African Journal of
Biochemistry and Molecular Biology Research

ISSN : 1595-7926

Index: Harvard, Boston, Sydney University, Dimensions, Lens, ResearchGet Scilit, Semantic, Google Scholar, Base etc

https://doi.org/10.58578/AJBMBR.v2i2.5582

Evolution of DNA Technology in Treating Animal Diseases

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Article Info:

Submitted:	Revised:	Accepted:	Published:
Mar 30, 2025	Apr 14, 2025	Apr 26, 2025	May 1, 2025

Abstract

A single gene mutation can result in aberrant cell activity and the production of a faulty protein. The cell will certainly operate very poorly or not at all as a result of this mutation. Given that the genetic material may be a therapeutic agent; this might be seen as qualitatively distinct from other conventional drugs. Gene therapy may be able to rectify or perhaps cure the pathophysiology of a disease by changing the genetic composition of cells. In veterinary medicine, genetic engineering has been used to xenografts, and detects, prevent, and treat illnesses. Among the challenges that gene therapy faces include transfection, intracellular vector stability, cellular and nuclear entrance, and ethical concerns. Deficits in gene transfer vectors and a lack of knowledge about the biological interactions between these vectors and the host are two examples of fundamental challenges.

Keywords: DNA technology, Genetic engineering, Molecular diagnostics, Genomic selection, Vaccine development

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Introduction

These studies can help identify the best therapeutic gene, increase our understanding of the biological interactions between these vectors and the host, and develop alternative treatment options when conducted in appropriate animal models. However, a more successful overall treatment plan and a delivery system that enables accurate and efficient gene delivery are necessary for gene therapy to be effective. (Sayed et al.,2022)These must be controlled to avoid the negative effects of cell transduction that targets target cells on healthy cells. By contrasting the characteristics of human diseases with those of animal models, pathophysiology can be better understood. These findings might subsequently be applied to the development of gene therapy or pharmaceutical therapies. When novel genes underlying human illness are identified, transgenic technology and genetic selection will be used to create new mice models of human diseases. It is anticipated that improved gene therapy techniques would result from the increasing efficacy of employing these models to comprehend the biology of illness. Infectious peritonitis (FIP) in cats has been the subject of several studies. The epidemiology and pathophysiology of FIP can be better understood by using PCR, a common subtype of neurological disorder, which may be more accurate in peripheral blood mononuclear cell (PBMC) samples. Semi quantitative reverse transcription-PCR can detect changes in cytokine mRNA levels in PBMCs by recognizing certain interleukins (ILs) and one interferon (IFN). In this study, 8-week-old kittens were challenged with the feline infectious peritonitis virus (FIP) 79-1146, which includes two recombinant spike proteins. Every kitten's gross necropsy confirmed the onset of FIP symptoms. The recombinant proteins did not alter the duration of the sickness or cause a specific antibody response, although they did raise IL-6 in addition to the IFN gamma mRNA expression one week after viral infection. As FIP progressed, it was also demonstrated that the mRNA levels of IFN gamma and other ILs dropped significantly. Even though beauty is a subjective concept (except in California, where a formal assessment is being done to ascertain their possible environmental impact), practically everyone would concur that they are the first and only transgenic animals that are currently accessible to the general public in the United States. The researchers next showed that in an E. coli extract, the ligase was necessary for the repair of single-strand breaks phage λ DNA. More specifically, it was shown that the enzyme could form a 3'-5'-phosphodiester link between the 3'-OH end of a nearby DNA fragment and the 5'-phosphate end of the last nucleotide of one DNA fragment. Researchers were eventually able to conduct their

own recombination studies, which involved recombining DNA from several persons, including different species, as well as DNA from a single individual, after discovering DNA ligase, the first of several essential stages.

DNA technology

One of the main goals of genetics is to isolate, describe, and modify genes. Finding a single gene in a DNA sample is like attempting to find a needle in a haystack, while isolating a DNA sample from a group of cells is comparatively easy. Consider that each human cell has nearly two meters (6 feet) of DNA. A little tissue sample will therefore contain several kilometers of DNA. The ability to remove any DNA segment, including genes, analyze its transcripts, modify it in highly specific ways, and then reintroduce the modified sequence into a living organism is made possible by recombinant DNA technology. Plasmids can carry genes that give the host cell advantageous characteristics including the ability to generate poisons, survive medications, and mate, even if they are not a part of the original cell's genome. These are the steps that are part of the cloning process. The DNA of the organism is extracted and separated into cloning-ready fragments. The restriction enzymes, which serve as defense mechanisms against viruses, are extracted from a variety of bacterial species and strains. (Buermans et al.,2014)

Genetic engineering

When the phrase "genetic engineering" was first used, it encompassed a wide range of methods for altering or transforming organisms through reproduction and inheritance. Thus, it encompassed all biomedical practices, including genetic modification, artificial selection, cloning, artificial insemination, and in vitro fertilization (including "test-tube" newborns).

Unlike type I restriction enzymes, which break DNA at random locations, type II restriction enzymes have proven essential for genetic engineering because they can cleave a specific site inside DNA. These enzymes were found the next year by Hamilton O. Smith, an American chemist. American molecular scientist Daniel Nathans built on Smith's work between 1970 and 1971 by improving DNA recombination techniques and demonstrating the possible application of type II enzymes in genetic research. Recombination-based

genetic engineering was initially established in 1973 when American biochemists Stanley N. Cohen and Herbert W. Boyer were among the first to break DNA into pieces, put those fragments back together, and introduce the new genes into the bacterium. E. coli, which kept expanding. (Kleckner et al.,1977)

Molecular diagnostics

The area of laboratory medicine or clinical pathology known as "molecular diagnostics" makes use of molecular biology methods to identify illnesses, forecast how they will develop, choose therapies, and track how well they work. Though its primary focus is on infectious illnesses, cancer, and genetics, molecular diagnostics is linked to almost all clinical specialties and is a crucial adjunct in many fields of clinical and laboratory medicine. This chapter focuses on molecular genetics, which examines human nucleic acids and how they relate to illness. Molecular genetics has advanced quickly and is not showing any signs of slowing down since the first working draft of the human genome sequence were finished in 2000 and the refined sequence was finished in 2003. There are now over 1,000 clinically accessible genetic testing, compared to a very small number in the late 1990s. Moreover, molecular genetic testing has shown enough utility and reliability to be used for population screening. It is therefore possible to comprehend the genesis of protein abnormalities by gene analysis. In this form of analysis, the DNA sequence of a gene is explicitly compared to its wild-type or normal sequence. In the end, pathogenic conditions and organ dysfunction are caused by protein failures linked to genetic abnormalities. This chapter, which is broken up into five sections that go over key ideas in molecular genetics, will go over the basics of the field. Discussion of the direct clinical application of these ideas has been included whenever feasible. The molecular structure of DNA, DNA transcription, and protein translation are the main topics of the first part. DNA replication, DNA repair mechanisms, and molecular disease are the main topics of the second portion. An introduction to transmission genetics is given in the third part. The fourth section provides the justification for molecular genetic testing and emphasizes the connection between genes, proteins, and phenotype. Allelic heterogeneity and the appropriate analytical approach are reviewed in the last section. (Dong et al.,2008)

Genomic selection

Numerous studies have been carried out to assess the efficacy of genomic selection (GS) in crop development since the theory and conceptual framework were first developed. Nonetheless, it has been shown that marker-assisted selection may significantly enhance qualitative features governed by one or a small number of genes. It has little influence on quantitative features that are regulated by several genes. In this sense, GS is a useful method for enhancing quantitative characteristics as it selects candidates for the upcoming breeding cycle based on genomically predicted breeding values of individuals derived from genomic markers. Because GS may maximize genetic gains, decrease phenotyping, shorten cycle times, and improve selection accuracy, it has been widely used in animal improvement projects across the world over the past 20 years. Furthermore, the potential for incorporating GS assessment into crop development is also being investigated, given the encouraging preliminary findings for enhancing the success of GS-based breeding programs depends on enhanced statistical models that use genetic data to improve prediction accuracy. The shift from conventional selection techniques to SF, the statistical techniques and instruments that underpin this process, the present status of SF research in crops, and the likelihood that they will be successfully applied study. For food and nutrition security, sustainable food production is essential. Reports indicate that 151 million children under the age of five are stunted, 821 million individuals suffer from under nutrition, and two billion people worldwide do not get enough micronutrients to lead healthy lives. A strong supply and manufacturing chain is necessary to satisfy these needs. (Crossa et al.,2007)

Vaccine development

The production method, final product requirements, in-process materials, and product components are all determined at this phase. Generally speaking, the production scale employed in development is far smaller than the final manufacturing process. It is generally expected that at least one of the three or more batch consistency batches required for Phase 3 clinical trials will be generated on a large scale, while Phase 1 and occasionally Phase 2 clinical trial vaccines are normally produced during product development. The product created during the development phase is manufactured in conformity with current good manufacturing practices. The creation of vaccinations, which constitute the sole

fundamental prophylactic against infectious illnesses, is receiving international interest. Ag quickly steadily is fundamental objective vaccine research; yet, the issue of how to administer enough vaccines to prevent infectious illnesses has not been resolved. In place of traditional injectable systems, simple, affordable, and minimally invasive vaccination techniques are needed to get the vaccine to that in need around the world, particularly in poor nations. An appealing path toward is provided by ICT. Ensuring is the primary difficulty that has to be solved during the development of ICT systems. Numerous strategies have been created to get beyond the SC barrier, as this review explains, and fundamental, preclinical, and clinical research on these strategies has been carried out. In contrast to IMI, recent research has demonstrated that the vaccine administered intradermally to skin stem cells (SSCs) can boost the strength of the immune response. (Bresee et al.,1999)

Conclusion

This overview has just touched on a handful of the latest advances in genetic engineering and its use in veterinary medicine. It is obvious and logical that the primary obstacles in this field of study, such as safety and ethical issues, must be resolved before putting research findings into practice full animal vaccination, severe maybe even find use in food. This method may also help scientists livestock production generally and benefiting livestock farmers monetarily.

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