

How does understanding cancer biology & genetics help in cancer prevention, detection & treatment?

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Abstract

Cancer is a broad concept covering a plethora of conditions characterised by uncontrolled cellular differentiation, proliferation and survival. The causes of cancer include genetic susceptibility, environmental factors, infectious agents and ageing. Irrespective of its varied causes, cancer has long been recognized as a multistage process involving an accumulation of genetic and epigenetic alterations that lead to changes in gene activity, and hence to altered phenotypes of cancer cells. At its core, cancer is a genetic disease. The understanding, even if partial, of the molecular and genetic mechanisms that underlie cancer initiation and progression has become an extremely fruitful source of new and innovative approaches to cancer prevention, detection and treatment. Extensive investigation of families with high risk and high incidence of specific cancer types led to the identification of several genetic cancer syndromes and the underlying cancer related genes. This knowledge has proven invaluable for the clinical management of affected families and for disease prevention of affected family members. The role of common genetic variation in determining individual susceptibility to cancer is also being increasingly recognised, and is expected to inform the design of strategies for prevention in groups at increased risk. Progress will most likely occur in a stepwise fashion with the biggest initial impact in diagnosis and molecular targeting of new medicines. The quest for biological and genetic markers has already resulted in major findings that are facilitating earlier cancer diagnosis and disease stratification. New treatments that target pathways specifically altered in cancer cells are underway for many cancers. Likewise, molecular analyses aimed at finding medicines with reduced toxicities are being conducted. Clearly, we are now approaching an era in which the understanding of cancer biology and genetics is likely to translate into clinically relevant interventions that will result in improved prevention, detection and treatment of cancer.