

Environmental Carcinogenesis, I. Bernard Weinstein

Cancer is of major importance in the field of public health since it is the second leading cause of death in the United States. Furthermore, the majority of cancers are due to environmental (exogenous) factors and therefore they are in principle preventable. At the same time genetic factors play an important role in determining individual risks of developing cancer. The environmental factors include cigarette smoke, industrial chemicals radiation, physical agents (asbestos, etc.), dietary factors and specific viruses and bacteria. Cigarette smoking causes about one-third of all cancers and tobacco carcinogenesis illustrates several basic principles. Carcinogens can act through two major mechanisms: 1) by damaging DNA and causing mutations (genotoxic mechanisms), or 2) by altering pathways of signal transduction and gene expression (epigenetic mechanisms, “tumor promotion”). Both types of mechanisms will be discussed. Cancer develops through a multistage process that involves abnormalities in multiple growth controlling genes called “oncogenes” and “tumor suppressor genes.” Dietary factors play an important role in both cancer causation and prevention. Thus, excess fat and caloric intake appear to increase cancer risks while fruits and vegetables have a preventive effect. Specific examples and possible mechanisms will be discussed. It appears that several types of human cancer are due to complex interactions between multiple factors (multifactor causation), including genetic factors, specific environmental chemicals, dietary factors and, in some cases, specific viruses and bacteria. Current guidelines for cancer prevention and future directions of research in this field will be briefly discussed.

Question: Describe the concept of “Molecular Epidemiology.”