

# Dr. Krishna Gopal

Scientist 'F' & Head

## **Aquatic Toxicology Division**



### ***CURRICULUM VITAE***

INDIAN INSTITUTE OF TOXICOLOGY RESEARCH  
(Formerly: Industrial Toxicology Research Centre)

(Council of Scientific & Industrial Research)

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**Name** : Dr. Krishna Gopal  
**Father's Name** : Sri P. N. Dubey  
**Date of Birth** : 23<sup>rd</sup> September 1952

**Present Position /Designation**

Scientist 'F' & Head, Aquatic Toxicology  
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**Academic qualifications**

<b>Class</b>	<b>Year</b>	<b>Board/University</b>	<b>Subject</b>	<b>Division</b>
<b>10<sup>th</sup></b>	1967	UP Board	Sc.-2, Maths-2, Biology, Social Sc., Hindi, English	2 <sup>nd</sup>
<b>10+2</b>	1969	-do-	Chemistry, Physics, Biology, Hindi, English	2 <sup>nd</sup>
<b>B.Sc.</b>	1971	DDU Gorakhpur University	Chemistry, Zoology, Botany	2 <sup>nd</sup>

<b>M.Sc.</b>	1973	-do-	Zoology	2 <sup>nd</sup>
<b>Ph.D.</b>	1983	-do-	Zoology	-

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**Positions, jobs and assignments held in chronological order**

<b>Designation</b>	<b>From</b>	<b>To</b>	<b>Institute</b>	<b>Division</b>
Scientist 'F' & Head	Feb.,2007	till date	IITR, Lucknow	Aquatic Toxicology
Scientist 'E- II' & Head	Feb.,2002	Feb.,2007	-do-	-do-
Scientist 'E-I' & Head	Feb.,1997	Feb.,2002	-do-	-do-
Scientist 'C' & Head	Feb.,1992	Feb.,1997	-do-	-do-
Scientist 'B'	Feb.,1982	Feb.,1992	-do-	-do-

**Current area of research**

- Standardization of modern techniques to assess the severity and mechanism of toxicity and physiological consequences viz. neurobehavioural, neurotransmitters and series of hormone induced tissues and haematological changes in freshwater fishes exposed to xenobiotics.
  - Expertise developed to assess waterborne diseases, environmental risk on direct exposure and indirectly through food chain, drinking water quality, biotoxins and other pollutants.
  - Expertise in the area of "Environmental Impact Assessment" (EIA) with reference to biosurveys / biomonitoring / freshwater fisheries.
  - Expertise on the hazardous solid waste management and safety evaluation of leachates.
  - Active participation in the national mission scientific programmes viz. National Drinking Water Mission, Antarctica expedition and biodiversity of Himalayan Glaciers.
  - Development of process / technology module for the analysis and purification of drinking water as well as human resource development. Initiation of a National Advance Centre for Water Acidity Assurance and Training (NACWQAT) at IITR.
  - Expertise on the Development of process/technology for the analysis and purification of drinking water.
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**List of the publications in indexed journals (exclude presentations  
made in conferences/seminars)**

**PUBLICATIONS:**

**Publications in peer review journals**

1. G.S. Shukla and **Krishna Gopal** 1975. Studies on The Semi-Polluted Chilwatal (Gorakhpur) In Relation to Insect Fauna. *Indian J. Zootom.*, 16 (3): 227-230.
2. **Krishna Gopal** 1976. Toxicity of Waste Effluent Discharged Form Fertilizer Factory, Gorakhpur to Teleost Fish *Channa Punctatus*. *Indian J. Zootom.*, XVII (2): 125-127.
3. Hansnath Yadav And **Krishna Gopal** 1978. Ganne Ki Thrips Aur Unke Roktham. *Bha. Sar. Mu.* VI: 7: 365.
4. **Krishna Gopal** and Gagannath Chaturvedi 1978. Pyrilla Ka Javik Niyantarak Tetrestichus Pyrillare. *Bha. Sar. Mu. Na.*, 7 : 58, Jan.-March.
5. **Krishna Gopal**, M. Anand, D. Mishra and G.S.D. Gupta 1979. Studies on the Toxicity of Thiodan on Cat Fish *Clarias Batrachus*. *Biochem. Biophys.*, 6:57.
6. G.S.Shukla and **Krishna Gopal** 1980. Malphigian Tubules of Ranatra Elongata (Fabr) Hemipetra-Nepidine. *Zoolische Beitrage*, **26**: 227-230.
7. D. Mishra, R. N. Khanna, M. Anand and **Krishna Gopal** 1980. Effect of Endosulfan on Blood Glucose. *Chemosphere*, **9**:119-121.
8. **Krishna Gopal**, M. Anand, R.N. Khanna and D. Mishra, 1980. Endosulfan Induced Changes in Blood Glucose in Cat Fish *Clarias Batrachus*. *Indian J. Adv. Zool.* **1**(2):68-71.
9. M. Anand, R.N. Khanna, **Krishna Gopal**, G.S.D. Gupta and R.N. Sur 1980. Effect of Endosulfan on Bioelectrical Activity of Brain In Rats. *Vet. Human Toxicol.*, **22** (60):385-387.
10. **Krishna Gopal**, R.N. Khanna and G.S.D. Gupta 1981. The Acute Toxicity of Endosulfan to Fresh Water Organisms. *Toxicol. Lett.*, **7**:453-456.
11. **Krishna Gopal**, R.N. Khanna and G.S.D. Gupta 1982. Haematological Changes In Cat Fish *Clarias Batrachus*. *Indian J. Biochem. Biophys.*, **17**(4) : 111.
12. **Krishna Gopal**, R.N. Khanna, M. Anand and G.S.D. Gupta 1982. Haematological Changes In Fish Exposed to Endosulfan. *Industrial Health.* **20**: 157-159.
13. D. Mishra, R.N. Khanna, M. Anand and **Krishna Gopal** 1982. Interaction of Endosulfan With Erythrocyte Membrane. *J. Adv. Zool.*, **3**(2): 133-141.
14. M.K. Srivastava and **Krishna Gopal**, 1984. Relative Toxicity of Organ phosphorus Insecticides against Stored Grain Pests. *J. Adv. Zool.*, **5**(1): 23-27.
15. **Krishna Gopal**, M. Anand, S. Mehrotra and P. K. Ray 1985. Neurobehavioral Changes In Fresh Water Fish *Channa Punctatus* Exposed To Endosulfan. *J. Adv. Zool.* **6** (2): 74-80.
16. M. Anand, S. Mehrotra, **Krishna Gopal**, R. N. Sur and S. V. Chandra 1985. Role of Neurotransmitters on Endosulfan Induced Aggressive Behaviour In Normal And Lesioned Rats *Toxicol. Lett.* **24** (1): 79-84.

17. M. Anand, A. K. Agarwal, Krishna Gopal, R N. Sur and P. K. Seth 1986. Endosulfan and Cholinergic Transmission: Effect of EEG. *Environ. Research*, **40**: 421-426.
18. M. Anand, **Krishna Gopal**, C. Agarwal, M. Verma, K. Shanker, S. V. Chandra and P. K. Ray 1986. Endosulfan Induced Inhibition of Aggregation and 5-Hydroxytryptamine Uptake In Platelets. *Toxicol. Lett.*, **32** : 203-208.
19. **Krishna Gopal**, V. B. Upadhyay and S. P. Tripathi 1986. An Alternative of Insecticides in Mosquito Control. *J. Adv. Zool.*, **7** (2) 121-122.
20. M. Anand, S. Mehrotra, Anil Gulati, **Krishna Gopal**, P. K. Seth and P. K. Ray 1987. Behavioural and Biochemical Alterations Induced By Hexachlorocyclohexane. *J. Adv. Zool.* **8** (2): 135-41.
21. M. Anand, **Krishna Gopal**, S. Mehrotra, P. K. Ray, S. V. Chandra And A. K. Paul 1987. Ocular Toxicity to Organochlorinated Pesticides. *Cutaneous & Ocular Toxicology*, **6** (3) : 161-171.
22. R. N. Khanna, M. Anand, **Krishna Gopal**, N. Verma, G. S. D. Gupta and P. K. Ray 1988. Effect of Repeated Exposure of Lindane And Cadmium of Lindane Metabolism In Rats. *Toxicol. Lett.*, **42** : 177-183.
23. **Krishna Gopal**, M. D. Ram, G. S. D. Gupta and M. Anand 1988. Lindane Induced Histological Changes In The Gills of *Channa Punctatus* (Bloch). *Indian. J. Biol. Res.*, **9** (1) : 25-27.
24. **Krishna Gopal**, M. Anand and P. K. Ray 1989. Central Neurohumoral Mechanism of Cardiovascular Toxicity of Lindane. *J. Adv. Zool.* **10** (2) : 126-135.
25. M. Anand, **Krishna Gopal**, G. S. D. Gupta and P. K. Ray 1989. Central Neurohumoral Mechanism of Cardiovascular Toxicity of Lindane. *J. Adv. Zool.*, **10** (2): 126-135.
26. M. Anand, A. Gulati, **Krishna Gopal**, R. N. Khanna, P. K. Ray and O. N. Tripathi 1989. Changes In Cardiac Rhythm and Calcium Levels In Guinea Pigs Treated Chronically to Fenitrothion. *Toxicol. Environ. Chem.*, **24** (4): 199-205.
27. M. Anand, S. Mehrotra, **Krishna Gopal**, G. S. D. Gupta, A. Gulati and S. V. Chandra 1989. Fenitrothion Induced Aggressive Behaviour In Normal and Brain Lesion Rats. *Toxicol. Lett.*, **45** : 215-220.
28. M. Anand, **Krishna Gopal**, N. H. Rahmani, K. Seth, P. K. Seth and P. K. Ray 1990. Effect of Chlorinated Hydrocarbon on Cholinergic (Muscarinic) Transmission and EEG on Pigeon Brains. *J. Environ. Biol.* **11** (2 Suppl.)183-199.
29. **Krishna Gopal**, M. D. Ram, R. S. D. Gupta and P. K. Ray 1990. Potential Effect of Elevated Temperature and Pesticides Stress to the Teleost: A Review. *Indian J. Environ. Protect.*, **10** (3): 161-169.
30. M. Anand, **Krishna Gopal**, A. Gulati, G.S.D. Gupta, R. N. Khanna, S. V. Chandra and P. K. Ray 1990. Hypertension And Myocarditis In Rabbits Exposed to Organochlorinated Pesticides. *Vet. & Human Toxicol.*, **32** (5): 521-523.
31. R. N. Khanna, R. Gupta, G. S. D. Gupta, **Krishna Gopal**, D. Agarwal, M. Anand and P. K. Ray, 1990. Effect of Level Dietary Protein on the Toxicity of HCH in Rats. *Toxicol. Environ. Chem.*, **25** (1): 91-103.
32. **Krishna Gopal**, M. D. Ram. G. S. D. Gupta and M. Anand 1990. Cellular Bioassay for the Assessment of Pesticides Toxicity Fresh Water Fishes. *J. Zool. Res.*, **4** (1-2): 11-18.

33. **Krishna Gopal**, M. D. Ram and M. Anand 1990. Effect of Lindane on the Levels of Biogenic Amines in Various Parts of Brain of Fresh Water Fish *Channa Punctatus*. *J. Adv. Zool.* **11** (2): 79-84.
34. M. Anand, R. N. Khanna, **Krishna Gopal**, N. Verma and P. K. Ray 1991. Cadmium and Lindane Interaction in Cardiovascular Toxicity. *J. Environ. Biol.* **12** (1): 9-14.
35. **Krishna Gopal**, M. Anand, R. N. Khanna, G. S. D. Gupta and K. Shankar 1991. Some Neurotoxicological Consequences in Hexa-Chlorocyclohexane (HCH) Stress in Rats Fed on Protein Deficient Diet. *Toxicol. Environ. Chem.*, **36** : 57-63.
36. M. Anand, **Krishna Gopal**, D. Agarwal, R. N. Khanna, G. S. D. Gupta, N. H. Rahmani and P. K. Ray 1991. Influence of Dietary Protein Deficiency in EEG. Neurotransmitters and Neurobehavioural Changes after Chronic Exposure to HCH *Toxicol. Environ. Chem.* **34**: 1-11.
37. M. D. Ram, **Krishna Gopal**, 1991. Fenitrothione induced Neurobehavioural Changes in Fresh Water Fish *Channa Punctatus*. *Bull. Environ. Contam. Toxicol.*, **47**: 455-458.
38. P. W. Ramteke and **Krishna Gopal**, 1991. Microflora of Gut Earthworm *Pheretima Posthuma*. *J. Adv. Zool.* **12** (1): 66-67.
39. Anita R. Gautam and **Krishna Gopal** 1991. Toxicity of Bloom of the Cyanobacterium *Microcystis*. *Int. J. Toxicol. Occup. Environ. Hlth.*, **1** (1): 221.
40. **Krishna Gopal** and Swarn Lata 1991. Biological Approaches for Evaluation of Carbaryl Toxicity to Teleost Fish *Clarias Batrachus*. *Int. J. Toxicol. Occup. Environ. Hlth.*, **1** (1) : 225.
41. M. Anand, A. Gulati, **Krishna Gopal**, N. H. Rahmani, R. C. Srimal and P. K. Ray 1992. Alteration in Blood Pressure and Medullary Receptor Following Exposure of Cadmium And Lindane to Rats. *Proc. Environ. Biol.*, Pp. 81-86.
42. D. Agarwal, P. Sultana, G. S. D. Gupta, **Krishna Gopal**, R. N. Khanna and M. Anand 1992. Effect of HCH on Biochemical Parameters of Rats on a Protein Deficient Deit. *Toxicol. Environ. Chem.*, **35** : 109-114.
43. M. P. Saxena, **Krishna Gopal**, J. W. Bhattacharjee and P. K. Ray 1992. Immune Responses in Cat Fish *H. Fossilis* to a Hydrophilla With Cadmium and Hexachlorocyclohexane (HCH). *Bull. Environ. Contam. Toxicol.*, **48** (2): 194-201.
44. **Krishna Gopal**, Murli Dhar Ram and D. Agarwal 1992. Some Physiological Consequences of Fresh Water Fish *Channa Punctatus* Exposed to Lindane. *Bull. Environ. Contam. Toxicol.*, **50** (2): 187-191.
45. **Krishna Gopal**, S.P. Pathak and B. Sharma 1992. Stress Mediated Immune Suppression A Disease Syndromes in Fresh Water Fishes. *Int. Toxicol. Occup. Environ. Hlth.*, **7**(3): 39-47.
46. **Krishna Gopal**, S.P. Pathak 1993. Possible Cause of Outbreaks to Fish Disease and Mortality in Polluted Water. *J. Adv. Zool.* **14** (1): 53-60.
47. B. Sharma, M. D. Ram, Swarn Lata and **Krishna Gopal** 1993. Carbaryl induced Alterations in the level of Biogenic Amines in Various Part of the Brain of *C. Batrachus*. *Toxicol. Environ. Chem.*, **38** (1-2): 95-99.
48. Bechan Sharma, **Krishna Gopal**, and Y. P. Khanna 1993. Interaction of Carbaryl With Acetylcholine Esterase of the Teleost *C. Batrachus*. *Toxicol. Environ. Chem.*, **39**: 147-152.

49. S.P. Pathak, A.R. Gautam, Abha Gaur, **Krishna Gopal** and P.K. Ray 1993. Incidence of Transferable Antibiotic Resistance among Enterotoxigenic *Escherichia Coli* In Urban Drinking Water. *J. Environ. Sci. Hlth. Assoc.*, **28** (7): 1445-1455.
50. S.P. Pathak, A.R. Gautam, Abha Gaur, **Krishna Gopal** and P.K. Ray 1993. Distribution and Resistance Pattern in *Aeromonas Hydrophila* from Organs of Infected Cat Fish *Clarias Batrachus Indian J. Microbial.*, 33 (3): 195-200.
51. **Krishna Gopal** and M.D. Ram 1994. Carbofuran Induced Histo-Pathological Changes in Certain Tissues of Fresh Water Fish *Channa Punctatus*. *Proc. Acad. Environ. Biol.*, **3** (1): 43-47.
52. Sanjay Kumar, N. Garg and **Krishna Gopal** 1994. Relationship between Electrical Conductivity and Cationic and Anionic Content in Ground Water. *Indian J. Environ. Protec.*, **8** : 595-603.
53. S. P. Pathak and **Krishna Gopal** 1994. Antibiotic Resistance and Metal Tolerance among Coliform Sp. from Drinking Water In Hill Area. *J. Environ. Biol.* **15** (2): 139-147.
54. P.W. Ramteke, S.P. Pathak, J.W. Bhattacharjee, **Krishna Gopal** and N. Mathur 1994. Evaluation of the Presence Absence (P. Test): A Simplified Bacteriological test for Detect Coliforms in Rural Drinking Water of India. *Environ. Monitor. Assess.*, 33: 53-59.
55. **Krishna Gopal** and Murli Dar Ram 1995. Alteration in Neurotransmitters Level in the Brain of *Channa Punctatus* Exposed to Carbofuran. *Ecotoxicity*, **4** (1): 1-4.
56. B. Sharma and **Krishna Gopal** 1995. Changes in Lactic Acid Content and Activity of Lactase Dehydrogenase in *C. Batrachus* Exposed to Carbaryl. *Toxicol. Environ. Chem.*, **47**: 89-95.
57. S.R. Naik, R.P. Agarwal, K. Samual, Sanjay Kumar, **Krishna Gopal** and P.K. Seth 1996. Quality of Water Obtained by Tapping Shallow Seepage in the Almora Hills (India). *Environ. Monitor. & Assess.*, **43** (1): 93-99.
58. Anubha, **Krishna Gopal** and R.C. Dalela 1997. Pathological Impact of Endosulfan and Lindane on *Chironomus* Larve (Chironomidae). *J. Environ. Biol.*, **18** (4): 429-434.
59. Anil K. Agarwal and **Krishna Gopal** 1998. Physico-Chemical Characteristics of Ganga Water near Unnao District *Indian Environ. Ecoplan.* **1 & 2**: Pp 39-42.
60. **Krishna Gopal** 1998. Environmental Impact Assessment for Sustainable Development. *Environment Bulletin*, **14** (A& 2): 6-10.
61. **Krishna Gopal** 1998. Samudri Khadya Pranio Men Jaio Vishow Ki Utpatti Avam Vishaluta Ke Pradurbhaw-Ak Samiksha. *Bhartiya Vaigyanic Avam Audhyogik Anusandhan Patrika* **6** (2): 74-80.
62. Sheo Kumar and **Krishna Gopal** 1999. Screening of Plant Species for Inhibition of Bacterial Population of Raw Water. *J. Environ. Sci. Hlth.*, A **34** (4): 975-987.
63. Suresh Kumar, Swarn Lata and **Krishna Gopal** 1999. Effect of Deltamethrin induced Physiological Changes in Fresh Water Catfish. *H. Fossilis Bull. Environ. Contam. Toxicol.*, **62** (3): 254-258.
64. Shikha Bajpai, H.K. Verma, **Krishna Gopal** and Sheo Kumar 1999. Studies on Bioefficacy of the Extract of Certain Plants in Control of Bacterial Population of Different Drinking Water. *Proc. Acad. Environ. Biol.*, **8** (2): 247-253.
65. **Krishna Gopal** 1999. Ecophysiological Consequences of Biotoxin and its Impact on Marine Fishes. *Environment Bulletin* (15) 29-32.

66. Suresh Kumar, Swarn Lata and **Krishna Gopal** 1999. Acute Toxicity of Deltamethrin to the Fresh Water Teleosts *H. Fossilis* and *Channa Punctatus* *Proc. Acad. Environ. Biol.* **8** (1): 83-85.
67. Sanjay Kumar and **Krishna Gopal** 2000. Variation of Trace Metals in the Streams of Sodic Land Regions. *Ind. J. Environ. Protect.* **20** (6): 417-20.
68. M. Farooq, K.R. Arya, Sanjay Kumar, **Krishna Gopal**, P.C. Joshi and R.K. Hans 2000. Industrial Pollutants Mediated Damage to Mango *Mangifera Indica* Crop- A Case Study. *J. Environ. Biology* **21** (2) 165-167.
69. P.W. Ramteke, Shilpi Khare and **Krishna Gopal** 2000. Bacterial Types and Abundance in Fresh Water of Schrimachar Oasis (Antarctica) *J. Environ. Biol.* **21** (2): 349-353.
70. **Krishna Gopal** 2000 Sources of Contamination of Drinking Water and Implication of Health, Proceeding All India Seminar on *Environmental & Social Issues in Water Resources Development*. 263-272.
71. **Krishna Gopal** and Rashmi Saxena 2000. Risk Assessment of Contaminated Drinking Water With Particular Relevance to Human Health. Proceeding of Training Workshop "Monitoring and Analysis of Toxic Chemical and Biological Toxins in Food & Water". C.S.C., London. 101-109.
72. V.P. Sharma and **Krishna Gopal**, 2000. Preservation, Transportation and Storage of Toxic Chemicals and Biotxin Samples. Sandra M.E. Wint. C.S.C., London. 122-126.
73. Suresh Kumar, Swarn Lata and **Krishna Gopal** 2000. Deltamethrin Induced Changes in Gills of *Heteropneustes Fossilis*. *Proc. Acad. Environ. Biol.* **9** (2) 159-163.
74. Kumar S. and **Krishna Gopal** 2000. A Review of Fluorosis and its Preventive Strategies. *I. J. E.P.* **20** (6): 430-440.
75. Suresh Kumar and **Krishna Gopal** 2001. Impact of Distillery Effluent on Physiological Consequences in Freshwater Teleost *Channa Punctatus*. *Bull. Environ. Contam. Toxicol.* **66** : 617-622.
76. Anupma Kumari, Ravindra Kumar Sinha and **Krishna Gopal** 2001. Concentration of Hch in Sediment Samples from the River Ganges in Bihar, India. *Research Journal of Chemistry and Environment Vol. 5* (1) 73-74.
77. Anupma Kumari, **Krishna Gopal**, Ravindra Kumar Sinha and K. Prasad 2001. Dietary in take of Persistent Organochlorine Residues Through Gangetic Fishes in India. *International Jour. Ecol. & Environ. Sci.* **27**: 170-120
78. Anupma Kumari, Ravindra Kumar Sinha and **Krishna Gopal** 2001. Quantitative Estimation of Residues in Some Freshwater Fishes of River Ganga at Patna, Bihar. *Environment & Ecology* **19** (2) : 396-399.
79. S.P. Pathak, **Krishna Gopal** and R.C. Srimal 2001. Safety Evaluation of Drilling Mud Toxicity with Mysid Shrimp Bioassay. *J. Ecophysiol. Occup. Hlth.* **1**: 73-79.
80. R. Pandey, **Krishna Gopal**, S. Kumar. and J. Singh. 2001. Drinking Water Quality in Fluorosis Endemic areas of Deo Singh Khera, Gosainganj, Lucknow. *J. Ecophysiol. & Occup. Hlth.* **1**: 187-194.
81. R. Saxena, R. Gupta, M. Tripathi and **Krishna Gopal** 2001. Fluoride induced Haematological Alterations in the Fresh Water Fish *Channa Punctatus*. *J. Ecophysiol. Occup. Hlth.* **1**: 139-146.
82. S. Lata, **Krishna Gopal** and N.N. Singh 2001. Toxicological Evaluations and



- Morphological Studies in a Catfish. *Clarias Batrachus* Exposed to Carbaryl and Carbofuran. *J. Ecophysiol. Occup. Hlth.* **1**: 121-130.
83. Rajesh Gupta, Saroj, **Krishna Gopal**, Madhu Tripathi and U. D. Sharma 2001. Fluoride induced Haematological and Histopathological Changes in Fresh Water Fish *Labeo Rohita*. *Biol. Memoirs.* **26** (2): 27-31.
  84. Pathak, S.P. and **Krishna Gopal** 2001. Rapid Detection of *E. Coli* as an indicator of Fecal Pollution In Water. *Ind. J. Microbiol.* **41** (3), 139-151.
  85. Anupma Kumari, R. K. Sinha and **Krishna Gopal** 2001. Organochloride Contamination in the Fish of the River Ganges, India. *Aquatic Ecosystem Health And Management* **4**: 505-510.
  86. Rajesh Gupta, **Krishna Gopal**, Madhu Tripathi and U. D. Sharma 2002. Haematological Changes in Fresh Water Fish *L. Rohita* and *C. Punctatus* induced by Fluoride. *Proceedings S. B. Singh Comm. Vol. Zool. Soc. India* Pp. 105-144.
  87. Anupma Kumari, R. K. Sinha, **Krishna Gopal** and Swarn Lata (2002). Concentration of Organochlorines in Ganges River Dolphins from Patna, Bihar. *J. Environ. Biol.* **23**(3), 279-281.
  88. Sanjay Kumar and **Krishna Gopal** (2002). Indigenous Minerals for Defluoridation of Water-A Review. *Ind. J. Environ. Protection.* **22** (3), 355-361.
  89. Vinay Singh Baghel, Jaswant Singh and **Krishna Gopal** (2003). Antimicrobial Resistance Among Enteric Bacteria Isolate from Runoff of the Gangotri Glacier Western Himalaya, India. *J. Environ. Biol.* **24** (3), 349-356.
  90. **Krishna Gopal**, Sachin Behari Srivastava, Satish Shukla and J.L. Bersillon (2004). Contamination in Drinking Water and its Mitigation Using Suitable Sorbents: An Overview. *J. Environ. Biol.* **25**(4), 469-475.
  91. Vinay Singh Baghel, **Krishna Gopal**, Sanjai Dwivedi and R. D. Tripathi (2005). Bacterial Indicators of Faecal Pollution in the Runoff of Gangotri Glacier System Right at its Source. *Ecological Indicators, Vol.* (5), 49-56.
  92. Pathak, S.P. and **Krishna Gopal** (2005). Occurrence of Antibiotic and Metal Resistance in Bacteria from Organs of River Fish. *Environ. Res.* **98**, 100-103.
  93. Vinay Singh Baghel, R.D. Tripathi, P.W. Ramtake, **Krishna Gopal**, Sanjay Dwivedi, R.K. Jain, U.N. Rai and S.N. Singh (2005). Psychrotropic Proteolytic Bacteria from Cold Environment of Gangotri Glaciers, Western Himalaya, India, *Enzyme and Microbial Technology*, **36**, 654-659.
  94. Animesh Tripathi, **Krishna Gopal** And Madhu Tripathi (2005) Impact of Fluoride on Pigmentation f Fresh Water Fish *Channa Punctatus*. *J. Appl. Biosci.* **31** (1), 35-38.
  95. Saurabh Chandra, Pradeep Kumar, P.N. Pande, R.C. Murthy, **Krishna Gopal** and S.K. Gupta (2004) Alteration in Prenatal Development of Mice in Response to Solid Waste Leachates of Metal-Based Industries, *J. Ecophysiol. Occup. Hlth.* **4** (2004), 137-144.
  96. V.K. Gaur, S.K. Gupta, S.D. Pandey, **Krishna Gopal** and Virendra Mishra (2005). Distribution of Heavy Metals in Sediment and Water of River Gomti. *Environ. Monit. Assess.* **102**, 419-433.
  97. Sushree Swarupa Tripathy, Jean-Luc Bersillon, **Krishna Gopal** (2006). Adsorption of  $Cd^{2+}$  on Hydrous manganese dioxide from aqueous solutions. *Desalination* **194**, 11-21.

98. Shweta Agrahari, **Krishna Gopal** and K.C.Pandey (2006). Monocrotophos induced level of Biomarkers in Freshwater fish *Channa punctatus*. *J. Environ.Biol.***27**(2), 453-457.
99. Shweta Agrahari, K. C. Pandey and **K. Gopal** (2006). Effect of Monocrotophos on Erythropoietic Activity and Haematological Parameters of the Freshwater Fish *Channa punctatus* (Bloch). *Bull.Environ.Contam. Toxicol.* **76**(4), 607-613.
100. Sushree Swarupa Tripathy, Jean-Luc Bersillon, **Krishna Gopal** (2006). Removal of fluoride from drinking water by adsorption on to alum impregnated activated alumina. *Separation and Purification Technology* 50 (3), 310-315.
101. **Krishna Gopal**, R. Saxena, G.S.D. Gupta, M.D.Rana and D.Agrawal (2006). Fluoride induced alterations in cardiovascular and nervous system of albino rats. *J. Adv. Zool.* **27** (1).
102. **Krishna Gopal**, Sushree Swarupa Tripathy, Jean Luc Bersillon and Shashi Prabha Dubey,(2007) "Chlorination byproducts their toxicodynamics and removal from drinking water" *Journal of Hazardous Material* 140, 1-6.
103. S.P. Pathak and **Krishna Gopal** (2007) Bacterial contamination and antibiotic resistance in faecal coliforms from runoff of Gangotri glacier. *Bull. Environ. Contam. Toxicol.*79:163-167.
104. Shashi Prabha Dubey and **Krishna Gopal**. (2007). Adsorption of chromium (VI) on low cost adsorbents derived from agricultural waste material: A Comparative Isotherm Study. *Journal of Hazardous Material* 145:465-470.
105. Shweta Agrahari, K.C. Pandey and **K. Gopal** (2007). Biochemical alternation induced by monocrotophos in the blood plasma of fish, *Channa puntatus* (Bloch) *Pest. Biochem. Physiol.* 88:268-272.
106. Pathak, S.P. and **Gopal K.** (2008) Prevalence of bacterial contamination with antibiotic resistant and enterotoxigenic faecal coliforms in treated drinking water. *J. Toxicol. & Environ. Hlth. Part A*, 71, 427-433.
107. Pathak, S.P. and **Gopal K.** (2008) Enterotoxigenicity of enteric bacteria from various water sources. *J. Life Sciences Vol. II* (3), 1 - 9.
108. Shweta Agrahari and **Krishna Gopal** (2008). Inhibition of Na<sup>+</sup> -K<sup>+</sup> -ATPase in different tissues of freshwater fish *Channa punctatus* (**Bloch**) exposed to monocrotophos *Pest. Biochem. Physiol.* Vol.92(2)57-60.
109. Pathak, S.P. and **Gopal K.** (2008) Bacterial density and antibiotic susceptibility of *Aeromonas* sp. in organs of metal stressed freshwater fish *Channa punctatus*. *Toxicol. & Environ. Chem.*91:331-37.
110. S.P. Dubey, **K. Gopal** and S.P. Pathak (2008). Bactericidal Effect of Adsorbent on *Escherichia coli* for Disinfection of Drinking Water. *Tox. Environ. Chem.*90(6) 1109-1114.
111. **Krishna Gopal** and Shashi P. Dubey (2008). Chromium contamination in drinking water and strategies on purification. *Green Building: Striding towards environment protection Search Foundation New Delhi.*
112. Shashi Prabha Dubey, **Krishna Gopal** (2009). Application of natural adsorbent from silver impregnated *Arachis hypogaea* based thereon in the processes of hexavalent chromium for the purification of water. *Journal of Hazardous Materials* 164, 968-975.

113. Shashi Prabha Dubey, **Krishna Gopal** and J.L. Bersillon (2009). Utility of adsorbents in the purification of drinking water: A review of characterization, efficiency and safety evaluation of various adsorbents. *J. Environ. Biol.* 30(3), 327-332 .
114. S.P. Dubey and **Krishna Gopal** (2009). Breakthrough analysis for hexavalent chromium removal from drinking water in a fixed bed column. *Water Science and Technology Water Supply* 9.6, 661-670.
115. S.P. Dubey and **Krishna Gopal** (2009). Removal of chromium (VI) from contaminated drinking water by ecofriendly adsorbent equilibrium, isotherm and kinetic study. *Water Science and Technology Water Supply* 9.6, 671-679.
116. Pathak S.P. and **Gopal K.** (2009). Bacterial density and antibiotic susceptibility of *Aeromonas* sp. In organs of metal stressed freshwater fish *Channa punctatus*. *Toxicol. & Environ. Chem.* **91**(2), 331-337.
117. **Amarendra Dhar Dwivedi**, Shashi Prabha Dubey, Krishna Gopal, Mika Sillanpää, Strengthening adsorptive amelioration: Isotherm modeling in liquid phase surface complexation of Pb (II) and Cd (II) ions, *Desalination*, 267, 25-33, **2011**.
118. S.P. Dubey, **Amarendra Dhar Dwivedi**, K. Gopal, M. Sillanpää; Artemisia vulgaris-derived mesoporous honeycomb-shaped activated carbon for ibuprofen adsorption, *Chemical Engineering Journal*, 165, 537-544 **2010**.
119. **Amarendra Dhar Dwivedi**, K. Gopal, Biosynthesis of silver and gold nanoparticles using *Chenopodium album* leaf extract, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 369, 27-33, **2010**.
120. **Amarendra Dhar Dwivedi**, S.P. Dubey, K. Gopal, V.K. Tandon, A comparative investigation for strengthening the adsorptive phenomenon by activated natural minerals and plant waste-carbon for defluoridation in water milieu, *Desalination*, 263, 189-199, **2010**.

### List of Patents taken

- Kumar, S., **Krishna Gopal**, Seth, P.K. (2000) A process for the preparation of alum impregnated tea leaves carbon for defluoridation of drinking water. Patent Apl. No. NF-34 / 2000.
  - An improved colorimeter for physico-chemical analysis of a sample. P. K. Ray, P.K.Seth, H. Chandra, V. K. Sahgal, R.K.Sharma, V.P.Sharma, **K. Gopal**, S.Kumar, R.K.Srivastava, S.P.Pathak, P.W.Ramteke, M.M.Kureshi. Patent No.616/DEL 95 at 3.0415.
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## **Details of commercialization of the technologies developed**

### **Consultancy Services / Sponsored Work:**

1. Drinking water quality surveillance in problems districts, development of technologies for assessment as well as purification of drinking water and training & public awareness programme for 'Water Quality & Health' under Rajiv Gandhi National Drinking Water Mission, Govt. of India New Delhi.
2. Study on impact assessment on flora and fauna due to release of effluents in western region. Sponsored by K.D. Malviya Institute of Petroleum Exploration ONGC, Dehradun.
3. Waste water recycling of effluents at Nagpur and Gwalior (CPCB, New Delhi)
4. Ecotoxicological investigation on the impact of once-through cooling system on aquatic life at Farakka STPP-NTPC, New Delhi.
5. Development of Standard Protocol for Consumer Safety and occupational and ecological risk assessment through toxicological studies on irrigation of crops by effluents at Indian Petrochemical Corporation Ltd. Vadodara, Gujarat (IPCL sponsored project)
6. Environmental impact risk assessment Yamunanagar due to Thermal Power Project-NTPC, New Delhi sponsored.
7. Environment impact assessment over Maitri (Antarctica Programme) in collaboration with NPL/NIO.
8. EIA Baseline Data Collection for 100% Export Oriented Alumina Project Kakriguma Orissa
9. EIA Baseline Data Collection in Barha river. TATA-INDAL-HYDOR alumina Project. Tikri Raygadda, Orissa.
10. Acute toxicity testing of Catfloc-t Polyelectrolytes in fresh water fish.
11. Pathogenicity testing of test organism provided by Wochardt Research Centre.
12. Determination of *E. coli* in 20 district of U.P. under World Bank Sodic Land Reclamation project, RSAC, Lucknow.
13. Revaluation of drinking water quality in Kangra (H.P.) District.
14. Acute Toxicity Evaluation of Drilling mud samples ONGC, Mumbai.
15. Development of guidelines and selection of sites for the disposal of solid hazardous waste Lucknow (U.P.).
16. Development of guidelines and selection of sites for the disposal of solid hazardous waste Moradabad (U.P.).
17. Development of guidelines and selection of sites for the disposal of solid hazardous waste Buland Shahar (U.P.).
18. Investigation into Morbidity/Mortality of Human and Cattle Around Swaroop Chemicals Uttardhauna, Chinahat, Lucknow.
19. Water quality surveillance in flood affected areas on Gorakhpur and Deoria districts and to suggest preventive safety measures sponsored by Council of Science & Technology U.P. Lucknow, 1998.

20. Training course on drinking water quality analysis in four district of Haryana, Bhiwani, Rohtak, Karnal & Ambala sponsored from RGNDWM, New Delhi, 7-15 June, 1999, SSP 0062-22.
  21. Training courses on drinking water quality analysis in four places of Himachal Pradesh and Punjab (two each) sponsored from RGNDWM, New Delhi. CNP 106 May & June, 2000.
  22. Water Quality Surveillance in Problem Villages of 30 Districts of U.P. sponsored by U.P. Jal Nigam. (SSP-87).
  23. UNICEF Water Quality Surveillance in the Rural Areas of Chitrakoot district (SSP- 107).
  24. Water Quality Surveillance with Suggestive Safety & Preventive Measures in the Flood Affected Areas of Gorakhpur and Deoria District of U.P. (SSP-101).
  25. Evaluation of toxicity of Tar Powder in fish (Narmada Chemabur) SSP-96.
  26. Fish acute toxicity evaluation of TDI-Tar powder-SSP-109.
  27. Evaluation of metals in water and biological samples sponsored from Patna University Patna, 2003. SSP-123
  28. Exhaustive characterization chemical analysis and safe disposal of solid waste of CNP , Nasik, sponsored from Ministry of Finance Govt. of India, Currency Note Press, Nasik SSP-0127.
  29. Disinfection of drinking water by silver Ionization sponsored from Bharti Waters, New Delhi. CNP-164
  30. Scientific popular lecture/demonstration in the school/college of Lucknow city under YSA 2004-05 sponsored from UPCST, Lucknow. SSP-136
  31. Safety evaluation of general disinfectant Decol for the use in Sericulture, CNP-175 sponsored from SSTL, Bangalore.
  32. Toxicity of hazardous element in sludge from dying effluent centre coir Research Institute Alappuzha (SSP-154).
  33. Cleanup measure and environmental improvement of illegal dumping sites. SPP 158
  34. Biosafety testing of the entomo pathogenic bacterium Bacillus cereus strain WG PsB 02.
  35. Technical consultancy and advice to Jalnigam. SWSM and DWSM in administrating and implementing NRDQM and SP. CNP-181.
  36. Testing kit for the detection of silver content in water after treatment through silver ionization plant. M/s Bharti Waters Pvt. Ltd., New Delhi, CNP-193.
  37. Testing of Silver ionized water samples efficacy of silver ionization for bacterial disinfection of drinking water. M/s Bharti Waters Pvt. Ltd., New Delhi, CNP-194.
  38. Technical consultancy and advice to UP Jal Nigam SWSM & TWSM in administering and implementing NRDWQM &SP. UP Jal Nigam, Lucknow, CNP-195.
  39. Organization of district level training courses for water quality monitoring and surveillance programme in the State of Punjab, SSP – 193.
  40. Testing kit for the detection of silver content in water after treatment through silver ionization plant, M/s Shree Krishna & Co. Erode , Tamilnaidu, CNP – 206.
  41. Efficacy study of silver ionization based water disinfection, Bharat Power Engineer, Salem, Tamilnadu, CNP-218.
-

## List of books/reviews written

### Books Edited

- River Pollution in India and its Management (2003). Edited by **Krishna Gopal** and Anil Kumar Agarwal, APH Publishing Corporation 5, Ansari Road, Daryaganj, New Delhi-2.
- Fundamentals of Water and Waste Water (2004). Edited by **Krishna Gopal**, APH Publishing Corporation 5, Ansari Road, Daryaganj, New Delhi-2.
- Advisor Editor of Conservation & Management of Aquatic Resources Ed. Daya Publishing House-Delhi 1998.
- Water and waste water (2007) Edited by Dr. **Krishna Gopal**, APH Publishing Corporation 4435-36/7, Ansari Road, Daryaganj, New Delhi -110 002.
- Principles of Toxicology (2010) Edited by Anju Agarwal and **Krishna Gopal**, International Publishing House, Lucknow.

### Book Chapters Contributed

- **Krishna Gopal**, and V. Mishra 1988. Bioassay test for acute toxicity of chemical to fresh water fish. In : *Manual of Aquatic Ecotoxicology*, Ed. H. A. M. de Kruifif. *et al.*, Allied Publishers Ltd., pp. 286-288.
- **Krishna Gopal**, and V. Mishra 1988. Bioassay test for chronic toxicity of chemical to fresh water fish. In : *Manual of Aquatic Ecotoxicology*, Ed. H. A. M. de Kruifif. *et al.*, Allied Publishers Ltd., pp. 286-288.
- R. Gautam, J. W. Jones and **Krishna Gopal** 1990. Taste, odour and toxic algae isolated from various natural sources of Lucknow area. In : *Recent Trends in Limnology* Ed. V. P. Agarwal *et al.*, 379-391.
- Spring water quality in Himalayan ranges. S. Kumar, P.W. Ramteke, S.P. Pathak and **Krishna Gopal**. In: *Current Trends in Limnological Research*, Vol. II, Ed. N. K. Shastree, 1992.
- Bacterial indicator of pollution. S.P. Pathak, Abha Gaur and **Krishna Gopal**. In: *Aquatic Environment*. Ed. A Gautam Ashish Publishing House, New Delhi, pp36-47, 1992.
- Pathak, S. P. and **K. Gopal** (2001) Jal ka suchham jivanvik vishleshan. In: Prayogik vidhiyon ka takniki gyan. Saxena D. K. (Ed.) Industrial Toxicology Research Centre, Lucknow. pp. 96-100.
- Sheo Kumar and **Krishna Gopal** (2002). Cyanobacterial toxins occurrence properties and biological significance. *Natural Resource Management and Conservation*, Kalyani Publishers, New Delhi, Chapter 3 pp. 52-74.

- Virendra Misra, Shri Dhar Pandey Vivek Kumar Gaur and **Krishna Gopal** (2003). Fate of Contaminated Sediment in Ecological Decline of Indian Rivers. In : River Pollution in India and its Management, APH Publishing Corporation, New Delhi, Chapter 2 pp. 23-36.
- A. C. Pandey and **Krishna Gopal** (2003). River Pollution and its Impact on Fisheries Resources: An Overview. In : River Pollution in India and its Management, APH Publishing Corporation, New Delhi, Chapter 13 pp. 209-235.
- **Krishna Gopal** (2004) Sources of contamination in water and its impact on health. Fundamentals of water and waste water. A. P. H. Publishing Corporation, New Delhi. Chapter 1 pp. 1-16.
- **Krishna Gopal** (2004) Enumeration of Blue Green Algae (Cyanobacteria) in water. Fundamentals of water and waste water. A. P. H. Publishing Corporation, New Delhi. Chapter 11 pp. 137-140.
- Shashi Prabha Dubey and **Krishna Gopal** (2007). Analysis of Trihalomethanes (THMS) in water and water edited Krishna Gopal.

### **Particulars of citation index of published work in national and International journals**

“333” citations of published work in national and international journals

### **Overseas visit**

- Participated in 3<sup>rd</sup> Congress of FAOB and presented research paper at Chulanlongkom University Bangkok, Thailand from 27<sup>th</sup> November 3<sup>rd</sup> December, 1983.
- Participated in 12<sup>th</sup> ESCPB Congress and presented research paper at Utrecht, Netherlands from August 21-31, 1990.
- Participated in Regional workshop on Environmental Impact from fertilizers agrochemical and industrial wastes at Dhaka, Bangladesh sponsored from Commonwealth Science Council, London (CSC) January 24-30, 1993.
- International Training Course on “Environmental Toxicology” from 7<sup>th</sup> November to 2<sup>nd</sup> December 1994 at Chulabhorn Research Institute, Office of Academic Affairs, Vipavadee-rangsit Highway, Lak Si, Bangkok, Thailand.
- Resource person in the workshop on “Cyanobacteria and Their Toxin in Water” from July 21-23, 1997 at Brisbane, Australia.
- Visiting Scientist under IFCPAR collaborative Research projects “Use of natural products as drinking water purifiers” from 19<sup>th</sup> November to 21<sup>st</sup> December, 2001 at Laboratoires Environment et Mineralurgie, Groupe de Recherché sur l'Eau et les Solides Divises, Centre de Recherché Francois FIESSINGER, 15, Avenue du Charmois-BP40, F-54501 Vandoeuvre-les-Nancy Cedex, France.

- International Training Course on Health /Environmental Risk Assessment from November 20-29, 2003 at Chulabhorn Research Institute, Office of Academic Affairs, Vipavadee-rangsit Highway, Lak Si, Bangkok, Thailand.
  - Visiting Scientist under IFCPAR collaborative Research projects “Use of natural products as drinking water purifiers” from 26 April to 28 May 2004 at Laboratoire Environment et Mineralurgie, Groupe de Recherches sur l'Eau et les Solides Divises, Centre de Recherché Francois FIESSINGER, 15, Avenue du Charmois-BP40, F-54501 Vandoeuvre-les-Nancy Cedex, France.
  - Visiting Scientist under IFCPAR collaborative Research projects “Use of natural products as drinking water purifiers” from 8<sup>th</sup> May to 15<sup>th</sup> May 2005 at Laboratoire Environment et Mineralurgie, Groupe de Recherches sur l'Eau et les Solides Divises, Centre de Recherche Francois FIESSINGER, 15, Avenue du Charmois-BP40, F-54501 Vandoeuvre-les-Nancy Cedex, France
  - International Training Chulabhorn Research Institute (CRI), Bangkok, Thailand Fellowship, for attending Training Programme on ‘Detection of Environmental Pollutants, Testing and Screening of Toxicity’ 23 January – 10 February 2006, Bangkok, Thailand.
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**Particulars of the memberships in Academic/Societies**  
**/Professional bodies**

- **Life Member**, Indian Academy of Neurosciences.
  - **Vice President**, Association of Advance Academy of Zoology (India).
  - **Secretary (HQ)**, The Academy of Environmental Biology (India).
  - **Member**, International Society of Environmental Protection Gorakhpur, U.P.
  - **Patron**, Parayavaran Chetna, a monthly Hindi periodical on Environmental Issues.
  - **Editor-in-chief**, Ecophysiological & Occupational Health, Published by The Academy of Environmental Biology, Lucknow.
  - **Fellow**, The Academy of Environmental Biology (India).
  - **Fellow**, Bioved Science Society of India.
  - **Life member** Indian Network for Soil Contamination Research.
  - **Member Advisory Board** – Environment Conservation Journal.
  - **Advisor** National Academy of Biological Sciences and rural Development, Allahabad.
  - **Member/Vice-Chairman** – State level Expert Appraisal Committee, U.P.(SEAC)MOEF notification New Delhi 12 July, 2007.
  - **Member of working committee** for State Ganga Basin Authority Govt. of U.P. Lucknow – 2010.
  - **Member of Research Advisory Council (RAC)** of Directorate of Coldwater Fisheries Research (DCFR) for 3 years (April 2010 to onwards).
  - **Member of Executive Council 2010**, SWSM, Department of Rural Development, Govt. of U.P. for 3 years.
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**Awards won (full particulars such as Agency/Organization which gave the awards)**

- **Awarded, Archana Gold Medal** of The Academy of Environmental Biology, India.
  - **Visiting Fellow**, CRI, 7<sup>th</sup> November to 2<sup>nd</sup> December, 1994 at Bangkok, Thailand.
  - **Gold medal** and appreciation certificate for organizing a symposium on “Environmental Impact Assessment for Sustainable Development” (Dec. 21<sup>st</sup>, 1997 at IITR, Lucknow) at Bareilly College, Bareilly during Annual Meeting of AEB, 1999.
  - **Visiting Fellowship** at Chulabhorn Research Institute, from November 20-29, 2003, Bangkok, Thailand
  - **Scientist of year 2006 awarded** at B. H. U., Varanasi 2006.
  - **Visiting Fellowship award** of CRI, Bangkok, Thailand from 23 January 2006 to 10 February 2006.
  - **Certificate of Accomplishment** - Training course on water quality testing during 10-12 July 2002 organized by Upper Ganga Basin organization Ministry of Water Resources, Govt. Of India.
  - **Certificate of Honor** - The Training course on Water Quality Assurance July 23-26, 2002 by Human Resource Development Cell PHED, Punjab.
  - **Guest of Honour 2008** - National Workshop on Green Building: Striding towards Environment Protection & Clearance jointly organized by MOEF & SEARCH Foundation at New Delhi.
  - **Esteemed Guest of Honour 2008** - Ministry of Renewable Energy Resources and SEARCH Foundation at New Delhi.
  - **The Academy of Environmental Biology (AEB) Honour 2008** – Honoured by Prof. T Ramasami, Secretary, Department of Science & Technology, Govt. of India, New Delhi at Jamia Hamdard (Hamdard University), New Delhi.
  - **Guest of Honour 2010** in workshop of Aqua farming at College of Fisheries, GB Pant University of Agriculture and Technology 16-17, March 2010.
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**Significant research contributions made in the area of Science/Technology/Engineering disciplines during the past 10 years**

**Contributions in R & D**

Toxicity and fate of pesticides such as endosulfan, lindane and phosphamidon were studied and established in the animal models, viz. cat, rabbit, rat, mice and freshwater fishes following the selected parameters showed promising tools for safety evaluation. Attempts have been made to establish the correlation between the role of various neurotransmitters and behavioral responses in these models. Pharmacokinetic studies of the test pesticides were

determined along with its distribution pattern in the vital organs followed by the changes in the cardiovascular system of treated/exposed animals.

Baseline data on the microbial diversity of the Gangotri glacier was generated from Gomukh to Rishikesh and it is concluded that the ratio of *E. coli* and *F. streptococci* reflecting towards the original of fecal coliforms from animals. Occurrence and distribution of fecal coliforms are noticed at all the sites except Haridwar. However, physicochemical parameters are found to be similar at all the sites.

The removal of chromium, arsenic and lead from drinking water is a recurring challenge especially in developing countries. The aim of our study was to establish broad spectrum adsorbents which can be used for the removal of these metals. A variety of natural products and indigenous minerals have been collected/keeping in view of its cost considerations and availability. Several adsorbents studied for the removal of chromium however, SIGNH is found most suitable which can remove more than 92% of chromium. Apart from, the impregnation of silver with GNH is not only enhancing the process of removal, but at the same time it disinfects the water from the bacteriological contamination. This adsorbent has been validated in the samples collected from the endemic area of chromium contaminated ground water and found its suitability for the development of technology. Active participation in the national mission scientific programme viz. National Drinking Water Mission, Antarctica expedition and biodiversity of Himalayan Glaciers have been appreciated.

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### **Other relevant information**

#### **Principal Investigator / Co-Principal Investigator in Grant in-aid Projects**

- Biological Approaches for the Assessment of Pesticides Toxicity in Fresh Water Fish, Council of Science and Technology, U.P., India.
- Screening of indigenous mineral for fluoride removal, Ministry of Rural Development (Govt. of India).
- Biodiversity of Anaerobes on Maitri-Antarctica –Sponsored from CSIR-DOD.
- Effectiveness of the active ingredients of plants in elimination of undesirable chemicals and pathogenic microorganisms from Raw Drinking Water.
- Toxicity and fate of fluoride in aquatic ecosystem with particular reference to fresh water fishes, Council of Science and Technology, U.P., India. (1999-2000).
- Microbial Biodiversity and Environmental quality Studies at Gangotri-Glaciers Sponsored from DST, New Delhi.
- Impact of Anthropogenic Activities on Ecophysiology of Gangotri Glacier Sponsored from U.P. Council of Science and Technology, Lucknow.
- Appropriateness of H<sub>2</sub>S strips for the determination of faecal coliform (UNICEF and RGNDWM).

- Ecotoxicological Impact Assessment and Remediation of Contaminated Sediments of the River, Gomti Sponsored by UP-CST, Lucknow.
- Toxicity Evaluation of Leachates of Solid Industrial Hazardous Waste Sponsored by Ministry of Environmental Forest, New Delhi.
- National Environmental Health Profile and Comparative of Health Risk Assessment Sponsored by MOEF, New Delhi and WHO.
- Use of natural products as drinking water purifier Indo-French collaborative research programme.
- Study of the status of fish biodiversity, hydrobiology energy flow and breeding with a view to formulate strategy for sustainable utilization of fishery resources in Ramgargh Lake of the Gorakhpur, U.P. Sponsored by UPCAR, Lucknow.
- Investigations on toxic strains of cyanobacteria, in Nanital nature and concentration of their toxins and potential causes of their blooms Lake (Uttaranchal) sponsored from DST, New Delhi.
- Mobilization of arsenic to the ground water and its mitigation in the endemic areas of Uttar Pradesh. Council of Science & Technology, U.P. Lucknow GAP-211.

### **Supervised Ph.D. Students:**

1. **Dr. M.D. Ram**, Lecturer in Zoology, Dr. Ram Lakhan Shukla P.G. College, Rampur (Faizabad University). **Topic:** Studies on some physiological consequences of pesticides stress to the fresh water fish *Channa punctatus*. (Kanpur University, Kanpur, 1991).
2. **Dr. (Mrs.) S.L. Srivastava**, Technical Officer E1, Aquatic Toxicology Division, ITRC, Lucknow. **Topic:** Toxicity and fate of carbamate pesticides to the blood constituents of fresh water fish *Clarias batrachus* (Dr. Ram Manohar Lohia Avadh University Faizabad, 1995)
3. **Dr. (Mrs.) Anubha**, Department of Zoology, DAV, P.G. College, Muzaffarnagar. **Topic** Effect of environmental factors on the toxicity of Organo-chlorine pesticides to aquatic insects (Meerut University, Meerut,1995).
4. **Dr. Suresh Kumar**, M.D. University, Rohtak.  
**Topic :** Toxicity of deltamethrin on fresh water teleost with particular reference to calcium homeostasis and ionic balance (2001).
5. **Dr. Vinay Singh Baghel**, Dr. R.M.L. Avadh University Faizabad (U.P.). **Topic:** Studies on Microbial Flora of Bhagirathi basin (Gangotri Glacier) and Evaluation of their Biotechnological prospects.
6. **Mr.Agha Parvez Masih**, Purvanchal University, Jaunpur. **Topic:** Impact of anthropogenic activities on the Ecophysiology of Gomti river at Jaunpur (U.P.).
7. **Mr.Rajesh Gupta**, Lucknow University, Lucknow. **Topic:** Pathophysiological consequences to fresh water fish *Channa punctatus* induced by fluoride.
8. **Mrs. Kshama Pandey**, Department of Zoology, Lucknow University, Lucknow.  
**Topic:** Studies on water with special reference amphizoic amoebae (2005).

9. **Mr. Animesh Tripathi**, Department of Zoology, Lucknow University, Lucknow.  
**Topic:** Effect of fluoride on fresh water fish *Channa punctatus* (2006).
10. **Ms. Shweta Agrahari**, Department of Zoology, Lucknow University, Lucknow.  
**Topic:** Studies on monocrotophos induced biochemical and histopathological changes on *Channa punctatus* (**Bloch**) (2007).
11. **Ms. Shashi Prabha Dubey**, Lucknow University, Lucknow (2008).  
**Topic:** Use of Natural products for the purification of drinking water
12. **Mr. Satish Chandra Shukla**, H.N.B. University, Garhwal, (Srinagar) Uttarakhand (2008).  
**Topic:** Development, safety evaluation and comparative studies of low cost adsorbent technology for arsenic removal from drinking water.
13. **Mrs. Sangeeta Singh**, Department of Botany, Lucknow University, Lucknow (2009).  
**Topic:** Toxicity Assessment of Industrial Solid Waste Using Biological Indicators.

### Supervised MD Students

1. **Dr. Amit Tandon** (1996), Fluoride analysis in Dental Binding Material, Dental College, K.G.M.C., Lucknow.
2. **Dr. Sharad Kumar** (1997), Role of *Azadirachta indica* on Periodontal Health Dept. of peridontics Faculty of Dental Sciences K.G.M.C., Lucknow Supervised M.Sc. student.
3. **Dr. Rohit Anand** (2005), U.P.K.G.M.U. of Dental Sciences Lucknow: An estimation of fluoride concentration after use of different fluoridated mouth rinse.
4. **Dr. R. N. Bahadure** (2008), Faculty of Dental Science, CSM Medical University, Lucknow. Estimation of fluoride releases from different restorative materials at different pH an in vitro study.

### Registered for Ph. D.

1. Effect of fluoride on neuromuscular and behavioral responses of male albino rats. **Mr. Vinod Kumar Bhartiya** D.B.S. (P.G.) College, Dehradun ,H.N.B. Garhwal University Sri Nagar Garhwal (Uttaranchal), India.
2. Feasibility study of sensor for detecting green house gasses and arsenic pollution in water. **Ms. Mamta Pandey**, Deptt. of Physics, Lucknow University, Lucknow.

### Thesis Submitted

1. Studies on the effect of Socio-biological stress on the ecological parameter of Gomti River water. **Mrs. Archi Shukla**, Department of Zoology, Lucknow University, Lucknow.
2. Eco-physiological studies of Gomti River with particular reference to Ichthyo-Fauna. **Sharad Chandra Srivastava**, Department of Zoology, Lucknow University, Lucknow.

3. Studies on Toxicological impact of arsenic of Fresh Water Fish (*Channa punctatus*). **Mrs. Richa Bajpai**, Department of Zoology, Lucknow University, Lucknow.

### **Supervised M. Sc. Students for Project Dissertation**

1. Identification and isolation of cyanobacteria from Gomti river water **Ms. Rachna**, Deptt. of Botany, Lucknow University, Lucknow, 1997.
2. The effect of distillery effluent of the haematological parameters of fresh water catfish, *Clarias batrachus*. **Ms. Sivani Bakshi**, Deptt. of Botany, Lucknow University Lucknow 1999.
3. The effect of distillery effluent of the biochemical parameters of a fresh water fish *Channa punctatus*. **Ms. Seema Singh**, Deptt. of Botany, Lucknow University Lucknow 1999.
4. The effect of distillery effluent on the morphological and behavioural changes in freshwater teleost *Channa punctatus*. **Ms. Ruchi Singh**, Deptt. of Botany, Lucknow University Lucknow 1999.
5. Fluoride in Deosingh Khera village (Distt-Lucknow). **Mr. Rajiv Pande**, Dr. R.M.L. Avadh University, Faizabad, 1999.
6. Isolation, identification and characterization of bacteria from fresh water fishes. **Ms. Sangeeta Chandelkar**, Institute of microbiology & Biotechnology (Barkatullah University) Bhopal, 2000.
7. Impact of sodium arsenite on *Channa punctatus* **Ms. Richa Bajpai**, Department of Env., C.S.M. University, Kanpur 2003.
8. Isolation, identification and characterization of coliform bacteria from drinking water'. **Mr. Deepak Kumar Singh**, Department of Botany & Microbiology, Gurukul Kangri Univ. Haridwar, 2004.
9. Effect of Monocrotophos for behavioral and biochemical responses in teleost *H. fossilis*. **Mr. Sharad Chandra Srivastava**, Department of Applied Aquaculture, Barkatullah University, Bhopal, 2005.
10. Toxicity and Fate of heavy metals in fresh water fish *Channa punctatus*. **Mr. Hemant Kumar Bist**, Deptt. of Env. Sci. Gurukul Kangri Univ. Haridwar.
11. Characterization of Bacterial Population in metal exposed fresh water fish (*Channa Punctatus*). **Miss. Vijya Verma**, Doon (P.G.) Paramedical College, H.N.B. Garhwal University, Srinagar Garhwal.
12. Detection of metal tolerant coliform species in drinking water. **Ms. Jayshree Ghosh**, B.Sc.(Hons) Microbiology) AAI, Allahabad.
13. Detection of antibiotic resistant coliform species in drinking water . **Mr. Gaurav Nigam**, B.Sc. (Hons) Microbiology AAI, Allahabad.
14. Detection of antibiotic resistant coliform species in drinking water. **Ms. Vandana Singh** , Msc.(Hons) Microbiology AAI, Allahabad.
15. Isolation and characterization of aeromonas species from *Channa punctatus* **Bloch**, a fresh water fish, exposed to Lead. **Mr. Ranjan Singh**, M.Sc. (Microbiology) Department

- of post graduate studies and research in biological science, Rani Durgavati Vishwa Vidyalaya, Jabalpur, (M.P) 2006.
16. Isolation and characterization of aeromonas species from fresh water fish exposed to Chromium. **Ms. Jyoti Raturi**, M.Sc. (Microbiology), Sai Institute of Paramedical and Allied Sciences, Dehradun 2006.
  17. Isolation and characterization of aeromonas species from fresh water fish exposed to Cadmium. **Mr. Gaurav Naik**, M.Sc. (Biotechnology), Dr. Ram Manohar Lohia Avadh University, Faizabad 2006.
  18. Isolation and characterization of aeromonas species from Toxicity of Arsenic in fresh water fishes. **Ms. Anuradha Tewari**, M.Sc. Department of Environmental Sciences, C. S. M. University, Kanpur 2006.
  19. **Ms. Namrata Nath**, M.Sc. Zoology, Department of Zoology, M.L.K. (P.G.) College, Balrampur, 2007.  
**Topic : Impact of Environmental factors on ecosystem of Gomti River**
  20. **Ms. Shahla Khan**, M.Sc. Microbiology II<sup>nd</sup> year , Department of Biotechnology, Integral University (Deemed University) Lucknow, 2008.  
**Topic : Aerobic Bacterial Density in Vital organs of Morbid Fresh Water Fish, *Heteropneustes fossilis*, Bloch**
  21. **Ms Nazia Khan**, M.Sc. (App. Microbiology) II<sup>nd</sup> year, Department of biotechnology, V. B. S. Purvanchal University, Jaunpur (U.P), (2008).  
**Topic : Bactericidal efficiacy of silver ion as a disinfection of drinking water.**
  22. **Ms. Shuchi Shukla**, M.Sc. Microbiology, Jiwaji University, Gwalior (M.P)(2009).  
**Topic: Bactericidal activity of silver on Esherichia coli for disinfection of drinking water under different pH and temperature.**
  23. **Mohammed Irfan**, M.Sc. Microbiology, Integral University Lucknow (2010).  
**“Bactericidal efficacy of copper for disinfection of drinking water”.**
  24. **Neelesh Gangwar**, M.Sc. Biotechnology, H N B Garhwal University, Srinagar (2010).  
**“Bactericidal efficacy of Silver Ions for disinfection on water”.**

### Societal Activities/Technical Report of Water Quality:

1. Allahabad
2. Gorakhpur
3. Doda, J &K
4. Udhampur, J & K
5. Rajouri, J &K
6. Jammu, J &K
7. Bageshwar, U.P.
8. Kangra, Himachal Pradesh
9. Contribution of ITRC to Rajiv Gandhi National Drinking Water Mission (1996-1997).
10. Determination of *E. Coli* in the Sodic Land area of U.P.
11. Base papers on water quality monitoring kits surveillance in rural areas, ITRC publication 1998. Water quality monitoring and kits RGNDWM-UNICEF.

12. Base paper on Water Quality Test Kit for Arsenic, Fluoride and Nitrate ITRC, Publication 1999.
13. Contribution of ITRC to Rajiv Gandhi National Drinking Water Mission 1986-98 ITRC, Publication 1988.
14. Water Quality surveillance in the flood affected areas of Gorakhpur and Deoria and to suggest preventing safety measures: ITRC, publication 1998.
15. Mitigation of Drinking Water Quality in the cyclone affected areas of Orissa a CSIR efforts November, 1999.
16. Assessment of Environmental Status of Lucknow City 5<sup>th</sup> June, 2003.
17. Assessment of Environmental Status of Lucknow City 4<sup>th</sup> November, 2003.

### **Public Awareness Programmes**

- |       |   |                               |
|-------|---|-------------------------------|
| i)    | Lucknow, U.P.   | 02.01.1990-05.01.1990         |
| ii)   | Nainital (Uttaranchal)  | 20.07.1990-26.07.1990         |
| iii)  | Jammu, J & K  | 20.05.1990-29.05.1991         |
| iv)   | Gorakhpur, U.P.   | 27.04.1991-30.04.1991         |
| v)    | IITR, Lucknow, U.P.   | 27.05.1992                    |
| vi)   | Midnapore, W.B.   | 24-28 March, 1992             |
| vii)  | Coimbatore, T.N.  | 14-18 September, 1992         |
| viii) | UP Jal Nigam, Lucknow   | 22-26 September, 1992         |
| ix)   | Training on the Water Testing Kit<br>Patna in collaboration with India<br>Institute of communication and Human<br>Relations   | 25-29 May, 1993               |
| x)    | Bakkas, Lucknow, U.P.   | July, 1993                    |
| xi)   | Deosingh Khera, Lucknow   | 5 June 1994-28 February, 1995 |
| xii)  | Sivdaspur, Jaipur   | 18 January, 1996              |
| xiii) | Gorakhpur (in 8 blocks)   | October, 1998                 |
| xiv)  | Water Quality Surveillance in Problem Villages of 30 Districts of U.P. Sponsored by U.P. Jal Nigam, Lucknow, 2001.  |                               |
| xv)   | Water Quality Surveillance with Suggestive Safety & Preventive Measures in the Flood Affected Areas of Gorakhpur and Deoria District of U.P. Sponsored by UP-CST, Lucknow ( 27 Sept.– 5 Oct. 2001) Water Quality Surveillance in Problem Villages of 30 Districts of U.P. Sponsored by U.P. Jal Nigam, Lucknow. |                               |

### **Demonstration/Exhibitions**

- |      |                |                         |
|------|----------------|-------------------------|
| i)   | Etawah, U.P.   | 08.09.1990 - 10.09.1990 |
| ii)  | Fatehpur, U.P. | 09.10.1990 – 11.09.1990 |
| iii) | Jhansi, U.P.   | 06.03.1991 – 10.03.1991 |
| iv)  | Ballia, U.P.   | 06.03.1991 – 10.03.1991 |
| v)   | Bahraich, U.P. | 07.08.1991 – 08.08.1991 |

vi) New Delhi (Teen Murti House)	22.10.1992 – 05.11.1992
vii) Mandi, H.P.	19.02.1992 – 05.11.1993
viii) Bakkas, Lucknow	
ix) Kopa Ganj, U.P.	29.12.1993 – 30.12.1993
x) Gorakhpur	21.03.1998 – 24.03.1998
xi) Allahabad	17.06.1998 – 20.06.1998
xii) Neemsar	28.02.1999
xiii) Allahabad (The National Academy of Sciences)	24.12.1999
xiv) Lucknow University Lucknow Science Congress	January 3-7, 2002

### **Papers /Abstracts Presented in Conferences/Symposia/Workshops**

1. Pollution and animal life in Chilwatal (Gorakhpur). Symp. 63<sup>rd</sup> All India Sci. Cong. Assoc., 1975, Delhi University, Delhi.
2. A preliminary study on the fresh water insects of the lake Chilwatal (Gorakhpur). Proc. 3<sup>rd</sup> All India Cong. Zoology, Waltair, 1976.
3. Control of mosquito larvae by an aquatic insect *Ranatra elongat* (Fabr). 65<sup>th</sup> Indian Science Congress Ahmedabad, 1978, 73 : 225.
4. Toxicity of Dimecron to teleost fish *Colisa fasiatus*. 65<sup>th</sup> Indian Science Congress Association 1978, 91 : 236.
5. Analysis of the waste, effluent discharged from fertilizer factor, Gorakhpur Proc. Nalt. Acad., Rajkot, 1979.
6. Physical factors and distribution of aquatic insects in Chilwatal, Gorakhpur, 1979.
7. Chronic toxicity of endosulfan in rat brain. Meeting of Society to Toxicology. ITRC, Lucknow, 1979.
8. Ammonia as toxicant in Chilwatal, Gorakhpur, Annual Meeting of Society of Toxicology, 1979,21.
9. Oil pollution in Chilwatal, Gorakhpur, Annual Meeting of Society of Toxicology 1979, 21.
10. Toxicity of endosulfan to aquatic organisms. Annual Meeting of Society of Toxicology, ITRC, Lucknow, 1979.
11. Occurrence of fish diseases and parasites in polluted environment. Fish and fisheries 2<sup>nd</sup> All India Seminar on Ichthyology, Nainital, 1979, 28-31.
12. Effect of endosulfan on the blood of cat and cat fish. Symp. Science and Technology. Gorakhpur University, Gorakhpur, 1980.
13. Behavioural indexes in the assessment of endosulfan toxicity of fish. All India Symposium on physiological responses of animals to pollutants. Dec. 9-11, 1982. Department Zool. Marathwada University, Aurangabad.
14. Behavioural toxicity in fish exposed to endosulfan: Symposium on Testing and Ecotoxicology-Methods and their evaluation IAES and SDCOTOX. Neuherberg, Germany, 1982.



15. Biochemical and behavioural changes in fresh water fish after endosulfan exposure. 3<sup>rd</sup> FAOB 29<sup>th</sup> Nov. to 2<sup>nd</sup> Dec. 1983, Bangkok, Thailand.
16. Effect of endosulfan on cholinergic transmission IVPAC July 1984, Berbion, Centre, London, U.K.
17. Endosulfan induced physiological biochemical and behavioural changes in fish. National Symposium on Assessment of Environment Pollution due to Industrialization and urbanization 22-23, Dec. 1994, Deptt. of Zoology, Marathwada University, Aurangabad, No. 58, pp 53.
18. Endosulfan induced inhibition of 5HT uptake by blood platelets in rat. Asian Congress of Pharmacology, 15-19 January 1985, New Delhi.
19. Chronic toxicity of lindane in malnourished rats. V<sup>th</sup> Annual Conf. Soc. Toxicol. Nov. 1-3, 1985, ITRC, Lucknow.
20. Behavioural and biochemical alteration associated with lindane exposure in teleost fish. International Conferences on Pesticides Toxicity and Risk Assessment. October 27-31, 1985, ITRC, Lucknow.
21. National Symposium on Industrial Pollution and pesticides in context to Bhopal tragedy Dec. 3-5, 1985, Zoology Department, Gorakhpur University, Gorakhpur.
22. Behaviour modeling approach for the assessment of environmental pollution. Plenary lecture IX AMSE International Conference at Gorakhpur, Dec., 27-30, 1985.
23. Assessing tolerance to pesticides stress in fresh water fish, National seminar on fish and their environment. Dec. 15-18, 1986, Gurukul Kangari University Haridwar.
24. Toxic and sublethal effect of hexachlorocyclohexane (HCH) to teleost fish *Channa punctatus*. National Symposium on Ecotoxicity, 18-20 June, 1987, Aurangabad.
25. Effect of organochlorine pesticides on electroencephalogram (EEG) of pigeon brain. National Symposium on Ecotoxicity, 13-20 June, 1987, Aurangabad.
26. Hexachlorocyclohexane (HCH) induced neurohumoral changes to protein deficient rats. VII National Conference on Indian Academy of Neuroscience. March 6-8, 1988, IICB, Calcutta.
27. Assessing tolerance limit to stress of HCH in fresh water fish *Channa punctatus*. Symposium on Environmental Risk Assessment and Management. Jai Research Foundation, Valvada Gujarat, December 29-31, 1988.
28. Hexachlorocyclohexane (HCH) induced changes to aggregatory responses and 5HT uptake of platelets in rats fed on protein deficient diet. International Conference on Biomembranes in Health and Disease. November 1-4, 1988, IITR, Lucknow, India.
29. Cellular bioassay for the assessment of pesticides toxicity in fresh water fish. Bhubaneswar 100 years of Fishery Research. Central Institute of Fisheries and Aquaculture, November 1989.
30. Neurobehavioural changes in fresh water fish exposed to HCH. Indian Academy of Neurosciences. March 16-18, 1990, IITR, Lucknow.
31. Stress responses in fresh water fish exposed to HCH. Indian Academy of Neurosciences 16-18, 1990, IITR, Lucknow.
32. Neurobehavioural and cardiovascular sequelae of intoxication by hexachlorocyclohexane (HCH) in rats. 12<sup>th</sup> European Society of Comparative Physiology and Biochemistry meeting held at Utrecht, The Netherlands, August, 27-31, 1990.

33. Stress mediated immune suppression and disease syndromes in fresh water fish. 2<sup>nd</sup> Congress of Toxicology in Developing Countries, Nov. 24-28, 1991.
34. Toxicity of organochlorine pesticides: Hexachlorocyclohexane to aquatic insects collected from fresh water lake. 14<sup>th</sup> Annual Meet. Environ. Biol. Dec. 27-19, 1992, Meerut College, Meerut.
35. Investigation of a hepatotoxic bloom and its toxin isolation. Annual Meeting Acad. Environ. Biol. Dec. 27-29, 1992, Meerut College, Meerut.
36. Study of bio-environmental parameters over the Indian Antarctic station Maitri. November 7-9, 1993, AEB Annual Meeting at Indore.
37. Morphological and pathological impact of endosulfan and lindane on aquatic insect *Chironomus* (Chironomidae). AEB Meeting, November 7-9, 1993.
38. Isolation and characterisation of bioluminescent bacteria from indigenous sources. Academy of Environ. Biol. November 7-8, 1983, Indore.
39. Jaiv Samudri Khadya Sroton par Carbanic Avam Dhatwic Vishaluta Ka Anklan, Tritiya Akhil Bhartiya Rastriya Sangosthi Samudri Sansdhan Se Khadya Rasayan Avam Aushdhiyan, November 18-19, 1993, CSMRI, Bhavnagar, Gujarat.
40. Incidence of resistant *Aeromonas hydrophila* in some organs of infected fresh water fish *C. batrachus*. Int. Symp. Nutrients and Bioactive Substances in Aquatic Organisms. Sept. 9-10, 1993, CIFT, Cochin.
41. Contamination of drinking water and health risk. Seminar on Management of Water in the Himalayan and Shivalik Foothil of Uttar Pradesh, Defence Agriculture Research Laboratory, Pithoragarh, March 9-10, 1994.
42. Carbaryl induced perturbations in the level of certain enzymes in the blood of *Clarias batrachus*, a fresh water fish annual meeting Bioved Society, Feb 19-20, 1995, Allahabad.
43. Screening of carbon based sorbents for defluoridation of water in rural areas. Proc. Int. Sym. Clean Tech. 96 Brunel Univ. London. 19-21 June, 1996.
44. Pesticides induced alteration in immune responses: A causative factor in the decline of fish population. Symp. on Fish Genetics and Biodiversity Conversation by Sustainable Production. 20-27 September, 1996. NBFGR, Lucknow.
45. Deltamethrin induced physiological changes in fresh water cat fish *Heteropneustes fossilis* 19<sup>th</sup> Proc. Environ. Biol., 14-16<sup>th</sup> Nov., 1998 Bareilly College Bareilly.
46. Studies on bioefficacy of the extract of certain plants in control of bacterial population of different drinking water sources. 19<sup>th</sup> Proc. Environ. Biol., 14-16<sup>th</sup> Nov., 1998 Bareilly College Bareilly.
47. Health and social impact of contaminated drinking water in the urban supply. Workshop organised in Indo-French Collaboration at NGRI, Hyderabad between 22-23 March, 1999.
48. Risk Assessment of contaminated Drinking Water with particular reference of Human Health Proc. Acad. Environ. Biol. 8 page-60, 1999, 20<sup>th</sup> Annual Session Vishakhapatnam.
49. Deltamethrin Induced changes in ATPases and inorganic constituents in fresh water teleost *H. fossilis* Proc. Acad. Environ. Biol. 8 page 62, 1999, 20<sup>th</sup> Annual Session Vishakhapatnam.

50. Soil Microbial Flora of Antarctica (Schimaher Oasis) Proc. Acad. Environ. Biol. 8 page 63, 1999, 20<sup>th</sup> Annual Session Vishakhapatnam.
51. Risk Assessment contaminated Ground Water0Chemicals Indo-French Water Week Nov. 19-26, 1999, Hotel Hayat, New Delhi.
52. Deltamethrin induced changes in calcium homeostasis in the particular reference to  $Ca^{++}/Mg^{++}$  ATPase in fresh water cat fish *Heteropneustes fossilis*. International conference on Probing in Biological System Feb 7-11, 2000. Department of Zoology Institute of Science, Mumbai.
53. Freshwater cyanobacterial toxins and its effect. First National Conference on Aquatic Biotoxins 25-26 Nov. 1999, Indian Institute of Toxicology Research, Lucknow.
54. Enterotoxigenicity of enteric bacteria in water. First National Conference on Aquatic Biotoxins 25-26 Nov. 1999, Indian Institute of Toxicology Research, Lucknow.
55. Toxins produced by freshwater and marine fishes. First National Conference on Aquatic Biotoxins 25-26 Nov. 1999, Indian Institute of Toxicology Research, Lucknow.
56. Risk assessment of contaminated drinking water with particular relevance to human health. Training workshop on monitoring and analysis of toxic chemicals and biological toxins in food and water May 15-20, 2000.
57. Haematological alterations in fingerlings of fish *Labeo rohita* exposed to fluoride. Proc. Acad. Environ. Biol. 9, Suppl 200 page 51 Abstract No. 136. Symposium held on November 6-8, 2000 at Narendra Dev University Agricultural & Technology, Kumarganj, Faizabad.
58. Fluoride induced histopathological alterations in fresh water fish *Channa punctatus*. Proc. Acad. Environ. Biol. 9, Suppl. 200 page 54 Abstract No. 141. Symposium held on November 6-8, 2000 at Narendra Dev University Agricultural & Technology, Kumarganj, Faizabad.
59. Jaliya Vatavaran mein fluoride ki upasthiti evam matsya jeevan par puprabhav. Matsya evam parivesh rashtriya sangoshthi, August 10-11, 2000 Lucknow, organised by Kendriya Matsya Shiksha Sansthan Versova, Mumbai.
60. International Workshop on Fluoride in drinking: strategies, Management and Mitigation January 22-24, 2001 held at old Vidhan Sabha Bhawan Bhopal, attended by Krishna Gopal.
61. Susceptibility to antibiotics and metals in bacteria from organs of river fish. 21<sup>st</sup> Annual Session of Academy of Environmental Biology, India held at N.D. Univ. of Agriculture & Technology, Faizabad U.P. Nov. 6-8, 2000.
62. Physico-chemical characteristic of water quality of river Ganga with particular reference to Gangotri glacier. 21<sup>st</sup> Annual Session of Academy of Environmental Biology, India held at N.D. Univ. of Agriculture & Technology, Faizabad U.P. Nov. 6-8, 2000.
63. Studies on Bacteriological quality of water of upper stretch of Bhagirathi Basin. 21<sup>st</sup> Annual Session of Academy of Environmental Biology, India held at N.D. Univ. of Agriculture & Technology, Faizabad U.P. Nov. 6-8, 2000.
64. Deltamethrin induced changes in energy metabolisms and ionic status in tissues of *Heteropneustes fossilis*. 21<sup>st</sup> Annual Session of Academy of Environmental Biology, India held at N.D. Univ. of Agriculture & Technology, Faizabad U.P. Nov. 6-8, 2000.

65. Histopathological changes in gill of *Heteropneustes fossilis* induced by Deltamethrin. 21<sup>st</sup> Annual Session of Academy of Environmental Biology, India held at N.D. Univ. of Agriculture & Technology, Faizabad U.P. Nov. 6-8, 2000.
66. Internet info-Resources and Toxicological sciences with special references to Genetics. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
67. Fluoride induced behavioural and neuromuscular responses in rats. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
68. Deltamethrin induced changes in AT-Pase activity and ionic status in tissues of *Heteropneustes fossilis*. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
69. Bioaccumulation of heavy metals in fresh water mollusk (*Viviparous bengalensis*) of river Gomti. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
70. Antimicrobial resistance among enteric bacteria isolated from runoff of the Gangotri Glacier, Western Himalaya India. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
71. Major ion chemistry of Gangotri Glacier and upper stretches of river Ganga, Uttaranchal, India. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
72. Effect of Ascorbic acid on the recovery of fluoride induced alterations in fish *Clarias batrachus*. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
73. Assessment of pollution load in sediment/water of river Gomti with reference to heavy metals. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
74. Accumulation of fluoride in different tissues of the fresh water fish *Clarias batrachus*. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
75. Fluoride induced biochemical and reproductive alterations in the fresh water fish *Clarias batrachus*. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
76. Screening of suitable sorbents for the removal of arsenic and fluoride from drinking water. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002
77. Efficiency of modified H<sub>2</sub>S Test for faecal contamination in water. 22<sup>st</sup> Annual Session of Academy of Environmental Biology held at National Bureau of Fish Genetic Resources, Lucknow UP, September 11-13, 2002.
78. Contaminants in drinking water and use of indigenous minerals for its mitigation. National Workshop on Mitigating Potable Water Demands-Turnaround in Treatment Technologies, GGS Indraprastha University, Delhi January 17-18, 2003.

79. Contaminants in drinking water and its mitigation using cost effective adsorbents. National workshop on Priority Research and Technology Programme for Rural Water Supply and Sanitation, NEERI, Nagpur Feb. 2003.
80. Impact of Anthropogenic Activities on Ecophysiology of Gangotri glacier. Workshop on Gangotri glacier held at Geological Survey of India, Lucknow March 26-28, 2003.
81. Chronic Arsenic Toxicity International Training Course on Risk Assessment of Health /Environment and Impact CRI, Bangkok, Thailand 28<sup>th</sup> November, 2003.
82. Participated in National Seminar on Good Laboratory Practices 13-15 Jan 2005.
83. Ecotoxicity and fate of leachates generated from Hazardous Industrial Solid Waste. National Symposium October 22<sup>nd</sup> – 24<sup>th</sup> October, 2005 at Gulbarga.
84. Biochemical alteration induced by monocrotophos in the blood plasma of fish, *Channa Punctatus* (Bloch), National Symposium on October 22<sup>nd</sup> – 24<sup>th</sup> October, 2005 at Gulbarga.
85. Effect of fluoride on cardiovascular system in rats, National Symposium on October 22<sup>nd</sup> – 24<sup>th</sup> October, 2005 at Gulbarga.
86. Efficacy of silver ionization for drinking water disinfection, National Symposium on October 22<sup>nd</sup> – 24<sup>th</sup> October, 2005 at Gulbarga.
87. Efficiency, Characterization and safety evaluation of adsorbents for the purification of drinking water – An overview, National Symposium on October 22<sup>nd</sup> – 24<sup>th</sup> October, 2005 at Gulbarga.
88. International Conference on Toxicology, Environmental and Occupational Health Lucknow, India. 14-17 November, 2005. Industrial Toxicology Research Centre, Mahatma Gandhi Marg, Post Box No.80, Lucknow.
89. “Water Pollution and Aquaculture” presented at National Symposium organized by Bioved Research Society, Banaras Hindu University, 21 Feb. 2006.
90. Toxicogenic Responses in Fresh Water Fishes under the Environmental Stress 5-6 March, 2006 M. G. P. G. College, Gorakhpur.
91. National Conference on “Environmental Scenario: Challenges and Solutions” 23-25 December 2006, A.P.S University Rewa, Madhya Pradesh.
92. “Biotechnological Approaches to Harness Potentials of Coldwater Fisheries” 5-6 April 2007, NRCCF, Bhimtal, Distt. Nanital.
93. Water Quality Assurance, health effects and mitigation. Safe and affordable technologies June 28-29, 2007 Lucknow University.

### **Popular Articles:**

1. Ling Akristak Hormone-Pheromone. Vigyan Pragati, 1977.
2. New Trends in insect control. Pranilok, 43-48, 1978.
3. Paryavarn Aur Keetnasak Dawayan. Swatantra Bharat, August 20<sup>th</sup> 1988.
4. Water pollution its prediction and control. Pioneer, 1988.
5. Drinking water and health. Environmental & Health, 1992.
6. Banaspati Pariveshodwar dwara sandooshit Khetron se Dhatuon Ka Nistaran. Paryavaran Patrika, 1998. NEERI, Nagpur 40-42 (1998).

7. Peysa Jal Ka Chlorinikaran; Vardan Ya Abhishap, **Krishna Gopal** and Saroj Sharma "Vish Vigyan Sandesh" IITR, Lucknow, 6 (6), 13-14 (2000).
8. Paudhon dwara jal se pradushakon ka nistaran, Shashi Kant Trivedi avam **Krishna Gopal** "Vish Vigyan Sandesh" IITR, Lucknow, 6 (6), 47-49 (2000).
9. Himnad Apgaman (Glacieron ka pighalana); Sarvabhoomik Paryavarniya samasya Shashi Kant Trivedi avam **Krishna Gopal** "Vish Vigyan Sandesh" IITR, Lucknow, 7 (7), 47-48 (2001).
10. Biodiversity and its maintenance. Kartikeya Shukla, V.P. Sharma and **Krishna Gopal** "Envis News Letter" IITR, Lucknow, 10 (1), 2-5 (2002).
11. Toxicity and Fate of Arsenic in the Aquatic System/ Drinking Water , **Krishna Gopal**, Richa Bajpai and Madhu Tripathi "Envis News Letter" IITR, Lucknow, 14 (2), 8-12 (2007)

### Scientific /Popular Lectures

- Series of lecture at Lucknow University, Lucknow related to health problem with contaminated drinking water.
- Several talk included Vigyan Samachar at All India Radio and Doordarshan Kendra, Lucknow.
- Talk of pesticide toxicity at AIR, Rewa, MP.
- Talk on AIR and Doordarshan, Gorakhpur Station.
- Toxicology considerations of contaminated drinking water to human health. Organized by Ecomen, Lucknow and Allahabad on 27<sup>th</sup> Nov. 1992.
- The participants of refresher course at the Academic Staff College of Lucknow University on 14<sup>th</sup> March 1995.
- Session of exchange of ideas and concepts with the participants of refresher course Academic Staff College, Lucknow University March 22, 1995.
- Energy and Information within Environmental System (Enzymatic control of metabolic reaction) at School of Environmental Biology, A.P.S. University Rewa-486003 (M. P.), July 28-29, 1995.
- The workshop on "Biological Techniques and Speciman Preparation" organised at Dept. of Zoology, University of Lucknow from January 8-14, 1996.
- Environmental Impact Assessment with particular reference to biological system in Mass Communication in Science and Technology Programme of Lucknow University on 23-24 Sept. 1996.
- Control of fluorosis of endemic areas of Uttar Pradesh, Rae Bareli, Saraini, Unnao 1999 (UPHRD and UNICEF).
- Paryavaran Mai Sudhar : Industrial Waste Management. All India Radio July 8, 2000.
- Overview of the national status on water quality HIPA, Shimla 22 July, 2000. Training programme on Water Quality Analysis at Himachal Pradesh sponsored by RGNDWM, New Delhi.

- Overview of the national status on water quality H. P. Agricultural University Palampur, July 27, 2000. Training programme on Water Quality Analysis at Himachal Pradesh sponsored by RGNDWM, New Delhi.
- Sources of ground water pollution with special reference to Fluoride, Nitrate and Arsenic (Grand Hotel) a training programme on Executive Excellence Department Sponsored by UNICEF.
- Contaminated sources of drinking water and its impact on environment and health on the session of refresher course organised at Gorakhpur University, delivered by Krishna Gopal.
- Purification of water-New ideas about entrepreneurs a seminar on March 24, 2001 in Swadeshi Mela at NBRI Auditorium Lucknow, delivered by Krishna Gopal.
- Toxic Chemicals and Microorganisms in drinking water, Department of Zoology, University of Lucknow, Lucknow Sept. 3, 2001.
- Movement of Pollutants and its Impact on Ground water, Department of Zoology, University of Lucknow, Lucknow Sept. 5, 2001.
- Ecotoxicology assessment of hazardous chemicals, Department of Zoology, University of Lucknow, Lucknow Sept. 10, 2001.
- Impact of Anthropogenic activities on Himalayan Glaciers, Department of Zoology, University of Lucknow, Lucknow Sept. 10, 2001.
- Technologies in the field of water purification WALMI, Lucknow.
- Ongoing environmental and toxicology programmes of ITRC, Lucknow and contributions in the area of drinking water in the national context. Laboratories Environment et Mineralurgie, France 11<sup>th</sup> Dec 2001.
- Contamination of drinking water, its impact on health and technologies for mitigation of the problem. Laboratories Environment et Mineralurgie, France 18<sup>th</sup> Dec 2001.
- Contamination of Drinking Water and Associated Health Problems on 18<sup>th</sup> Feb 2002.
- Biological approaches toxicity evaluation using fish as model NATP workshop organized by NBFGR, Lucknow on 13<sup>th</sup> June 2002.
- Specific impact on various flora and fauna, training programme of water quality testing at upper Ganga Basin organization CWC, Lucknow July 10-12, 2002 at Lucknow University, Lucknow.
- Impact of water quality monitoring at upper Ganga Basin organization CWC, Lucknow July 10-12, 2002 at Lucknow University, Lucknow.
- Safe Drinking water and Human Health in 16 schools/ colleges of Lucknow city under YSA – 2004-05 (December 2004 and January 2005) Sponsored from UPCST, Lucknow.

**Place:**

**Date:**

**Dr. Krishna Gopal  
(Scientist F & Head)**