

CAREER IN TOXICOLOGY

Dr. Pawan Kumar Bharti

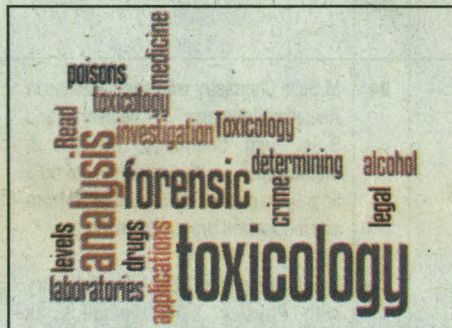
Toxicology is a branch of biology, chemistry and pharmacology concerned with the study of the adverse effects of chemicals on living organisms. It also studies the harmful effects of chemical, biological and physical agents in biological systems that cause damage in living organisms upto different extent. The relationship between dose and its effects on the exposed organism is of high significance in toxicology. Factors that influence chemical toxicity include the dosage (acute or chronic); the route of exposure, the species, age, sex and environment.

Toxicology involves observing and reporting symptoms, mechanisms, detection and treatments of toxic substances, in particular relation to the poisoning in humans. It includes environmental agents and chemical compounds found in nature, as well as pharmaceutical compounds that are synthesized for medical use by humans. These substances may produce toxic effects in living organisms including disturbance in growth patterns, discomfort, disease and death.

The goal of toxicity assessment is to identify adverse effects of a substance. Adverse effects depend on two main factors: i) Routes of exposure (oral, inhalation, or dermal) and ii) Dose (duration and concentration of exposure).

To explore dose, substances are tested in both acute and chronic models. Generally, different sets of experiments

are conducted to determine whether a substance causes cancer and to examine other forms of toxicity. Toxicity experiments may be conducted in vivo (using the whole animal) or in vitro (testing on isolated cells or tissues), or in silico (in a computer simulation).



Branches of Toxicology

There are several branches of toxicology, which focus on particular aspects of toxicology. These are: Aquatic toxicology, Medical toxicology, Chemical toxicology, Environmental toxicology, Clinical toxicology, Eco-toxicology, Forensic toxicology, Occupational toxicology, Regulatory toxicology, and Toxicogenomics.

Toxicology and career opportunities

As a profession, toxicology is very important, as people are concerned about the potentially harmful effects of products, medications and the chemicals they're exposed to in their daily lives.

Without toxicologists we would not understand what could potentially poison or harm living things as well as the environment around us. Toxicologist is one who explores the effects of chemicals on living organisms.. Toxicology covers two main areas- One deals with the effects that toxic materials have on humans and the other with their impact on the environment.

Toxicology is an enormous field of study that has so many subdivisions. Aspirants can pursue graduate or post-graduate courses in their respective areas of interest.

Major Courses:

Toxicology is a field that requires candidates from various interdisciplinary branches like biology, mathematics, veterinary sciences, pathology, physiology, immunology, and genetics. Not only do toxicologists figure out chemical make-up, they use their knowledge of biology, chemistry, and the environment to devise strategies to reduce or control exposure to these chemicals. To become a toxicologist one must take science stream in senior secondary level. After that one can opt for a bachelor degree in botany, chemistry, zoology, biochemistry, medicine, veterinary science, pharmacy, biochemistry, biotechnology, microbiology, environmental biology or some other life science based discipline.

Continued on page 47

CAREER IN ...

Continued from page 1

Science graduates can make career in their interests. Various degree/diploma courses are conducted by various universities/institutions in India and abroad. One can pursue different courses/degree in the field of toxicology. Few major courses are given below:

- B.Sc.- in Toxicology or Biological sciences
- M.Sc.- in Toxicology or Environmental Toxicology
- PG Dip. - in Eco-toxicology, etc.
- Short-Term Courses/ Diploma - in Aquatic ecology, Xenobiotics, Auditor, etc.
- Ph.D. - in Toxicology or environmental toxicology

Major Entrance Exams conducted in Toxicology are: (a) All India Postgraduate Medical Entrance Examination AIPMT (b) Combined Biotechnology Entrance Examination (c) Delhi University Medical Entrance Test (DUMET) (d) National Institute of Mental Health and Neuro Sciences Entrance Exam (e) National Institute of Pharmaceutical Education and Research Joint Entrance Examination - NIPER JEE (f) Punjab Medical Entrance Test and (g) Rajiv Gandhi University of Health Sciences Post Graduate Entrance Test.

Study centres /Institutions

- International Institute of Biotechnology and Toxicology, Kancheepuram (Tamil Nadu) - 601301
- Central Drug Research Institute, Lucknow (Uttar Pradesh) - 226021
- Indian Institute of Toxicology

Research, Lucknow (Uttar Pradesh) - 226001

- National Institute of Pharmaceutical Education and Research (NIPER - SAS Nagar), SAS Nagar (Punjab) (Mohali Dist.) - 160062
- School of Medical Science & Technology - IIT, Kharagpur
- Indian Institute of Science - Bangalore
- SCMS Institute of Bioscience and Biotechnology Research and Development, Kalamassery (Kerala) - 682033
- SCMS Institute of Technology and Management, Kochi
- Bhavans New Science College, Hyderabad (Andhra Pradesh) - 500029
- Institute of Reproductive Medicine - Kolkata
- Kasturba Medical College - Manipal.

Universities Carrying Out Exams in Toxicology

There are many universities and institutions, where one can pursue the above said courses. Few of them are: Aligarh Muslim University; All India Institute of Medical Science, Delhi; Allahabad Agriculture Institute; Anna University Annamalai University; Assam Agricultural University; Baba Farid University of Health Sciences

Bundelkhand University; Centre for Advancement in Health Sciences (CAHS);

CCS University Meerut (UP); Chaudhary Charan Singh Agriculture University, Hissar, Delhi University; Devi Ahilya Vishwavidyalaya; Dr BR Ambedkar University, Agra; Dr. Harisingh Gour University, Sagar; G. B. Pant University of Agriculture & Technology

(Veterinary Pharmacology & Toxicology), Pantnagar; Gujarat Forensic Sciences University; Guru Gobind Singh Indraprastha University (Forensic Toxicology); Guru Jambheshwar University; Indian Institute of Toxicological Research, Lucknow; Indian Veterinary Research Institute, Bareilly; Institute of Clinical Research India (ICRI) - New Delhi, Delhi; Jamia Hamdard University, Delhi; Karnataka University; Karnataka Veterinary, Animal & Fisheries University; Lucknow University; Maharashtra Animal & Fishery Sciences University - (Veterinary Pharmacology and Toxicology), Parbhani, Maharashtra; Mahatma Gandhi University; National Institute of Pharmaceutical Education and Research; Osmania University; Panjab University, Chandigarh; Pondicherry University; Punjabi University, Patiala; Rajiv Gandhi Institute of Health Sciences, Bangalore; Sardar Patel University; Saveetha University; Sikkim Manipal University; St. Xavier's College Mumbai; Tilak Maharashtra Vidyapeeth;

University of Calicut; University of Madras; University of Mumbai; University of Pune; Veer Narmad South Gujarat University - Surat, Gujarat and West Bengal University of Health Sciences.

Scope and career perspectives:

After pursuing a suitable degree or diploma in toxicology or environmental toxicology from the above said university or similar institutions, the candidate can choose any of the given options as per his qualification, interest and potential. The most popular occupations for professional career are: (a) Scientist - in Government or private Research

Institute (b) Lecturer/Professor - in University or academic institution (c) Lab in-charge - in testing laboratories (d) Scientific Officer - in scientific governmental organizations or NGOs (e) Assistant Manager - in corporate (f) Ecologist - for sensitive areas or special regions (g) Consultant - in consultancy or similar firms (h) Writer/Author - for various publishing houses or freelance (i) Scientific Journalist/Editor - for various magazines, newsletters (j) Analyst - in testing laboratories (k) Dy. Director/Scientist - in Govt. institutions/organization or ministries (l) JRF/SRF/RA/SRA - in various prestigious institutions like NIITs, IITs, IISc, TIFER, etc and (m) Technical Officer in bioscience organizations.

Apart from these, candidate can make his/her career as Drug Inspector, Pharma Manager, Biotechnologist, Toxicologist, Environmentalist, Forensic Inspector and many other posts. Candidate can start his career in the field of toxicological research or environment toxicology or biotechnology easily and can get a starting salary from 15-20,000 to 70,000 after promotion in various organizations.

Toxicology is one of the fast growing disciplines under science arena and having tremendous job opportunities for enthusiastic researchers. After completing education in toxicology subject opting this stream for career point of view is indeed very good idea in present conditions. One can create many opportunities for further researches, developments, innovations and even discoveries in this discipline.

(Author is a well known environmentalist & freelance writer. E-mail: gurupawanbharti@rediffmail.com)