What is gene manipulation biology essay

Science, Biology

Gene manipulation, also known as genetic engineering, is the human manipulation of an organisms genetics in such a way that does not occur in nature. There are many types of gene manipulation, such as the polymerase chain reaction (PCR), Gel electrophoresis (used for DNA profiling), the Human Genome Project, Gene therapy (Gene transfer) and Cloning. Figure : End product of G. E. Polymerase chain reaction, aka molecular photocopying, (PCR) allows researchers and scientists to create millions of copies of a just one specific DNA sequence in a short amount of time of about 2 hours. PCR is helpful when a large amount of specific DNA is needed for molecular and genetic analyses. http://www. biologyreference. com/images/biol_02_img0140. jpgGel Electrophoresis (G. E.) is a technique used to separate DNA, RNA, or protein fragments based on their size, and using electricity to allow the fragments to migrate through the gel. The Human Genome project (HGP) was created in 1997 to sequence the human genome. gives researchers and scientists the ability to read the complete genetic blueprint for building a human being. Gene therapy is an experimental way for treating diseases caused by defective genes by altering the patient's genetic makeup. Gene therapy is normally done by introducing a healthy copy of the defective gene into the patient and hopefully have it replace or repair the defective gene. Cloning is a process that is used to produce genetically identical copies of a biological organism. The copy is called a clone. This could have many medical benefits, such as the replacement of organs and damaged tissue. An example of a clone, is dolly the sheep.

Uses today:

PCR and Gel Electrophoresis: PCR allows one to detect and identify trace amounts in DNA while avoiding the use of bacteria, this also allows for easier technique of identification and detection. DNA produced through the help of PCR could be used in many different ways, for example, mapping techniques in the Human Genome Project (HGP) use PCR. PCR is commonly used for DNA fingerprinting, diagnosis of genetic disorders, for detection of bacteria and viruses (particularly HIV/AIDS), PCR technology can also be used to distinguish among the small variations in DNA that make individuals unique. Gel Electrophoresis (G. E.) is also used for DNA fingerprinting and can be used as DNA evidence in criminal court cases to prove the suspect was in a certain location or is the culprit, done through looking at small variations in DNA (again similar to PCR). The uses for G. E. are very similar to PCR as they are very closely linked. Restriction fragment length polymorphism (RFLP) is a type of polymorphism that are due to variation in the DNA sequence, recognized by restriction enzymes. Typically, gel electrophoresis is used to visualize RFLP. Human Genome project: Genetic mapping (aka linkage mapping), the primary goal of HGP, gives us evidence that the transmission of a disease from parent to child is linked to one or more genes. It allows us to estimate which chromosome contains the gene and possibly the rough location on the chromosome. There are many more current potential applications for the HGP, such as Bioarchaeology (which will provide insight into the relationships between archaebacteria, eukaryotes, and prokaryotes.), anthropology, molecular medicine (helps improve the diagnosis of diseases, the ability for early detection of diseases and even

helps in gene therapy) and so on. Gene therapy: Presently, the most common vector to deliver the remedial gene to the defective gene in someone’s body, is a virus. These viruses are genetically altered to carry normal human DNA. But why use viruses? Well, viruses in general are capable of enclosing and delivering their genes to a human cell with relative ease. Scientist have taken advantage of this capability by replacing the viruses DNA that causes disease and replacing it with a remedial gene instead. Some of the current viruses used as vectors are: Retroviruses - viruses that create double-stranded DNA copies of its RNA genomes. These copies can be integrated into the chromosomes of cells in a host. HIV is an example. Adenoviruses - viruses with double-stranded DNA genomes that cause respiratory, eye, and intestinal infections in an individual. An example of this virus is the common cold. With viruses there is always a risk for an immune response for the patient as a virus is a foreign substance. The simplest way in which to apply gene therapy is to make direct contact between the remedial DNA and diseased cells. Although this method is limited because it can only be used with certain tissues and requires a large amount of DNA. Cloning: Stem Cells can be used to repair damaged or diseased organs and tissues, so researchers have been looking at cloning as a way to create genetically defined human stem cells for research and medical purposes. Because Stem cells can differentiate into any type of cell, cloning stem cells could lead to rejection free transplants and tissue replacement. Cloning in human beings can prove to be a solution to infertility, it can be an option for producing children with desirable traits. Cloning can make it possible for us to create ‘ customized’ organisms and

use them for the benefit of society. Gene pharming is a process that scientists use to alter an organisms own DNA, or splice in new DNA (transgene) from another species. In pharming, these genetically modified (transgenic) animals are mainly used to make human proteins that have medical uses. The protein encoded by the transgene is found in the milk, eggs or blood produced by the organism, which is then collected and purified. Livestock in general has already been modified in this manner in order to produce useful proteins and drugs for society. But all of this raises ethical issues in regard to religion on moral beliefs. Should we really be playing God, and creating man-made people?

World issues regarding these process:

Human Genome Project: The goal of HGP, genetic mapping, is controversial due to the high cost and because of the belief that sequencing a huge amount of noncoding DNA should have a low priority in a time where funds are limited for research. But most individuals involved in the HGP agree that detailed genetic map would be extremely useful in diagnosing a disease before any symptoms appear which may make management of the disorder more effective. The ability to diagnose a genetic disorder before any treatment is available may do more harm than good, as it creates anxiety and frustration. Geneticists have isolated several disease-causing gene mutations and studied them in detail but have yet to develop a treatment.
Gene Therapy: The therapeutic DNA introduced into host cells need to remain functional and cells containing the therapeutic DNA must be stable, but the problem with inserting therapeutic DNA into the genome is that cells have a rapidly dividing nature which prevents gene therapy from becoming s

long-term benefit. Patients will have to undergo multiple procedures. Another problem is the immune response one’s body has to anything foreign, immune systems have enhanced response to foreign invaders which it has seen before, and therefore makes it difficult for gene therapy to be repeated in the same individual. Because gene therapy makes changes to the body’s genetic makeup, it raises many ethical concerns. This process could be used to eliminate diseases/disabilities, but can also enhance desirable traits. There is a thin line between what is considered a " disease" (for example, the dwarfism disorder achondroplasia) and what is considered a " trait" in an healthy individual (for example, a short stature). Therapy for trait enhancement can have a negative impact on what society perceives as " normal" and thereby promote discrimination toward individuals with the " undesirable" traits.(Sort of like the book Brave New World, where everyone is simply a clone and it is seen as strange or unwanted when someone is a little different). It’s feared that the acceptance of germ line gene therapy could lead to the acceptance of gene therapy for genetic enhancement. Today, gene therapy uses somatic cell therapies using genes that cause diseases. However, many worry that, as the feasibility of germ line gene therapy improves and more genes causing different traits are discovered, people will begin using other genes in gene therapy. Cloning: The ethical issues of cloning, whether in animals or humans, has been raised by the Catholic Church and other religious organizations. They are all strongly opposed to cloning as they believe life begins at conception and that life cannot be created artificially, only through the unity of a male and female. Cloning creates identical genes thereby hampering the diversity of a species. By

doing so we are weakening an organisms ability to adapt because they will all be the same. This can be extremely dangerous for an organism, due to the fact that if there is an outbreak of a certain disease in that species, because they are all the same, every one of them will most likely contract the disease. The species will be considerably weaker than if there was a wide diversity.

Citation:

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