

LSC 522 — RADIATION AND CANCER BIOLOGY

1. Interaction of radiation with matter, types of radiation, ionization and excitation, linear energy transfer, direct and indirect effects of radiation chemistry of water.
2. Biological effects of radiations, whole body irradiation and sensitivity of tissue units of radiation measurement, radiation levels and limits.
3. Cell survival curves, reproductive integrity, mechanism of cell killing, survival curves in mammalian cells, radiosensitivity and cell cycle, effect of X rays and high LET radiations.
4. Heritable effects of radiations, chromosomal and chromatid aberrations, point mutations, chromosomal and multifactorial diseases, genetic risk assessment, doubling dose, mutation component, bystanders effects, adaptive response.
5. Radiosensitizers, radioprotectors, radioprotection mechanisms, sulfhydryl compounds, WR series, dose reduction factor (DRF).
6. Mechanisms of DNA repair, photoreactivation, excision repair, postreplication recovery, base excision repair, nucleotide excision repair (NER), transcription coupled repair (TCR) and bulk DNA repair.
7. Radiation carcinogenesis, radiation induced signaling pathways.
8. Cancer incidence and mortality; origin of neoplastic cells; cancer as cellular disease; tumor cell growth kinetics.
9. Oncogenes and tumor suppressor genes.
10. Environmental carcinogens, carcinogen metabolism, chemical carcinogenesis; initiation, promotion and progression.
11. Animal models of cancer research, athymic nude mice model, syngeneic and transgenic mice models, etc.
12. Viral carcinogenesis mechanism, immunological aspects of cancer.
13. Cell cycle progression in cancer, cell signaling in cancer, apoptosis.
14. Tumor angiogenesis, invasion and metastasis.
15. Cancer surgery, radiation and chemotherapy; chemoprevention of cancer.

Suggested Readings

1. Radiation Biology – by Alison P Casarette
2. Radiobiology for the Radiologist – by Eric J Hall & Amato J Giaccia
3. An Introduction to Radiobiology – by A.H.W. Nias
4. Molecular Biology of Human Cancers - by Wolfgang Arthur Schulz
5. Biology of Cancer – by Robert Weinberg