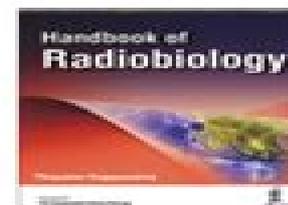


## Handbook of Radiobiology



**Editor:** Thayalan Kuppusamy  
**Title:** Handbook of Radiobiology  
**Published:** Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi, 2017  
**Pages:** 223 pages  
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This book is an addition to the number of books written by Prof. Kuppusamy on radiological physics, diagnostic radiology, radiation safety, and medical physics.

Medical physics being a multidisciplinary subject demands adequate knowledge of basic biology, radiation physics, cellular radiobiology, tumor biology, and biological effects of ionizing radiations. The author having gone through this rigorous training at erstwhile Directorate of Radiation Protection, Bhabha Atomic Research Centre, has effectively used his knowledge while creating this handbook. The information contained in this handbook can be obtained only by referring to a number of books, and these books are not easily accessible and also very expensive. Prof. Kuppusamy has tried to overcome this problem by writing this handbook.

The first chapter of the book deals with basic biology. Even though the chapter covers many aspects of biology, there is an ample scope to make this more informative by providing some more information on tumor biology and also by including a few illustrations to describe the human anatomy. There are also a few minor errors which, though not serious, could have been avoided.

The second chapter deals with basic radiation physics. This chapter provides information on the atomic structure, nature of radiations, interaction of radiation with matter, energy dissipation, attenuation of photons as well as particulate radiations, thus providing information relevant for understanding the basic principle of applications in diagnostic radiology and radiation therapy. In this chapter, inclusion of some information on radioactivity and some of the important isotopes used in therapy and diagnosis would have been useful.

Chapters 3–5 dealing with cellular radiobiology provide extensive information on the mechanisms of induction of damage, theory, and models of cell survival, physical, biological, and chemical factors modifying the radiation response. Even though the linear-quadratic model (LQ model) of cell survival is dealt in detail in a later chapter, it should have been introduced briefly in this chapter. The information contained in this chapter is important for understanding the radiation response of both the normal tissues and tumors.

Chapters 6 and 7 provide information on the biological effects of radiation in multicellular organisms, specifically in human beings. The mechanistic basis for the induction of deterministic and stochastic effects, kinetics of expression of early and late damage, normal tissue toxicity, human data from epidemiological studies on the induction of cancers, and risk estimation by ICRP have been discussed in this chapter.

The information provided here will be useful for radiation therapy students, radiologists, medical physicists as well as those engaged in radiation protection.

Chapters 8 and 9 deal with the biological bases of fractionated radiotherapy and brachytherapy. Chapter 8 focuses mainly on the radiobiological rationale of dose fractionation such as sublethal damage recovery, reoxygenation, and problems of repopulation in tumors with short potentially doubling time. Modified fractionation schemes and their applications in specific situations have also been discussed.

Chapter 9 describes the radiobiology of brachytherapy. The effect of dose rate and the role of 4Rs of radiotherapy, comparison of low-dose rate (LDR) and high-dose rate (HDR) protocol, rationale for choosing the fraction size for HDR, influence of geometric sparing, etc., have been discussed at length. It would have been good to include some information on the new radionuclides such as ytterbium-169, thulium-170, Cs-131, and Ru-106.

Chapter 10 of the book describes the time, dose, and fractionation models. The author has rightly reviewed the contributions of Strandquist, Ellis, and Orton in the development of cube root rule, nominal standard dose, time-dose factor, and cumulative radiation effect. Since these models have limited use and do not have sound biological mechanistic bases, they are fraught with uncertainties in predicting the physiological response. The author has pointed out these while explaining the limitations of these models. Most part of this chapter deals with more reliable biologically effective doses (BED) based on the LQ model of cell survival. To make it easier to understand Prof. Kuppusamy has provided many worked examples. These examples should enable the reader to easily understand the method of applying the model in practical situations. Many aspects such as gap correction, modified protocols such as accelerated fractionation, multiple

# Handbook Of Radiobiology

**Ensheng Dong**



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## **Table of Contents Handbook Of Radiobiology**

1. Understanding the eBook Handbook Of Radiobiology
  - The Rise of Digital Reading Handbook Of Radiobiology
  - Advantages of eBooks Over Traditional Books
2. Identifying Handbook Of Radiobiology
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Handbook Of Radiobiology
  - User-Friendly Interface
4. Exploring eBook Recommendations from Handbook Of Radiobiology
  - Personalized Recommendations
  - Handbook Of Radiobiology User Reviews and Ratings
  - Handbook Of Radiobiology and Bestseller Lists
5. Accessing Handbook Of Radiobiology Free and Paid eBooks
  - Handbook Of Radiobiology Public Domain eBooks
  - Handbook Of Radiobiology eBook Subscription Services
  - Handbook Of Radiobiology Budget-Friendly Options

6. Navigating Handbook Of Radiobiology eBook Formats
  - ePub, PDF, MOBI, and More
  - Handbook Of Radiobiology Compatibility with Devices
  - Handbook Of Radiobiology Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Handbook Of Radiobiology
  - Highlighting and Note-Taking Handbook Of Radiobiology
  - Interactive Elements Handbook Of Radiobiology
8. Staying Engaged with Handbook Of Radiobiology
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Handbook Of Radiobiology
9. Balancing eBooks and Physical Books Handbook Of Radiobiology
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Handbook Of Radiobiology
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Handbook Of Radiobiology
  - Setting Reading Goals Handbook Of Radiobiology
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Handbook Of Radiobiology
  - Fact-Checking eBook Content of Handbook Of Radiobiology
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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