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Genomic Technologies towards Better Human Society

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Humans developed so many technologies to cultivate knowledge and/or to simplify a process in conjunction with minimal efforts, resource utilization and time. Among them, genomic technologies play a central role to expand our knowledge in the field of anthropology, epidemiology, ecology, evolution, paleontology and so on. However, the contribution of genomics in the form of tangible benefits to entire human society or publics that contributed massive funds remains as a major question. Hence, translation of knowledge into practice is the immediate requirement to provide the benefits to the society. The purpose of this communication is two fold. First, to convey achievements of genomics in layman language to attract young brains, publics, health personnel's and policy makers for further progression. Second, to address the future directions and practical challenges while applying genomics into practice.

The classical definition of Genomics is "an interdisciplinary field of science that concerned with structure, function, evolution and mapping of genome". Genome simply represents the entire set of genetic material of an organism and its size widely varied from single cell organism to human. In nutshell, genomics infers scientific conundrums in a holistic view based on complex data derived from entire genetic material of targeted organism (s). Findings of genomics can be applied in real world issues such as public health measures, agricultural productivity, environmental and ecological monitoring activities etc. However, immediate conversion of such raw knowledge into practical applications is not possible (even advisable) due to inherent limitations such as complexity, reliability, and reproducibility.

The accomplishment of genomic methodologies in health sector is beyond traces of skepticism. The major advantageous of genomic approaches resides in discovering newly emerging pathogens, understanding pathogenesis, development of diagnostic methods, therapeutic interventions and vaccination for human diseases. The observation of epistemic interaction between several genomic loci on human diseases (autoimmune disorders, rare diseases, cancer and psychiatric ailments) and across species of human pathogens vindicated the need of genomic technologies on routine diagnosis [1,2]. At the outset, prospective screening for diseases and personalized therapeutics for better clinical management seems fascinating for all of us. However, elimination of fear and hesitation on general minds upon utilization of genomic technologies at various sectors including public health is prerequisite.

Ironically, emotional and psychological imbalance faced by an individual due to prior knowledge on the risk for future diseases must be addressed. Therefore, integration of genomic approaches into the national health policies is the only way to meet the pace of theory into the practice. This view was strengthened by several independent efforts with critical comments on implementation of genomics in public health settings [3-5]. Further, commencement of educational programmed for non-health personals to promote genomic approaches is also required to sensitize peoples working in the brim of health care setup [6,7]. The suggestion for application of implementation science principles pinpoints the pitfall of current trend in the genomic medicine arena [8].

Lack of funds, robust state of art technical facilities, trained skills and awareness of nations severely hampers prediction of newly emerging pathogen's evolutionary pattern in real world. The proposal to form a common platform such as Infectious Diseases Genomics Projects (IDGP) may help us to integrate global response while emergence of diseases [9]. The idea of coupling genomic diagnostics methods and epidemiology for development of open, global and digital pathogen surveillance system using One Health approach seems to circumvent several issues at a time and as a whole [10]. The cohabitation of humans and domesticated animals often plays a crucial role in emergence of newer pathogens or adaptation of existing pathogens to a specific host. Therefore, it is mandatory to develop such genomic surveillance - out break response model while emergence of diseases in poultry and veterinary farms.

Interestingly, recent developments in genomics suggested that human characteristics, behaviors and social attitudes are also partially defined by genetic composition. Genomic findings based on social-environmental conditions clearly depicted that everyday life circumstances also play a key role in differential expression of certain genes [11,12]. The possibility for heterogeneous expression of genes in a positive state of mind and perturbance of such balance may alters the risk for a variety of psychiatric and physical disorders highlighted the need of genomics to understand social behavioral shifts [13]. Future researches on this aspect may shed newer light on the basis of genetic sensitivity on human's social foundation factors such as charity, ethics, moral, trust and so on.

Application of genomics in promotion of agriculture or food production is a major requirement for development of human society. The combination of low income, over-population, and decline in availability of natural resources drastically increases the burden of poverty, health hazardousness and food insecurity in many countries. The discussion on influence of salinity induced stress on crops and recent developments to overcome such complications clearly suggested the need of genomic approach in agriculture [14]. Further, demand for fertilizers, cost of production, quantum of food and violent climate changes altogether pointed the possibility of global food deficit without technological assistance [15,16].

The innovative thoughts on connection of genomic data with population and community responses of organisms laid foundation for the emergence of a new field termed as ecological genomics [17]. Interestingly, utilization of genomic data to infer the current and future environmental adaptation opened newer paths to assess climate change

associated vulnerabilities at community level [18,19]. The need of a forum and guidelines for the usage of ecological genomics for genomic-breeding and conservation of forest genetic resources has been well discussed [20]. Assessment of habitat quality through genomic approaches delivered outstanding findings on diversity of animal populations present in different landscapes [21]. Findings based on genomic data revealed the role of tropical mountains in maintenance of biodiversity and long-term survival of various populations [22]. Taken together, genomic technologies provide novel insights in a holistic way to monitor ecological and environmental variations with conservational concerns.

Expanding human population combined with emergence of various diseases, food scarcity followed by insecurity, climate changes and socio-environmental crisis demands massive human efforts to have better human society. Genomic technologies holds the capability to contribute technical assistance in almost every crucial complications faced by modern humans. However, the central problem of genomic application is acquisition and interpretation of complex data. The need for guidelines, data mining approaches, computational tools, and common repositories for maintenance and collaborative efforts for each genomic application is growing day by day. The scientific community must focus on development of delivering livelihood gains to human society through genomic approaches. Policy makers and governments must aim to prepare appropriate policies to ensure legal rights/safety for consuming genomic products. Further, educational and awareness programmed must be conducted at large scale for the promotion of genomics and its applications.

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