Animals are Responsible for Advancements in Recombinant DNA Biotechnology

Within the past two decades DNA has been genetically modified, known as recombinant DNA, to help with further genome discoveries, assist with medical needs in humans such as insulin producers, and help with bodily regulation (Maksimenko, 2013). In order to uncover all these discoveries, scientists rely on animals for testing of recombinant DNA to understand how it affects mammal biology, and how it can eventually help the human species combat disease and other abnormalities (Jaenisch, 1988). While there is research analyzing how animals respond to ingesting genetically modified foods, how modified genes in animal genomes affect their daily functions, and how recombinant animal proteins can improve human life, scientists still wonder how exactly animals and recombinant DNA play a role in understanding gene function, expression pattern, and other developments in biology. How might animals and their recombinant proteins be used in biotechnological advancements today?

Recombinant DNA made its first real breakthrough in bioreactor technology with genetically modified animals, specifically mice; cattle and poultry have also been tested (Einspanier, 2001). The most popular way to alter animal genome is through a process called microinjection (MI) of DNA into pronucleus (Maksimenko, 2013). This process clones DNA that has been modified via translocations or rearrangements and is then directly injected into the pronucleus of a fertilized egg of a mouse. Another form of this genetically modified process is called retrovirus infection which takes place when a specific mechanism is forced into the genome of an infected host sequence (Jaenisch, 1988). After these methods are performed on the animals, they are studied and, in some cases, slaughtered immediately to invoke how such process affects mammals. Recombinant mice have been useful in understanding developments in biology and knowing how essential genes aid with development in an organism.

Transgenic animals are used for their cells in order to synthesize proteins via translation modifications. The byproducts of these animals are what researchers examine when understanding how these modifications can change proteins and reconstructive enzymes; some examples of this include: cows milk, urine, and egg whites (Houdebine, 2000). Scientists strive to determine functional uses for these transgenic proteins and also analyze the consequences of

altering the genome.Inventions have been discovered that use an expression system that comprises milk-specific protein promoter that is then correlated to a DNA expression coding for a desired recombinant protein product (Meade & Lonberg, 1989). They use use the method to inject transgenic materials into the animal and then the product of this is in the form of the mammal milk which holds the recombinant proteins (Meade & Lonberg, 1989). This particular invention is less costly than other conventional recombinant protein production mechanisms, however, the cost of the research is responsible for the lack of recent knowledge on this topic.

Another use for animals in biotechnology is that they are slaughtered and examined after ingesting recombinant materials such as toxin-maize (or *Bacillus thuringiensis* or Bt-maize) to reveal some small DNA fragments of such material which can be found in the animal's blood lymphocytes (Einspanier, 2001). This is an important advancement because recombinant DNA from the materials animal ingest are not always found in vital organs. Scientists rely on the way that animals react to genetically modified substances and even animals themselves that are genetically modified because this helps understand how humans will respond to such biotechnologies.

While there is much benefit with genetically modifying animal genome and utilizing their proteins to prevent and resolve issues in biology, there are several challenges with this technology given that genome expression vectors are possible to not be constructed correctly. This is common in biotechnology since various genes have unique signals, all of which are not identified and known, and can hinder the construction of functional expression vectors in recombinant proteins (Houdebine, 2000). Recombinant DNA is a modern concept and has only a few decades of research that conclude its safety levels. While GMOs are available on the market today, further research is needed to examine the results of animal reactions, transgenic animals, and transgenic animal protein use (Einspanier, 2001). In order to understand and fully optimize the DNA process of extraction, complex products and processes are required in this research. Overall, animals play a large role in the testing process for recombinant DNA whether they are recombinant mammals themselves, or just ingest the materials. Without their role in biotechnology, humans would not safely be able to benefit from resourceful recombinant materials.

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