Chapter 17
Novel Advancements in Genome Editing Technology to Be Used in In vitro fertilization (IVF)

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ABSTRACT

Genome editing in human embryos has raised keen concern worldwide. Genome editing might be acceptable in limited cases of serious or life-threatening conditions, where no alternative medicine is available. New methods of in vitro fertilization and the vastly expanding number of diseases are the reasons for preimplantation genetic diagnosis (PGD) testing. In recent years, cutting-edge genetic analysis methods have been applied in therapeutic settings. Promising techniques include blastocyst-stage biopsy, vitrification, time-lapse imaging, whole-genome amplification, array-based diagnostics, CRISPR-Cas 19, and next-generation sequencing for the accurate diagnosis of a variety of genetic conditions as well as for the selection of the best embryo with the best genetic potential. The 'genetic scissors' are easier to engineer, more efficient in methodology, and more precise in genome sequence being target-

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ed. During in vitro fertilization (IVF) cycles, preimplantation genetic diagnosis/ screening (PGD/PGS) tries to assist couples in reducing the risks of passing genetic abnormalities to their offspring, implantation failure, and/or miscarriage. The very novel techniques for base gene editing, protein synthesis, RNA editing systems, genomic data storage systems, and the building of bio parts have been revolutionised with the application of virtual screening till the date. Artificial intelligence would overtake the manpower and man skills put forth at the scientific laboratory if used precisely which would further bring a huge progress and advancement in synthetic biology. Hence, this study aims to review and study the novel technologies used for gene editing which would work with the application of artificial intelligence with accuracy and preciseness leading to better embryo development.

INTRODUCTION

The complete DNA sequence of an organism is referred to as its genome. The genome contains DNA sequences with particular functions that are a part of the process that produces the proteins and other chemicals required for biological functions like development, energy generation, and illness prevention. Our understanding of "health" and "disease" is becoming more complex as a result of our growing awareness and knowledge of the human genome. A number of numerous intricacies exist in the connection amongst hereditary dissimilarity (potentially harmful changes in the chromosome arrangement) physiologic variations across individuals, and health and illness, for instance: The genomes of all humans are similar, however there are numerous minor differences between the genomes of several individuals, resulting in each person's genome unique; Some genetic variations have a high correlation with Numerous more factors incline individuals to illness. In specific situations; a specific genomic variation can be connected to varied outcomes in there may be interactions between different genetic variations together with lifestyle or environmental factors.

The concepts of 'health' and 'disease' are being questioned and confronted. There are numerous intricacies in the genetic relationship result in different traits or characteristics that is the raw material for evolution. It is probable that the sequencing of genomes from a larger population will occur in the future. Numerous novel genetic variations linked to illness and other hereditary traits are many slight differences among the genomes of dissimilar persons, construction of each person's genome exceptional. (*Genome Editing and Human Reproduction*, n.d.)