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Clinical Cytogenetics in the 21st Century: Issues and Opportunity

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Introduction

The utility of further improving clinical cytogenetics is called into doubt by the potent applications of contemporary DNA sequencing technologies. The new conceptual and technological framework of the century clinical cytogenetics is given by briefly examining the history and present difficulties of cytogenetics. Since that karyotype dynamics are crucial to information-based genomics and genome-based macroevolution, the genome architecture theory has been specifically employed as a novel paradigm to highlight the significance of clinical cytogenetics in the genomic age. Additionally, high levels of genetic variation in a particular environment have been associated to a number of disorders. New prospects for clinical genetics to reintegrate genomics into genetics are presented with prokaryote coding in mind, since prokaryotic context provides a novel type of genomic information that organised. Defining genomic instability, highlighting the connection between stress, karyotype dynamics, and illnesses, and tracking the process of somatic evolution 3. formulating strategies for cytogenetics and genomics integration. We hope that these viewpoints may spark more debate outside of conventional chromosomal analysis. Clinical cytogenetics in the future should characterise somatic evolution caused by chromosome instability as well as the severity of non-clonal chromosomal abnormalities that track the genomic system's stress response. Several common and complicated medical issues, including ageing, may be successfully and visibly monitored for health benefits using this platform.

Description

Clinical cytogenetics' major objective is to identify the connections between chromosomal and nuclear abnormalities and numerous hereditary diseases that affect human health. The primary focus of this medical field is the investigation of human pathogenic chromosomal anomalies, which may be used to patient care, including genetic counselling, diagnosis, prognosis, and therapy. Clinical cytogenetics has historically aided in the discovery of several genes that contribute to a variety of inheritable disorders. Although being a subsection of cytogenetics, clinical cytogenetics has periodically led the overall discipline thanks to improvements in visual technology, a wide variety of clinical samples, greater financing, and researchers' passion with their chromosomes. Because of this, it is significant that the proper number of human chromosomes has been determined Likewise, the identification of the chromosomal basis The discovery of the Philadelphia chromosome for Chronic Myeloid Leukemia for Down's syndrome the Philadelphia chromosome for Down's syndrome and the creation of databases for chromosome aberrations and diseases all had a significant impact on the direction of genetic disease research

A gene-centric viewpoint predominated clinical genetics, and debates about replacing cytogenetic analysis with gene profiles occasionally surfaced. It makes sense to replace cytogenetics with molecular genetics since chromosomes were only considered to be gene carriers in cytogenetics, which had a supporting function in genetics. Higher sensitivity and resolution are intimately connected to mechanical understanding, according to reductionist perspectives Moreover, cytogenetic analyses take a lot of time, and identifying banding patterns may be difficult (molecular probes increased the accuracy of cytogenetic approaches later. Non-dividing cell populations were eliminated since access to mitotic figures was frequently necessary for chromosome production. However, unlike conventional molecular biology [1-4].

The idea that everything should be sequenced appeared to be the final straw for cytogenetics. Clinical cytogenetics is no longer attractive to the next generation of researchers as a career due to the retirement of many cytogenetic academics, and even directors of in reaction to the field's historical stagnation, cytogenetics has historically developed as a distinct subject; new cytogenetic procedures and discoveries typically occur only when some people begin to doubt the field's worth. For instance, because to the technical difficulties of making chromosomal spreads, cytogeneticists favoured working with plant chromosomes over human chromosomes until the development of hypotonic treatment and air-dry procedures the development of clinical cytogenetics was aided by this string of technical advancements. Chromosomal banding was created in the late just as the traditional comparison of the number and size of chromosomes appeared to have reached a technological limit Cytogenetics was significantly enhanced by various banding techniques, which connected particular chromosomes and areas to particular disorders. The illness gene is in the middle [5].

Conclusion

Chromosome mapping and disease gene hunting have both gained popularity, and cloning fusion genes has benefited greatly from the finding of translocation areas on the chromosome. Emergent molecular cytogenetics made significant contributions to medical genetics and physical mapping, a preliminary stage of the human genome project, during the heyday of molecular genetics, equipped with a variety of fluorescence in situ hybridization methods . FISH on banded chromosomes, to mention a few, were some of these molecular cytogenetic techniques. By combining these techniques with gene characterization and cellular functional analyses, researchers were able to further connect the behaviour of chromatin domains in health and disease with the role that different genes play in preserving mitotic, meiotic, and embryogenic processes, revealing the highly dynamic cancer.

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Conflict of Interest

None.

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