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Molecular Epidemiology and Fundamental Scientific Note on Genomic, Metabolomic, and Other Biomarkers of Cancer

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DESCRIPTION

The extent and complexity of the cancer problem in the United States of America now are far bigger than when the formal war against the disease was initially declared four decades ago. The disease's patterns are not fully explained by recognised risk factors. Much progress has been made in understanding the molecular basis of carcinogenesis, particularly the near-universal acceptance (realisation) that virtually all cancers are caused by an accumulation of genetic mutations and the more recent recognition of the role of inflammation and the tissue microenvironment, particularly in hormone-dependent cancers. Yet, most genetic mutations that lead to cancer are not inherited, and hence must be attributed to the accumulation of somatic mutations and epigenetic modifications caused by as-yet unknown environmental variables.

Most of the national effort to manage cancer has been centered on detecting and treating the disease rather than finding ways to prevent new instances from occurring. Considering this fact, studies suggested a cross-disciplinary paradigm for developing comprehensive environmental oncology research and policy institutes centered at chosen university cancer institutions across the country. The primary purpose of such institutions is to promote cancer prevention by generating effective therapies based on epidemiological findings, such as molecular epidemiology and fundamental scientific research on genomics, metabolomics, and other biomarkers of exposure, susceptibility, and disease. Based on existing information about cancer hazards in the personal, occupational, and general environment, these academic centres will develop specific interventions and/or policy recommendations to reduce the burden of cancer as the necessary scientific evidence for environmental factors contributing to cancer is revealed. Finally, the centres will increase their ability to detect and manage the underlying causes of cancer development and progression.

Lifestyle-related variables are not cancer-causing agents in and of themselves, but rather risk factors linked with cancer genesis, such as professional exposures, behavior-related behaviours, and addiction that lead to exposure to known or suspected carcinogens. While lifestyle-related factors are typically well determined and thus accessible to epidemiological studies, cancer-causing agents, due to their multiplicity, diversity, and diffuse nature in the environment, are more difficult to identify and recognise, and thus evidence through traditional epidemiological methods. Indeed, in the case of environmental carcinogens, researchers must analyse the biological and toxicological data in close contact with genetic vulnerability in the context of molecular gene-environment interactions in order to interpret epidemiological research in a more complete manner.

There are now two opposing theories of the rising cancer incidence. The first considers that environmental pollutants can only play a minor role in overall cancer incidence changes, and thus that population growth and ageing, lifestyle influences such as smoking, alcohol consumption, and diet, and new advances in diagnosis and screening procedures can explain the majority of the current increased cancer incidence. The second interpretation, on the other hand, believes that, in addition to these factors, there is a contribution from the environment and that involuntary exposure to various physical, chemical, and biological agents that may be present in an individual's surroundings plays a significant role in the occurrence of the disease.