Alcohol, Tobacco and Cancer
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Seven million deaths have been attributed to cancer in 2001. Of these 35% were attributable to nine potentially modifiable risk factors, including smoking and excessive alcohol consumption. Alcohol consumption is a leading risk factor for cancer of the upper aerodigestive tract (UADT, esophagus, pharynx, larynx and oral cavity), liver and colon, while smoking increases the risk of mouth, oropharyngeal, and esophageal cancers as well as cancer of the trachea, bronchus, lung, liver, stomach and urinary bladder. This book highlights general mechanisms leading to cancer, and provides the latest information on the underlying mechanisms, whereby alcohol consumption and tobacco use initiate and/or promote carcinogenesis.

Concurrent smoking and drinking, which is common, further increases the risk for cancers of the UADT. Several metabolic and genetic factors interact to increase the risk of carcinogenesis due to smoking and drinking. Acetaldehyde, which is the first product of alcohol metabolism (by cytosolic alcohol dehydrogenase [ADH], and, at high concentrations of alcohol, by CYP2E1) is also naturally present in tobacco. Acetaldehyde is carcinogenic by forming adducts with DNA and by inhibiting the DNA repair processes. Furthermore, procarcinogens present in tobacco smoke, such as aromatic and heterocyclic amines, are metabolized by CYP2E1, which is induced by alcohol, and by CYP1A2. Genetic variations in alcohol metabolizing enzymes that result in acetaldehyde accumulation (high-activity ADH variants, or the low-activity aldehyde dehydrogenase [ALDH] variant which is unable to metabolize acetaldehyde) contribute to the risk for various cancers. In addition, both smoking and drinking result in the formation of reactive oxygen species (ROS) which could result in DNA damage. Genetic factors,
including variations in ADH, ALDH, and CYP2E1, which increase the risk for cancers are addressed in this book. In addition, smoking and drinking interfere with retinoid metabolism and signaling, which can result in uncontrolled cell proliferation and cancer.

Several chapters address in detail the correlations between alcohol and carcinogenicity, and focus on specific organs such as UADT, liver, colon, pancreas and breast. Of particular interest is the notion that the risk for breast cancer appears to be significant even with moderate alcohol consumption. The impairment of methionine-folate metabolism and DNA methylation by alcohol, as well as the use of s-adenosylmethionine to prevent cancer, are addressed in a comprehensive manner. Also, the synergistic effects of ROS and iron in producing liver cancer are addressed.

Over 1.3 billion people use tobacco worldwide and cigarette smoking alone causes approximately 20% of cancer deaths globally. Several chapters are dedicated to the role of tobacco in lung and digestive tract cancers, and equally important to the prevention of tobacco-induced cancers, especially phytochemicals. Nicotine, a major alkaloid of tobacco, is responsible for smoking-related malignancies. The mutagenic, mitogenic, pre-carcinogenic, anti-apoptotic, and immunosuppressive properties of nicotine which are involved in the development of cancer, and the possible use of nicotine vaccine in the prevention of mortality associated with tobacco use are discussed.

In summary, this book contains a wide array of the state-of-science knowledge and addresses an important topic that highlights the association between cancer and smoking and/or drinking, two modifiable risk factors.

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