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Editorial

Molecular epidemology

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1. Introduction

Molecular epidemiology is a subdivision of medical science and epidemiology that emphases on the involvement of potential environmental and genetic risk factors, recognized at the molecular level, to the etiology and avoidance of sickness through populations.[1,2]

This pandemic has seen real contemporaneous for molecular epidemiology in action. Virus genome sequencing has been used in recent years for outbreak research during recent Ebola virus outbreak in Africa and arbovirus outbreak in America. However, the scale of genomic surveillance undertaken during the current covid pandemic is unprecedented.

During current pandemic, molecular epidemiology has been used to further study origins, to determine main routes of introduction and spread for outbreak investigations, to analyse regional, national & international epidemiological trends and to study potential immune escape.[3]

This arena has developed from the combination of molecular biology and traditional epidemiological research. Molecular epidemiology can improve our knowledge about the precise pathogenesis of disease through recognizing particular pathways that affect the risk of developing the disease. Furthermore, it tries to find how the collaborations between genetic characteristics and environmental exposures works in disease occurrence.[4,5]

Molecular epidemiology surveys are designed to help researchers to conduct etiologic study and increase our understanding about the disease determinants. Moreover, molecular epidemiology will elucidate the mechanism of cancer formation and progression while also finding a susceptible population can be targeted for cancer prevention.[6] Several factors which affect the gene-environment interaction, can be changeable and might be a suitable point for primary prevention. The molecular epidemiology covers principles in the biomarker selection and validation, research design and statistical analysis methods for gene-environment interactions, sample collection, storage, and banking, and recent laboratory methods for biomarker analysis.[5,6]

2. History

The term "molecular epidemiology" was first coined by Edwin D. Kilbourne in a 1973 article entitled "The molecular epidemiology of influenza". The term became more formalized with the formulation of the first book on Molecular Epidemiology: Principles and Practice by Paul A. Schulte and Frederica Perera. At the heart of this book is the impact of advances in molecular research that have given rise to and enabled the measurement and exploitation of the biomarker as a vital tool to link traditional molecular and epidemiological research strategies to understand the underlying mechanisms of disease in populations.[7]

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3. Molecular Epidemiology and Infectious Diseases

Molecular epidemiology is science which molecular biology helps in identification of distribution patterns of disease in the population. Pathogen genome project has helped multilocus sequence typing of pathogen isolates and ecological fitness survey and virulence patterns in disease. A better understanding of a pathogen distribution outside of its host and finding new disease-causing pathogen would be possible by such these researchers. [3,5]

For example, a molecular epidemiologic study has provided the genomic evidence of HIV-1 predominance genotype infection associated with injection drug addicts in Iran or Shah-Hosseini, et al [8] investigated the possible association of KIR-HLA genotypes with HBV infection and base on their result, they suggested a potential influence of the immune cells' activating phenotype that clear viral infection in Iranian HBV positive patients.

By new methods like pyrosequencing and molecular marker detection, we are able to translate complex pathways of disease and find the distribution routes. In all, comparative sequence analysis of pathogen strains and functional genomic studies are in progress, providing new vision into disease susceptibility. [8]

4. Consideration for Future

Despite the fact that about 30 years passed since the term Molecular epidemiology was exposed and the importance of molecular methods in epidemiologic research is approved, but there are some limitation.

Inconsistency and inconclusiveness of the result in many molecular epidemiology studies are due to biases and errors flew in study design. Small size results in insufficient power to detect association and is a usual problem in molecular epidemiology researches, because of the interaction between genotype and exposure.

The fact that, genotype alone may not represent enzyme activities and the importance of polymorphism on disease incidence in the disease process is still one of the most problems of these surveys. The function of many polymorphisms is not cleared and evaluation of such genes in cancer is questionable. Procedures that provide a real-time evaluation of tens of hundreds of genetic variance in a large number of the sample will be valuable in molecular epidemiology studies of cancer. With the purpose of designing effective cancer prevention programs, we must recognize the main characteristics of the disease.

5. Conflict of Interest

None.

6. Source of Funding

None.

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