The Description Of Gene Cloning

Gene cloning is a biotechnology in which a section of DNA is isolated and extracted before being cloned using bacterial plasmids. To execute this process, a restriction enzyme isolates a specific gene from a strand of DNA and the plasmid, and then cuts the gene creating complementary sticky or blunt ends. These are joined to form recombinant DNA, which is then inserted into bacteria via heat shock to be cloned. Gene cloning is used for many reasons such as to create therapeutic proteins and to create DNA libraries. It can can create therapeutic proteins such as insulin in higher quantities than previously by inserting the recombinant DNA into E.coli. DNA libraries are created which can help to work out long DNA sequences to create maps of chromosomes.

It is also thought in the future that scientists may be able to utilise gene cloning to create tissues and eventually organs out of a single cell. Implications and Issues with Gene Cloning As with all biotechnologies there is a great amount of social implications and ethical issues with gene cloning. This technology greatly benefits medical society as it allows for; greater amounts of life saving proteins to be synthesised, increased availability of replacement organs, and the process of gene therapy, where normal genes are inserted in place of defective ones. However, socially it could have damaging effects, with the ability to create designer babies, as attempted by He Jiankui when trying to modify babies to disable the CCR5 gene, and other ethical implications such as the experimentation on animals. Furthermore, there is a great many ethical issues such as the potential for cell degradation from creating too many clones, and the bacteria used in cloning may have antibiotic resistance which could be transferred to other bacteria via horizontal gene transfer.

How does Gene Cloning affect Earth’s Biodiversity? Gene cloning has the potential to greatly deplete Earth’s biodiversity in the long term, as it contributes to the dominance of particular alleles in a species. It can be implemented to replace copies of genes leading to the disappearance of defective or missing genes, so ‘fixing’ DNA sequences, as in the experiment by He Jiankui, can cause loss of biodiversity. Additionally, the increased availability of insulin has led to increased usage, thereby increasing biodiversity as it has allowed those suffering from Type 1 diabetes to live long enough to reproduce thus passing on genes that increase risk of diabetes, like some variants of the HLA-DQA1, HLA-DQB1, and HLA-DRB1, to their offspring.

Furthermore, in the process of cloning genes, often bacterial plasmids are given antibiotic resistance to grow a culture of the pure gene effectively. This could escape into the general bacterial population as bacteria can pass plasmids to others through horizontal gene transfer which speeds up the spread of this trait, making it a dominant trait within that population. This could result in antibiotics becoming ineffective, leading to doctors being unable to effectively treat bacterial diseases which could eventually decrease biodiversity due to possible extinctions. Therefore, gene cloning increases and decreases biodiversity, however in the long term it may lead to great loss of biodiversity. Does Gene Cloning have the potential to change populations forever? Gene cloning very much has the potential to change populations forever. Although it has many benefits it also has disadvantages such as the ability to greatly deplete the Earth’s biodiversity. This loss of biodiversity would greatly change populations forever as it could lead to

the extinction of certain populations as as previously described.

It could also positively change populations with endeavours like creating organs from single cells which would allow organ transplants to be readily available, thus increasing the number of transplants given, resulting in an increased life expectancy within populations. However there are more negative possibilities like the prospect for designer babies, which has has become a concern in the scientific community since the work of He Jiankui was released. His experimentation shows the possibilities of gene cloning, via gene editing, which could change populations forever in a deliberate way.

Lastly, synthesis of therapeutic proteins, although a positive development, could have the possibility to negatively change populations, the increased use of insulin means that a larger percentage of the population develops Type 1 diabetes. This could be due to the certain variants of the aforementioned genes being dominant alleles, which could lead to much of the human population developing diabetes, thus changing populations forever. Ultimately, gene cloning has great potential to change populations forever.