triphenylmethane dyes and optimization of biotransformation conditions in stirred tank reactor, Rajesh Kumar Sani and U.C. Banerjee, *Indian Journal of Environment and Ecoplaning*, 2(1): 1-9, 1999.

46. Decolorization of Triphenylmethane dyes by the growing and resting cells of *Bacillus sp.*, Wamik Azmi and U.C.Banerjee, *Indian Journal of Environment and Ecoplaning*, 2(3): 241-246, 1999.
47. Purification and characterization of a novel β -galactosidase from *Bacillus sp.*MTCC3088, S. Chakraborti, R.K. Sani, U.C. Banerjee and R.C. Sobti, *Journal of Industrial Microbiology and Biotechnology*, 24: 58-63, 2000. **(Impact factor 2)**.
48. Production, purification and characterization of debittering enzyme naringinase, Munish Puri and U. C. Banerjee, *Biotechnology Advances*, 18: 207-217, 2000. **(Impact Factor: 8.250)**
49. Biological decolorization of crystal violet by a newly isolated *Bacillus sp.* and microbial assessment of toxicity of untreated and treated dye, W. Azmi and U.C. Banerjee, *Scientia Iranica*, 8(3): 171-178, 2001.
50. Microbial production of Drugs and Drug intermediates Rohit Sharma and U. C. Banerjee, *Current Research Information on Pharmaceutical Sciences*, 2(3), 2-9, 2001.
51. Production, purification, characterization and applications of lipases, Rohit Sharma, Y. Chisti, U.C. Banerjee, *Biotechnology Advances*, 19: 627-662, 2001. **(Impact Factor: 8.250)**
52. Studies on the production of phytase by a newly isolated strain of *Aspergillus niger* var teigham obtained from rotten wood-logs, Purva Vats and U. C. Banerjee, *Process Biochemistry*, 38: 211-217, 2002. **(Impact factor 2.4)**.
53. Production and characterization of a thermostable β -galactosidase from *Bacillus coagulans* RCS3, Navneet Batra, Jagtar Singh, U.C. Banerjee, P.R.Patnaik, Ranbir C. Sobti, *Biotechnology and Applied Biochemistry*, 36: 1-6, 2002. (Impact factor: 1.269)
54. *Botryococcus braunii*: A renewable source of hydrocarbons and other chemicals, Anirban Banerjee, Rohit Sharma, Yusuf Chisti, U.C.Banerjee. *Critical Reviews in Biotechnology*, 22(3): 245-279, 2002. **(Impact factor 4.46)**.
55. The nitrile degrading enzymes: current status and future prospects, A. Banerjee, R. Sharma, U.C. Banerjee, *Applied Microbiology and Biotechnology*, 60: 33-44, 2002. **(Impact factor 3)**.
56. Biotechnological applications of cyclodextrins. Mamata Singh, R. Sharma, U.C. Banerjee, *Biotechnology Advances*, 20: 341-359, 2002. **Impact Factor: 8.250**
57. Biological stabilization of textile and dye-stuff industrial waste, Wamik Azmi and U.C. Banerjee, *Indian Chemical Engineer, section B*, 44(4): 230-234, 2002.
58. A rapid and sensitive fluorometric assay method for the determination of nitrilase activity, A. Banerjee, R. Sharma, U.C. Banerjee, *Biotechnology and Applied Biochemistry*, 37: 289-293, 2003. Impact factor: 1.269
59. A high-throughput amenable colorimetric assay for enantioselective screening of nitrilase producing microorganisms using pH sensitive indicators, A. Banerjee, P. Kaul, R. Sharma, U.C. Banerjee, *Journal of Biomolecular Screening*, 8(5): 559-565, 2003. **(Impact factor 2.15)**.
60. Production and Partial Characterization of a Novel β -galactosidase from a Newly Isolated *Bacillus polymyxa.*, S.Charkraborti, R.K.Sani, D. K. Sahoo, U. C. Banerjee, R. C. Sobti. *Scientia Iranica*. 10 (3):279-286, 2003.
61. Microbial reduction of 1-acetonaphthone: a highly efficient process for multigram synthesis of S (-)-1-(1'-naphthyl) ethanol, A. Roy, M. S. Bhattyacharya, L. Ravi Kumar, H.P.S. Chawla and U.C.Banerjee, *Enzyme and Microbial Technology*, 33(5): 576-580, 2003. **(Impact factor 2.37)**.

62. Cyclodextrins: Emerging applications, Brajesh Barse, Praveen Kaul, A. Banerjee, C.L. Kaul and **U.C.Banerjee**, *Chimica oggi/Chemistry Today*, 19: 48-53, 2003.
63. Recombinant factor VIII for haemophilia an overview of production technologies, M.S. Bhattacharyya, Jaskrat Singh, Pankaj Soni, **U.C. Banerjee**, *Current Research Information on Pharmaceutical Sciences*, 4(3): 2-8, 2003.
64. Process optimization and scale-up of the *Bacillus thuringiensis* fermentation process for delta-endotoxin production. Khanna V, Marwaha S.S., **U.C.Banerjee**, *Asian Journal of Microbiology, Biotechnology and Environmental Sciences*, 5 (1):119-121, 2003.
65. Release of intracellular β -galactosidase of *Bacillus polymyxa* using high pressure homogenization in French Press, Purva Vats and **U.C.Banerjee**, *Indian Chemical Engineering section A*, 45(1): 43-45, 2003.
66. Comparative studies on the microbial adsorption of heavy metals, N. Goyal, S.C. Jain and **U.C. Banerjee**, *Advances in Environmental Research*, 7: 311-319, 2003. **(Impact factor 2.08)**.
67. Screening for enantioselective nitrilases: Kinetic Resolution of racemic mandelonitrile to (R)-(-)-Mandelic Acid by new bacterial isolates, P. Kaul, A. Banerjee, S Mayilraj, **U.C.Banerjee**, *Tetrahedron Asymmetry*, 15: 207-211, 2004. **(Impact factor 2.5)**.
68. Determination of gibberellins in fermentation broth produced by *Fusarium verticillioides* MTCC 156 by high-performance liquid chromatography tandem mass spectrometry, Rohit Sharma, Jitesh Iyer, A. K. Chakraborti, **U.C.Banerjee**, *Biotechnology and Applied Biochemistry*, 39: 83-88, 2004. (Impact factor: 1.269)
69. Streptokinase– a clinically useful thrombolytic agent. Anirban Banerjee, Yusuf Chisti, **U.C.Banerjee**, *Biotechnology Advances*, 22: 287-307, 2004. **(Impact Factor: 8.250)**
70. Production of phytase (myo-inositolhexakisphosphate phosphohydrolase) by *Aspergillus niger* van Teighem in laboratory scale fermenter, Purva Vats, D. K. Sahoo and **U.C.Banerjee**, *Biotechnology Progress*, 20(3): 737-743, 2004. **(Impact Factor 2.045)**
71. Production studies and catalytic properties of phytases (myo-inositolhexakisphosphate phosphohydrolases): An overview, Purva Vats and **U.C.Banerjee**, *Enzyme and Microbial Technology*, 35: 3–14, 2004. **(impact factor 2.37)**.
72. Opportunities for the pharmaceutical industry: key biotransformation technologies for the future, Praveen Kaul, Anirban Banerjee, **U.C.Banerjee**, *Drug Discovery World spring*, 80-86, 2004.
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Technologies Developed

I was heading the **National Facility of Biochemical Engineering Research and Process Development Centre** at **Institute of Microbial Technology, Chandigarh**. Four technologies were developed and transferred to the industries,

1. **Development of an innovative environment friendly process technology for production of natural streptokinase, a life-saving thrombolytic drug, and its successful commercialization.** This process was given to M/S Cadila Healthcare, Ahemdabad.
2. **Developing a high osmotolerant, ethanol tolerant and genetically modified strain of *Saccharomyces cerevisiae* for the production of alcohol from molasses.** This process was licensed to various distilleries in India through Vittal Malya Research foundation, Bangalore.
3. **Development of a Biotransformation process for conversion of rifamycin B to rifamycin S.** This process of enzymatic transformation of rifamycin B to rifamycin S was demonstrated and subsequently transferred to M/S Indian Drugs and Pharmaceutical Limited, Rishikesh and to M/S Lupin chemical Ltd. on non-exclusive basis.

In the **National Facility of Biochemical Engineering Research and Process Development Center**, the following services were given to the different parties on payment basis.

- i) A process was optimized for the concentration of 6-APA from its other liquor in a RO (reverse osmosis) system. The 6-APA concentration (4000 ppm) recovered from the mother liquor was about 90% employing RO system. This work was carried out for **Fermenta Pharma, Kulu**.

- ii) A filtration process was optimized in a pilot scale filter press (Plate and Frame Filter Press and Horizontal Filter Press) for the filtration of an inorganic catalyst developed by **Thapar Corporate Research and Development Center (Patiala)**. Different process parameters such as filter quality (pore size), pressure drop, flow rate etc. were optimized with respect to quantity of material obtained.
- iii) A process was scaled up in 150 L fermenter for the production of an industrial enzyme. Different parameters were optimized during the growth and production of extracellular enzyme. This work was carried out for the **SPIC Science Foundation, Madras**.
- iv) A process was scaled up for the production of Hepatitis B-surface antigen (HBsAg) in 150 L fermenter. This work was carried out for the **International Center for Genetic Engineering and Biotechnology, New Delhi**.
- v) Laboratory scale fermenter was used for the optimization of process parameters for the production of Butanediol using *Enterobacter cloacae*. This work carried out for the **Microbiology Department, Panjab University, Chandigarh**.
- vi) A complete process was optimized for the production of Hepatitis-B surface antigen (HBsAg) in laboratory fermenters. This work was carried for **Transgene Vaccines Ltd., Hyderabad in collaboration with Rhein Biotech, Germany**.
- vii) A process was optimized for the production of **xylanase** using *Termitomyces clypeatus* in a 20 liter laboratory fermenter. Different fermenter runs were taken with varied agitation and aeration rates and 55-56 IU/mL xylanase activity was obtained in 60-72 h fermentation. This work was done for **Indian Institute of Chemical Biology, Calcutta**.
- viii) A bio-process was optimized for the production of ethanol using agro-residues as carbon source. Delignified agro-residues were saccharified using cellulase from *T. reesei* and then fermented to alcohol using *S. cerevesiae*. This work was done for the **Biochemistry Department of Punjab Agriculture University, Ludhiana**.
- ix) Demonstrations were given to **Gujarat Themis Biosyn Ltd. (GTBL)** for the biotransformation of rifamycin B to rifamycin S in aerobic reactor with rifamycin B fermentation broth.
- x) A downstream process was optimized in **Rotary Vacuum Filter (RVF)** using cephalosporin fermentation broth. This work was done for **Max-GB, Ropar**.
- xi) A process for the **hairy root culture** cultivation was optimized in modified stirred tank reactor. This work was done for **CIMAP, Lucknow**.
- x) A process was optimized for the production of secondary metabolite in 150 L reactor. This work was carried out for **M/S Koprana Drugs Private Limited, Bombay**.

xi) A process was optimized for the growth of *Penicillium chrysogenum* in a stirred tank reactor and immobilization of the whole cells using different carriers. This work was carried out for **Atomic Minerals Directorate for Exploration & Research, Hyderabad.**

Consultancy

- ✓ Validation of Streptokinase activity. Kee Pharma. Industries Limited, New Delhi, (2001)
- ✓ Water effluent load study at DSM. Anti-infectives India Pvt. Ltd. Tonsa, Ropar, Punjab, (2002)
- ✓ Microbial transformation of dl-ephedrine; Emmellen Biotech Pharmaceuticals Ltd., Maharashtra, (2003-2004)
- ✓ Biotransformation of Steroids. Jagsonpal Pharmaceuticals New Delhi. (January 2004)
- ✓ Microbiological analysis of water. M/S Alliance Formulation Chandigarh. (March 2005)
- ✓ Development of indigenous fermenter. M/S Harjee Exports Pvt. Ltd. Panchkula Haryana, (January 2006)
- ✓ Development of some “water soluble API”. M/S Alchem International Limited, New Delhi. (January 2007)
- ✓ Development of a process for the simultaneous saccharification and fermentation of starch to alcohol and acetic acid. M/S KRBL Ltd. Sangrur Punjab. (March 2007)
- ✓ Screening of microbes for the biotransformation of alkaloid colchicine to its higher derivatives i.e. 3-Demethylcolchicine, Cepham India Ltd., Barwala road, Village Bhagwas, Derabassi, Patiala, Punjab (2010).
- ✓ Nutrient optimization for the production of bacteriochlorophyll from halotolerant photosynthetic bacteria *R. spheroides* under aerobic conditions. Integral Biosciences Pvt. Ltd., C-64, Phase II extension, Hosiery Complex, Noida-2010306, Uttar Pradesh, (2010).