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Trends in Animal Production's Utilisation of Recombinant Proteins

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Abstract

Recombinant technologies have made it feasible to produce a huge variety of useful proteins, including those required for animal production. Animal proteins that have a significant role in reproduction, feed efficiency, and health have received the most research attention. For the recombinant manufacture of hormones for use in reproduction and fibrolytic enzymes to improve animal performance, respectively, mammalian cells and fungus are now the favoured options. But the creation of affordable goods is a top goal, especially for livestock. The research of cell factories like yeast and bacteria has significantly increased over the past few decades, making the newly created fibrolytic enzymes and reproductive hormones a true substitute for those now on the market. New recombinant approaches for prevention and therapy, like as passive immunisation and immune system regulation, have also received significant investment. By regulating physiological functions, this presents the opportunity to cut back on the use of antibiotics while enhancing the effectiveness of infection prevention. As a result, several recombinant fibrolytic enzymes, hormones, and medicinal molecules have been effectively manufactured using efficient techniques using microbial cell factories. These molecules have improved characteristics. Nevertheless, despite significant progress in lowering protein manufacturing costs, additional measures are still needed to do so. In this regard, a big step must be taken toward the application of cutting-edge techniques, such nanotechnology, which when paired with recombinant technology would make recombinant molecules inexpensive for the animal business.

Keywords: Recombinant proteins • Animal production • Recombinant expression systems • Reproductive hormones • Fibrolytic enzymes • Therapeutic molecules

Introduction

The development of recombinant DNA technology in the 1970s undoubtedly made it possible to produce recombinant proteins. Most important proteins can now be produced recombinantly thanks to the application of this technique. Prior to this, expensive procedures with low yields were used to isolate proteins of interest from their natural sources. Today, however, scientists can regularly extract or create genes and clone them in an appropriate expression system for use in industrial-scale production. Although a wide variety of cell factories, including bacteria, yeast, fungus, algae, insect cells, and mammalian cells, are being employed to produce recombinant proteins, Escherichia coli has emerged as the industry leader. This is caused by a number of factors, including the abundance of tools that enable this procedure simple to apply and the low production costs linked to this prokaryotic expression system. Somatostatin, the first functional recombinant protein, was created in 1977 using E. coli as the cell host. A few years later, Genentech Inc. released recombinant human insulin, which was also created using E. coli [1-5].

However, despite the clear advancements made in the field of recombinant protein manufacturing, downstream product processing and production methods also have significant related costs. This poses a particular obstacle to the manufacturing of recombinant proteins for animal science, a field where the creation of affordable goods and methods is of utmost importance.

Discussion

Recombinant proteins have been increasingly used in animal science during the past few decades, despite significant restrictions. The endocrine system is one of the most researched fields, according to the overall bibliography that uses recombinant proteins. In fact, a number of organisations are seeking to adopt commercially accessible recombinant hormones to enhance animal reproduction. Numerous studies also concentrate on less popular proteins that require particular adaptation of production processes in accordance with unique properties. Recombinant designed proteins are currently being investigated extensively for the development of both preventative measures and therapeutic approaches. Additionally, a number of enzymes are being created via recombinant technology in an effort to increase the efficiency of feed conversion into consumable goods [6-10]. The three key pillars of animal production—reproduction, feed efficiency, and health—are the subject of this article's summary of recombinant proteins made in microbial cell factories. This assessment aims to emphasise the potential value of recombinant technologies for the animal industry in the near future in addition to providing a map of the current situation. However, because to their extensive coverage in other publications and reviews, all recombinant products used in vaccination protocols have been left out of this revision.

The use of recombinant hormones in reproduction

Animal reproduction is one of the many applications for recombinant protein production. Reproductive hormones play an important role in the regulation of male reproductive function, female reproductive cycle, and pregnancy maintenance in dams. These hormones are used in animal production for two opposing purposes: improving female fertility by regulating ovulation and/or facilitating embryo implantation, and improving meat quality by sterilised males.

Follicle stimulating hormone (FSH) and luteinizing hormone (LH) are gonadotropins secreted by the anterior pituitary gland in response to the hypothalamic gonadotropin releasing hormone (GnRH). These glycoproteins, along with the chorionic gonadotropin (CG) secreted by the placentas of primates and equids, are used in animal breeding management to stimulate testosterone production and spermatogenesis in females and superovulation in males. Inhibin, which is secreted by both male and female gonads, is important because it provides negative feedback to the anterior pituitary, lowering gonadotropin secretion and thus their effects.

Conclusion

Recombinant products can be produced with superior qualities compared to those separated from their natural hosts thanks to recombinant DNA technology, which enables protein sequence modulation. As discussed in the book, this has contributed to the development of recombinant goods for a variety of purposes, including animal production. For the successful creation of enzymes, hormones, and medicinal compounds, a wide variety of microbial cell factories are being investigated. However, for this area of research to continue moving forward, a big step must be taken toward the application of fresh approaches that, when combined with recombinant technology, would enable the creation of products useful for animal science. In this situation, nanotechnology, and more particularly nanostructuration, could be extremely important in the creation of a new generation of affordable recombinant proteins for the animal sector.

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