

Preface

Environment carcinogens have been received more and more attention for human health. These carcinogens can be absorbed by cells, metabolized, and produces DNA damage, which directly affect the efficiency and fidelity of DNA replication. It has been realized that many diseases, including various cancers, are directly induced by environmental carcinogens. To understand how the carcinogens lead to diseases, firstly, we need to understand how these carcinogens lead to problems in DNA replication, because it is the first crucial factor for the integrity of genetic information and formation of mutation in life cycle. In this brief, we will discuss the DNA damage, which is formed due to the environmental carcinogens, disturbs DNA replication system through increasing the misincorporation ratio, blocking DNA replication and formation of frameshift, and destroying DNA replication by cross-linking. These researches are mainly based on DNA polymerases, and then, we will go to the level of DNA replisome, which is the complex of many proteins that perform DNA synthesis in a coordinated way. The DNA damage has obviously affected the leading- and lagging-strand DNA synthesis using the model replisome of *E. coli*, T4 and T7. Then, we further move to the level of cell. The environmental carcinogens have been identified to affect cell cycle, cell proliferation and apoptosis, and gene expression and tissue, through different and specific ways. In the last chapter, we will give the detailed protocols for studies of bypass of DNA damage by a DNA polymerase.

This brief is intended as a concise, handy overview of the main concepts that how environmental carcinogens and their corresponding DNA damage affect DNA replication and cell activities. Hopefully, this brief can provide some helpful insights for the research in biochemistry, molecular toxicology, microbiology, medicine, and cell biochemistry.

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