

Biology Science as A Human Endeavour (SHE) Inquiry

Introduction

The human body is filled with hundreds and thousands of small DNA (deoxyribonucleic acid) strands which together as a complete strand create what's called a Genome. DNA is a chemical compound which makes up the genetic instructions that are needed by all living things. DNA is made up of two intertwining, paired stands that create a double helix shape. Each of these strands is made up of four chemical units called nucleotide bases. These are adenine, thymine, guanine and cytosine or A, T, G and C bases. The Human Genome project was an international collaborative research program, there goal was the understanding and mapping out of all genes of human beings, or our "Gnome."

Background Biology

Your Genome is basically like the operating manual of a car except for your body. It is the thing that helped you go from a single cell in the womb to the human that you are today. It is the thing that guides your growth, helps your organ's function, repairs itself when it has been damaged and is unique to you. A gene is small segment of DNA, they provide your cells with the specific instructions for making proteins, which then go on to carry out particular functions in your body. All humans have the same genes in the roughly the same order, and more than 99.9% of your genetic sequence is pretty much the same as any other human. However, we do contain at least 1 – 3 pairs that differ between each person. This is however a big enough difference to change the shape and function of proteins, how many are made where they're made and what their purpose is. They affect eye-colour, hair and skin, but can also affect your risk of developing certain diseases. The structure of DNA was discovered by Crick and Watson in the 1950s and James Watson then went on to start the Human Genome project which is how we were able to obtain all this information that we have today.

Development

Many technological advances were made during the Human Genome Project which allowed the project to move forward. These things include: Sanger DNA sequencing and its automation. This is a method where DNA that need sequencing is combined into a tube with some primer, DNA polymerase and DNA nucleotides. That mixture is heated so the DNA template is denatured and then cooled so that the primer can bind to the single strand template. Other advances include DNA-based genetic markers, large-insert cloning systems and the polymerase chain reaction. Throughout the project these technologies were scaled up and then through “evolutionary” [image:] advances, such as atomization and minimization the technology became more efficient. Other technologies including capillary based sequencing and methods that are used for genotyping single nucleotide polymorphisms, were also introduced. This helped lead to further improvements in the capacity for genetic analyses. Even newer approaches have been introduced such as nontechnology and microfluidics, that have shown great promise, however further advances are still needed.

Benefits to Society

Many benefits came out of the Human Genome Project, that has allowed the us humans a greater understanding into what makes us individuals. For one it has the ability to help diagnosis and prevent of human diseases. As we start to understand the human body more and more, we can begin to understand how to mage different conditions and even what cures are needed. We could even cure genetic conditions, due to the work done by the Human Genome Project. It has also allowed to us to modify medication for more effective treatment. This is compared to the old treatment method which was a one-size-fits-all treatment and if it didn't work for you than that's just tough luck. Whereas now we can modify treatment so that it works for you as an individual. We now also have improved criminal justice proceedings. This is because out DNA is unique to us, and during the Human Genome Project they developed something call DNA fingerprinting. This is where DNA samples of an individual are compared with DNA samples that have been collected. This allows to more accurately accuse criminals of offenses. It has also helped boost the economy of America, as during it's time in operation it created jobs for more

than 4 million people. This created almost 1 trillion dollars in economic stimulus. It also created new positions and jobs due to its work on genetics. It has also lowered the price of sequencing a genome from about \$100 million in 2001 to roughly \$1000 in 2019.

Limitations and Harms to Society

As much as the Human Genome Project has had some amazing benefits to society there is no denying that in the wrong hands it could lead to some terrible things. The technology created could cause a loss in the diversity between us as humans. What makes us humans so strong as a race is our diversity. Even though diversity can be bad with things such as genetic mutations and defects. It's what makes us human, and with the way to make the perfect human, it would strengthen us in so many ways, but it would take away what makes us what we are, and we wouldn't be individuals any more. We would start forgetting about normal reproduction and start worrying about how to make the perfect human in the lab causing entire populations to be exactly the same. It could also be used to create new weapons that are able to target certain genetic populations in different civilizations. This would reduce the amount of structural damage caused by war, making it attractive to other nations looking for more global resources. It might also become the foundation for genetic racism where we move away from judging people based on their race, skin colour, gender preference and sexual preference. Instead, we would move towards whether you have better genetics than someone else which would push the gap between developed and developing civilizations further apart because the developed one will have access to the technology first.

Conclusion

In Conclusion, it can now be seen how much of a success the Human Genome Project really was. The goals were reached ahead of schedule and under budget and the information gathered has pushed genetic research further than ever. The first complete map of a human genome was created and was made available to the public eye. Multiple new and improved technologies were created during the project to help push it forward which have helped us learn more about genetics. It has created multiple benefits for society after being complete and even though it may

have a few harms that could be created, as long as we keep this technology in the hands of the right people, we can be sure that it will be able to make everyone's lives so much better.

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