AN OVERVIEW ON TRANSGENIC ANIMALS AND NUTRITIONAL RESEARCH

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ABSTRACT

The biological functions of proteins, particularly secondary gene products generated by protein catalysts, may be studied using transgenic mice. Their use as comparison models for normal and abnormal metabolism is beneficial to nutrition and associated studies. Although transgenic animal-derived food, nutritional products, and components have yet to reach customers, the technology to make them is improving and yielding encouraging results in lab or farm animals. Regulatory government bodies have already made recommendations and regulations in preparation of the introduction of these products and components. This research examines existing methods for generating transgenic animals, assesses their scientific and commercial potential, and considers nutrition-related issues.

KEYWORDS: *Nutrition, Transgenic Animals, Transgene, Targeted Mutants.*

1. INTRODUCTION

Animals that are transgenic or mutants with particular traits Transgenic animals (TA) express proteins that are expressed by cDNA or genes that are usually linked to heterologous transcriptional regulatory elements, or they may express them if they are properly activated (TRE). These fusion genes are often referred to as transgenes. It's worth mentioning that a TA's only acquired features may or may not be the synthesis of proteins, which are the primary gene products. If the transgene-encoded protein is an enzyme, and its substrates are accessible within the cell, secondary gene products will be generated. These compounds may build up in tissues and body fluids where they aren't normally present. Peptide hormone such growth hormone induces substantial changes in carcass composition as well as systemic physiologic alterations in TA. Mice that generate GH, for example, are larger, have higher insulin levels, as well as die sooner due to liver and kidney damage than their nontrans genic littermates. Furthermore, transgenic hydrolytic enzyme synthesis may cause chemicals present in animal tissues or biological fluids to disappear or alter **[1], [2].**

1.1. Animals that have undergone genetic modification:

Biological assemblages The state of the art in TA production has been reflected in many assessments throughout the years. These studies look at a variety of key technologies, including molecular biology19, pharmaceutical production in TA20,21, and also the general use of TA as research tools, as well as biotechnology, agriculture, and nutrition. All of the aforementioned studies contain sections on two important aspects of transgenic technology: the synthesis of transgenic recombinant DNA and the techniques for introducing it into animals. Methods for detecting TA and propagating transgenic embryos are also included in several of these publications **[3].**

1.2. Regulative elements:

Transgenes include TRE, which controls the expression of protein-coding DNA sequences. These elements direct the transcription of adjacent DNA into mRNA, which is subsequently translated into protein. TA has been proven to be effective in finding TRE like promoters, enhancers, and silencers, as well as establishing if their effects are comparable across species. It's worth mentioning that the term "promoter" has been used to describe TRE. Tissue-specific TREs are those in which the expression of adjacent DNA is limited to certain tissues or organs.

1.3. Nutritional issues or transgenic animals:

TA may be studied from a number of perspectives depending on their present and future contributions to the field of nutrition. The use of TA as experimental systems, models, or manufacturing prototypes for scientific study is discussed in the bulk of scientific papers. TA only makes protein therapeutics on a commercial or near-commercial scale a few times a year. In terms of diet and related areas, TA may be classified as follows: study models for nutritional phases or metabolic diseases genetically modified food sources.

1.4. Bioreactors generate the ingredients for healthy foods.

As the following example shows, the difference between mammals used as bioreactors as well as animals used as suppliers of modified food products may be subtle at times. Milk from a TA that produces a high amount of k-casein may be consumed immediately or used to create cheese. The product is acquired from the TA in this case with no more processing than is usually done with food. When k-casein is isolated from milk and utilized as an ingredient to improve the function or nutritional qualities of food or nutritional products, the TA is used as a bioreactor. The latter is the favored technique for producing medications in milk **[4].**

1.4.1. Milk and milk components that have been modified:

Milk is a meal that has been heavily changed via the expression of particular transgenes and, in many instances, genetically engineered. without having a negative impact on the TA milk already produces a number of medicinal proteins. and are at various phases of development, from idea to completion. From preclinical through clinical testing, we've got you covered. a few examples. Human a-antitrypsin is found in sheep, human plasminogen activator is found in goats, human protein C is found in pigs, and human plasminogen activator is found in humans. Rabbits were given human IGF-I.

1.4.2. Milk may be enhanced or changed from a variety of angles:

- As a significant factor.
- As a raw nutritional component for large consumption.
- As a source of components.
- As a raw material for dairy products for baby formula and other nutritional items

- The basics of transgene expression in lactating mammalian cells glands and the finer details of gene expression.

1.5. Nutritional research using transgenic animals or transgenic mutants:

Several reviews describing TA as a disease including biochemical models have been published. We'll go through a couple of them in this section. Barrett and Mullins52 discussed cardiovascular disease models based on renin-angiotensin system and other systems alterations. Some of these models may be useful in the study of diet-induced hypertension, cardiac hypertrophy, including thrombosis. Stewart investigated a variety of models for understanding endocrine disorders, such as diabetes. 53 Breslow54 investigated the metabolism of TA and TM lipoproteins as well as atherosclerosis models. This research covers mice with altered lipoprotein transport proteins, lipases, as well as receptors, and is likely one of the most insightful studies on TA's nutritional potential. Stewart53 addressed transgenic models for metabolic disorders, whereas Bray and Ryan55 explain the history and reasoning for animal models used to research obesity, enabling readers to compare models produced using conventional genetic techniques to models created using transgenic technology **[5], [6].**

1.6. These animals' glucose levels are normal, but their insulin levels are high:

Even if they are not diabetic, they have a high insulin sensitivity. This is a situation that is comparable to that which happens in diabetics. GH antagonist-expressing animals have normal glucose levels but decrease insulin levels in the same manner. Nutritional status, as well as increased or decreased levels of GH, may help predict glucose/insulin levels in people with type 2 diabetes. TAs, which were originally developed to study muscle growth and development rates, have also proved to be effective nutritional models **[7].**

The applications listed in this section are only a few of the nutrition-related domains where TA or TM models are being researched. Because of their role as examples, TA and TM have surpassed scientists' expectations. Furthermore, ectopic transgenic expression in the developing embryo may be deadly, or the TA could struggle to survive after birth if it occurs. Even in these cases, TA helps to our knowledge of gene product function and encourages new study fields **[8].**

1.7. Transgenic animals as bioreactors or functionally changed food suppliers:

The production of transgenic tomatoes65 is one of the most intriguing recent discoveries in the area of food research. TA products would be accessible at the same time as transgenic tomatoes, according to a business intelligence report66. As of June 1998, there were no TA products on the market. A variety of reasons may explain the apparent delay in the commercial introduction of TA devices, but a few stand out:

- Unlike plants, TA were designed to be used as bioreactors for pharmaceuticals, and these products must go through lengthy regulatory processes.
- Certain transgenes' expression in farm animals has had detrimental effects.
- While medications have been developed from a variety of sources, including genetically modified organisms, the regulatory hurdles for a transgenically produced food or nutritional product are yet unknown.

- It's possible that the current state of technology, along with the particular features of animal systems, may need longer development periods.

1.8. Alternatives to transgenic technology:

Science and industry are equally interested in transgenic organisms. Biotechnology, on the other hand, has advanced in a variety of areas. Given the usually long development timeframes for transgenic food products and components, other approaches for resolving specific problems may be investigated. One example is the synthesis of human b-casein. Phosphate groups attached to serine and threonine residues range from zero to five in this human milk protein, which occurs in a variety of forms and variants. Bovine phosphorylated b-casein with all variants has been produced in TA's milk.

1.9.. Legal and regulatory issues:

The use of TA to produce food and ingredients on a commercial scale does not seem to be viable in the near future. It's difficult to predict how long it will take for this to occur. Meanwhile, the technology has already been exposed and discussed outside of the specialized press. It's conceivable that medications made in TA bioreactors will be the first to hit the market, even ahead of food. Regulatory agencies and consumer advocacy groups are already taking steps to prepare for a situation like this. In the United States, the United states Food And drug (FDA) issued a warning titled "Points to Consider in the Manufacture or Testing of Therapeutic Products for Humans Use Produced from Transgenic Animals **[9].**

This notification is a necessary first step in beginning a discussion regarding TA regulatory issues, and it shows the FDA's stance toward this technical tool. Regulatory actions, on the other hand, do not happen by themselves. Consumer attitudes about biotechnology as well as political factors impact government actions that may affect the development of TA applications. Furthermore, the Dutch government has put limitations on cloning research that aims to spread TA. The time it takes to create a viable herd is obviously a current TA limitation. Cloning already existing TA may be used to get around this limitation. The impact of the aforementioned government decision on companies in the Netherlands may be significant. Even regulatory definitions may be a source of disagreement. It is feasible to skip the long wait for spontaneous or forced lactation in transgenic cows by expressing transgenes in the lactating gland using viral vectors. At the absolute least, this technique may be used to determine whether or not it's worthwhile to begin germline integration research for a certain transgene.

Nutritionists may now explore ways to improve the nutritional content of milk, meat, and eggs thanks to the advent of TA. Foods may now be substantially altered without the need for lengthy genetic selection thanks to Mendelian genetics-guided crossbreeding cycles, providing an unrivaled environment for future generations. It is now possible to picture or see the ideal milks for different applications, such as cheese production, infant formula manufacture, or products for undernourished children, as well as the ideal meat for large-scale ground beef production. These functional characteristics may be among the first modifications to animal tissues and fluids to reach the market due to their obvious economic significance. These possibilities force academic and industry researchers to reconsider prior concepts and standards based on current manufacturing methods' inherent limitations.

2. DISCUSSION

Transgenic animals may be used to investigate the biological roles of proteins or secondary gene products produced by protein catalysts. Their usage as models to contrast normal and abnormal metabolism benefits research in nutrition and related areas. Although transgenic animal-derived food, nutritional goods, and components have yet to reach consumers, the technology for their manufacture are developing and producing promising results in laboratory and farm animals. In anticipation of the arrival of these goods and components, regulatory government agencies have already issued recommendations and laws. This study outlines current technologies for producing transgenic animals, analyzes their scientific and economic possibilities, and looks at related problems in the area of nutrition.One of the study's main objectives was to provide a comprehensive overview of the technologies used in the manufacture of TA. It was also an aim to give examples and point the reader to more detailed explanations of the technology to show its current status and potential. Scientific literature was the primary source of information. Since it was decided that these concerns would inevitably influence the development and dissemination of transgenic technology, three research on regulatory and commercial issues were suggested. A variety of interesting experiments and simulations are included in patent applications, which may represent some of the most advanced aspects of the technology. It was chosen not to include the repetition and breadth of the occurrences in this assessment since they are seldom addressed.

3. CONCLUSION

Transgenic mice may be used to investigate the biological activities of proteins, including secondary gene products produced by protein catalysts. Nutrition and related disciplines benefit from their usage as models for comparing normal and abnormal metabolism. According to the reviewers, TA are already useful models for researching metabolic pathways, diseases, and infirmities, and that traditional approaches like as dietary management may now benefit from their inclusion. "Unfortunately, this area of study has received less interest in laboratories than it has in review articles," they say in their evaluation of transgenic dairy cows.

Although this is true, it is important to note that the thin boundary between science and technology is often crossed in areas like the one under consideration. Companies and universities do not disclose all of the advances in the area because scientific transparency takes a second seat to the filing of patent applications. Furthermore, scientific publications function as a marketing tool for developing technologies, therefore it's important to be able to tell the difference between facts and recommendations or too optimistic future possibilities. The following judgements, like prior biases, may also permeate the review: Some aspects of transgenesis technology, including such transcriptomic control, are still being investigated in basic research. most TA described to this point are prototypes. each process required its own evaluation, as obtained results in animal experiments do not always predict those obtained in farm animals; and TA and TM are effective tools for studying the effect of nut allergies.

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