

MANGALORE UNIVERSITY
Department of Applied Zoology
MSc Zoology

ZOH452: TOXICOLOGY AND CANCER BIOLOGY
TeachingHours 10/Unit

COURSE OUTCOME

1. Course focuses on different toxins of animal and also of microbial origin.
2. Understanding the mode of action of chemicals, toxins and fundamentals of toxicological assays.
3. Students are trained in forensic toxicological techniques. They are made aware of drug abuse and its ill effects..
4. They get basic knowledge on mutations, genotoxicity, carcinogens and carcinogenesis.
5. Advanced cancer treatment modalities are discussed.
6. Course helps students to get into various toxicological labs as drug inspectors, quality controllers and even as oncologists.

UNITI

Introduction- Definitions, What toxicologist study? Major subdivisions of toxicology. Dose-response relationships and their importance, basic components of tests generating dose-response data, Frequency response and cumulative response. Factors influencing toxicity- Route of administration, host factors-species, strain, age and sex, Biological factors- Accumulation and storage of chemicals in the organism. Biotransformation reactions. Role and mechanisms of xenobiotic metabolizing enzymes.

UNITII

Toxicological testing methods-Acute and chronic toxicity tests, LD₅₀, LC₅₀ and ED₅₀. Teratogenicity testing. Reproductive toxicology- Effect of xenobiotics on male and female reproductive organs/cells in mammals. Organ/tissues specific toxicity. Toxicity of metals (Lead, Mercury, Arsenic, Cadmium). Pesticide toxicity- Acute and Chronic effects of organophosphate, Organo-chlorine and Carbamate insecticides, Toxicity of pyrethroids. Bio-magnification. Natural toxins- Import microbial, plant and animal toxins. Treatment of toxicity- Antidotal therapy.

UNITIII

Foundations of Forensic Toxicology- classification of poisons, sign and symptoms of common poisons, antidotes, collection of samples. Drugs: Drugs of abuse, classification and identification. Narco analysis and brain mapping. Explosives: Classification, composition and characteristics of explosives, pyrotechniques, IEDs, explosion process and affects, types of hazards, effect of blast waves on structure Courtroom Testimony, Investigation of Toxicity-

Related Death/Injury, Documentation Practices, Considerations for Forensic Toxicological Analysis, Drug Concentrations and Distribution.

UNIT IV

Mutagenesis and genetic toxicology- Test systems of genotoxicity testing, Genotoxicity testing in mammals –Bone marrow chromosomal aberration, Micronucleus test, sperm abnormality assay, comet assay. Occupational and environmental exposure -Endosulphan tragedy. What is cancer?, classification of human cancers, Growth characteristics of cancer cells, tumor angiogenesis. Tumor staging. Causes of cancers-chemical carcinogenesis; Steps involved in chemical carcinogenesis. Radiation carcinogenesis-ionizing radiation, UV radiation.

UNIT V

Oncogenes-Functional class of oncogenes (proto-oncogenes), Mechanisms of carcinogenic transformations by oncogenes. Viral oncogenes. Tumor suppressor genes- mechanisms of tumor suppressor in cancer induction (P53). Patient – tumor interactions- Pain, nutritional effects, hematological effects, fever and infection hormonal effects, neurological and dermatological effects. Tumor immunology-mechanisms of immune response to cancer, natural killer cells, ‘Danger theory’.

REFERENCES

1. Albers, B., Bray D., Lewis J., Raff M., Roberts K. and Watson J.D. (1995) Molecular Biology of the Cell, 2nd edition, Garland Publishing Company Ltd. New York and London.
2. Becker, F.F. (Ed) (1975) Cancer, Vol.1-3, Plenum Press, New York.
3. Curry, (1986) Analytical Methods in Human Toxicology
4. Curtis, D. K., (2001) Casarett and Doull's Toxicology: the basic science of poisons, 6th edition, Mc-Graw-Hill Medical Publishing Division, New York.
5. Darnell, J., Lodish H. and Baltimore D. (1995) Molecular Cell Biology, Scientific American Books, New York.
6. Dekant, W. and Neumann H.G. (1992) Tissue –specific Toxicity: Biochemical mechanisms, Academic Press. Harcourt Brace Fovanovich, Publishers, London.
7. Duffus, J.A. (1980) Environmental Toxicology, Edward Arnold, Publishers, London.
8. Ernest Hodgson, (2010) A Textbook of Modern Toxicology, 4th edition, Wiley Publications. New Jersey.
9. Fan, A.M. and Chang L.W.(Ed) (1996) Toxicology and Risk assessment: Principles and methods and applications, Marcell Dekker publishers, New York.
10. Goldsmith, A., Aronow L., Kalman S.M. (1974) Principles of drug action: The basis of pharmacology. A Wiley Biomedical Health Publications, New York.
11. Habermehl, G.G. (1981) Venomous animals and their toxins, Springer-Verlag, Benlin.
12. Hayer, W. J., Jr Laws E.(1991) Vol.1,2 and 3, Hand book of pesticide toxicology, Academic Press Inc, California.
13. Heim, S. and Mitelman F.(1987) Cancer Cytogenetics, AlanR.Liss,InC., New York.

14. Kanth, S. (1989) Trends in environmental pollution and pesticide toxicology, Jagmandar Book Agency, New Delhi.
15. Kleinsmith, L.J. and Valeri M.K.(1995) Principles of Cell and molecular Biology, 2nd edition, Harper Collins College Publishers.
16. Lewin, B.(Ed)(1996) Genes, 7th edition, John Wiley and Sons, New York.
17. Loomis, T.A. and Wallace Hayes A.(1996) Loomis's Essentials of Toxicology, 4th edition, Academic Press Ltd, London.
18. Modi, J.K.(1988) Medical Jurisprudence and Toxicology, Tripathi N.M. Press Ltd., Allahabad.
19. Moriarty, F. (1983) Ecotoxicology, 2nd edition, Academic Press, London.
20. Prakash, R. (Ed) (1998) Recent trends in Toxicology, Agarwal Printers, Meerut, India.
21. Raymond, W.R. (2007) Cancer Biology, Oxford University Press, New York.
22. Sharma, P.D.(1999) Toxicology, Rostogi Publihers, Meerut.
23. Souhani R. (1986) Cancer and its management, Blackwell Publishers, Oxford.
24. Tiwari, S.N., (1987) Analytical Toxicology. Govt. of India, Publications, New Delhi
25. Tyson, C. A. and Frazier J.M (1983) Methods in Toxicology, Vol.1, Academic Press, London.
26. Urayuchi.K, Yamazaki M. (1978) Toxicology, Biochemistry and pathology of mycotoxins, Halsted Press book, Kadansh Ltd., Tokyo.
27. Watson, J.D, Gilman M., Witkowskyi J. and Zoller M. (1992) Recombinant DNA, 2nd edition, Scientific American Books, New York.

