



Genetic Engineering – 2020

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Received date: August 29, 2017, Accepted date: August 31, 2017, Published date: September 03, 2017

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Citation: Selvarajan E (2017) Genetic Engineering – 2020. J Genet DNA Res 1: 1000e102

Editorial

Earlier in 1970's when people were told that the computers will soon take over everything from shopping, banking to stock market and billions of people from all over the country would be connected via the web or even that they would have a hand held device that is powerful than the supercomputers, they felt absurd but it all happened. Today, science fiction has become our reality. Humans have been engineering life for thousands of years through selective breeding to strengthen useful traits in the plants and animals. But this mechanism was not fully understood until the discovery of Deoxyribo Nucleic Acid (DNA), a complex molecule that guides with the growth, development, function and reproduction of every living being on earth. The information is coded on the structure of the molecules with the help of four nucleotides (Adenine, Guanine, Thymine and Cytosine). Once this information changes, we induce a change in the being carrying it.

In 1960's, once DNA was found, the Scientists bombarded the plant species with the radiation trying to create random mutations in the genetic code. The idea behind the experiment was to create a useful plant variation by pure chance. Later in 1974, when researchers were studying on the recombinant property of the DNA, they successfully created a genetically modified mouse, making mice a standard tool for research. In 1990's the 1st human engineering was done where the baby is made to carry the genetic information from three different humans. While all this seems impressive, the gene editing process has become complicated and expensive to do. This is where the CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) technology comes into play where it reduces the time taken for the experiment and the cost of engineering has shrunk to over 99% overnight. This newly emerged technique literally has the potential to create revolution by changing the life forever like finding a cure for the disease or designing the babies or a solution for eternal youth. This technique was identified in the bacterial immune system where the bacteria stores some part of the bacteriophage DNA in them and quickly attacks by triggering the Cas9 protein when the phage comes into contact again. A major revolution occurred when the scientists identified that the CRISPR system is programmable. This gave a cheap, easy and quick access to living cells to switch genes on and off or to target and study the particular genes. This still is the first generation tool and more precise tools are being created.

In 2015, Scientists used this technique to cut the HIV virus from the living cells and a year later it was proved that this technology helped to remove more than 50% of the virus by simple injection of the CRISPR into them. In a few decades, the CRISPR technology might eradicate HIV and other infectious retrovirus like Herpes from the living body. This technique also can help the immune cells for better targeting of

cancer cells. In the near future, the cancer might be cured with a couple of injections too! Things are picking up the pace quickly.

Few genetic diseases like hemophilia and huntington's are deadly and cause decades of suffering. We may be able to end this with the powerful CRISPR tool where the Cas9 is modified. By 2020, we may be able to cure almost every genetic disease but this is limited to every individual as it can't pass on to next generations. But another interesting topic is on designer babies where the total human genome is modified and the genes are passed on successively. The means to edit the genome of the human embryo already exist but the technology is still under study. In 2016, Chinese scientists have successfully experimented the technique.

As the technology progresses more refined, more people might prefer using the genetically modified species for a disease free and healthy lifestyle and as it advances, the temptation will grow. This can also be used to make a child immune to Alzheimer's or any genetic disorders, give them perfect metabolism, to enhance the IQ, body built, hair, height etc.. in the future. These modified humans could become the new standard. Similar to this, the aging becomes a factor to worry about as the increase in death occurs due to aging. By combining genetic engineering and other technology, we'll be able to slow down aging process or probably reverse it. Few animals like lobsters are found to be immune to aging, by nature. Their genes can probably be tested on humans. On a bigger scale, we could certainly solve many problems by having a modified population. Engineered human can prevent himself from the metabolic diseases like obesity. In possession of a modified immune system, we might become immune to most diseases that haunt us today. In the near future we can also modify humans for well-equipped extended space travel with different conditions on other planets, which would be helpful in keeping us alive under different conditions.

Though this technology seems promising, some ethical and technological issues still restrict the full access to CRISPR technology as there is a fear of wrong edits and unknown cuts where the disease may be disabled but might accidentally trigger unwanted changes etc. But basically, the genetic engineering in human is a powerful technique, done to defeat the diseases, to have children without illness, to conquer our biology, to increase the life expectancy, super soldiers etc. Though the technology is suddenly a bit scary but we have a lot to gain from it. Genetic engineering is all about playing god and might just be a step in the evolution of intelligent species in the universe. We might end disease or could increase the life expectancy by the end of 2020 but the future is very promising with this new technology. What has once said in science fiction is about to become our new reality full of opportunities and challenges.