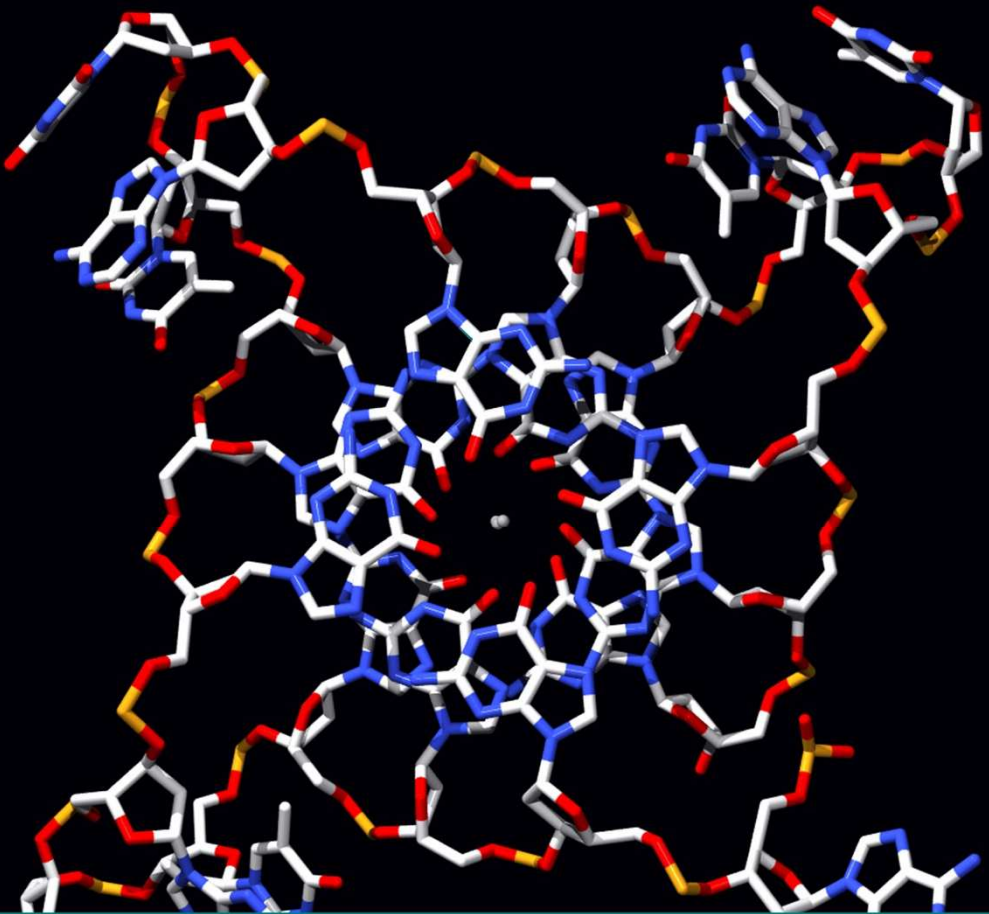


Apologetics Made Simple

Dangers Of Human Genetic Manipulations



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Dangers Of Human Genetic Experiments

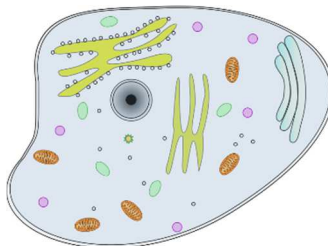
Everyone has heard about genes and practically everyone also knows that genes control our health and many other things related to our body. However, the subject of genes is much more vast than that, and by now genetic sciences have come to a stage where practically everyone should know at least a bit more about genes and also about what all kind of tampering they are doing with genes. Let us start with a bit of history to give you a good orientation. We will keep it illustrated to comply with our Keep It Simple approach.

A Bit Of History

Genes were identified only in the twentieth century, but Genetics as a subject had its foundation in late 19th Century. Gregor Johann Mendel, an Augustinian friar (priest) conducted numerous experiments of interbreeding various kinds of peas and deduced that characters are inherited by the next generation in a definitely predictable logical and mathematical pattern.

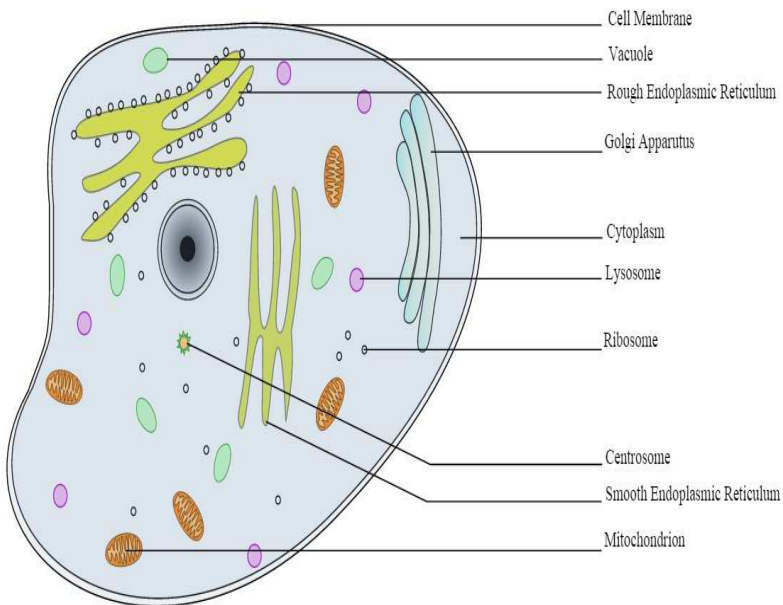


This was the start of Genetics, but he was so much ahead of his time that it took another three decades for the scientific community to understand the significance of this work by Mendel. Once they understood the importance of his work, Genetics started to grow with leaps and bounds. Soon it became clear that certain definite factors in human cell are responsible for such a strict genetic behavior.



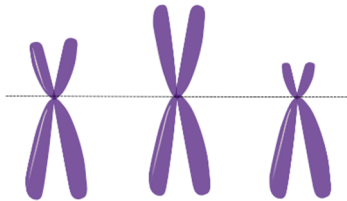
A Human Cell

Cells are the smallest independent constituents of human body. Within each cell there is a whole factory which is millions of times complex than any factory that modern man has ever built. So tiny are these constituents that they were unable to at that time to know the precise function of each one of them.

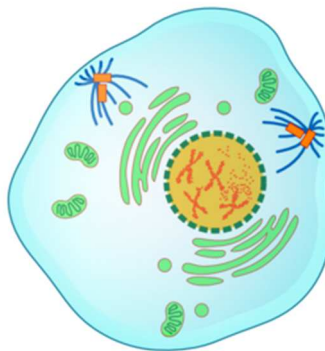


Cross Section of an Animal Cell

As the power of microscopes increased, and as methods of chemical staining and analysis of cell components were developed, it became clear that certain colored strands seen inside animal (and also plant cells) were the carriers of genetic information.



These colored strands were named as Chromosomes (Chroma=color).

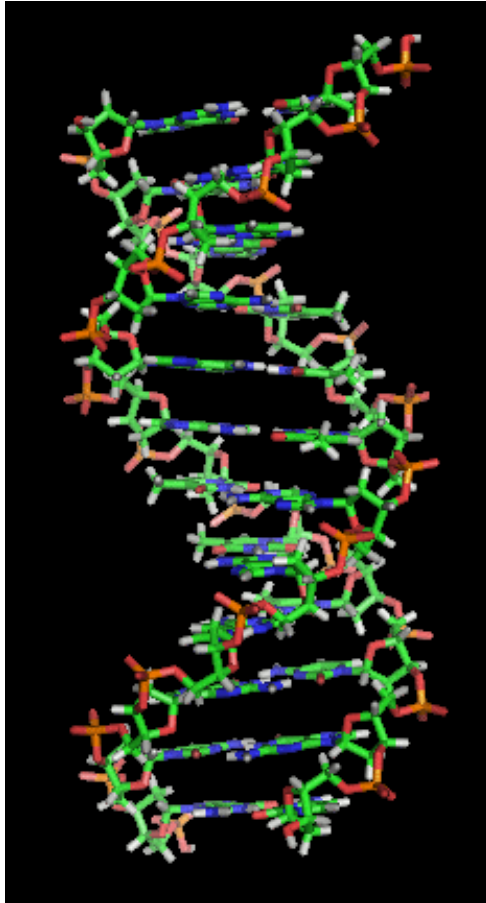


These Chromosomes reside inside what is called the nucleus (depicted with a circle in picture) for the sake of their

protection and integrity. Now the biggest question was, HOW and in what form do the chromosomes carry genetic information. After many years of investigation, it became clear in 1944 that a very complex chemical known as Deoxyribonucleic acid (now widely known as DNA) is the actual chemical carrier of genetic information.

This was a momentous discovery because if information about life is carried by (or in) a chemical chain, then one day men with sufficient chemical expertise might be able to tamper with it and manipulate it at will. After all, there is no chemical that is immune to tampering by chemists.

DNA is a chemical in the form of a very long chain, and this chain structure was discovered by James Watson and Francis Crick. The DNA is made up of just four chemical units, named A, C, G, and T. Of course, each chain has millions upon millions of these four units in different combinations. For safety and integrity each chain comes connected to a parallel complementary chain so that the 'information-carrying' chemical chain is not destroyed easily.



Picture: A sample of DNA Chain with two strands, connected with each other by horizontal connectors (chemicals)

(Picture: [Zephyris](#),
[Commons.Wikimedia.org](#))

It has been estimated that each human cell has around 3 billion pairs of the bases named A, C, G, or T. Let us get some idea of how much 3 billions means.

If each pair is represented by one letter in a book that has 500 words per page, the book would have 600,000 pages. If one book has 500 pages, 600,000 pages represent 1200 volumes. Or, to type all those letters, a person would have to type 60 words per minute, 24 hours a day, for about 16 years! So much is the genetic information that makes you and me.

Though mature human cells come in many forms such as skin cells, cells of the liver, etc, each and every cell of an individual contains this much information. Such a vast amount of information is necessary to form and run a human body with great integrity.

A large number of the above base-pairs form a 'gene' just as a number of letters combine to form words and sentences. The corruption of a gene can often cause serious handicaps and diseases.

For example, the following widely known diseases are caused by disorders of genes (genetic disorders):

- Color blindness
- Cystic fibrosis
- Down syndrome
- Duchenne muscular dystrophy
- Haemophilia
- Phenylketonuria
- Polycystic kidney disease
- Sickle-cell disease
- Tay–Sachs disease

Thus these have been studied extensively and there is a lot of theoretical clarity about how these genetic disorders might be cured, although actual cure for most of them is years away. That is because the hundreds of thousands of genes in a single human cell interact with each other in many complex ways that have not yet been understood clearly. As a result, not all current theoretical understanding can be translated into practically applicable cure. Just a bit of tampering here often results in numerous unexpected, unpredictable,

and unknown interactions in other locations that can have devastating effects in the long run.

Genetic Engineering

Modification of genes is called 'genetic engineering'. Man has been doing this for thousands of years through selective breeding of animals and plants. Such breeding is relatively safe because the complex genetic mechanism of living organisms have uncountable safety mechanisms which either prevent dangerous modifications or which do not allow the offspring of such cross-breeding to perpetuate.

A good example is 'ligers'. The liger is a hybrid between a male lion and a female tiger. Since this is an unnatural combination of genes, most ligers die in embryonic stage itself. If born, most of them they suffer premature death. Those that survive are often genetically or physically sterile and therefore unable to reproduce and therefore their lineage does not continue.

In 1970s, however, scientists started

direct manipulation of genes in the laboratory. Many safety-mechanisms inside cells resist such direct manipulation and initially such manipulations remained relatively safe. However, numerous techniques have been subsequently devised to overcome or destroy such resistance and in-built safety-mechanisms so that scientists can now do practically any kind of genetic manipulation with cells that they deem fit.

One does not know how early in time such unofficial experiments started and how many are going on right now, but officially the first genetic manipulation was done in 1972 when Paul Berg combined DNA from two viruses. Experiments to manipulate virus DNA have been going on ever since, because this is generally the easiest region for DNA manipulation. Viruses do not have a cell structures and the associated mechanism to resist DNA manipulation. Thus the ease in manipulating them.

The problem is that even though virus are infinitely more simple in structure than plant or animal cells, they are still not understood fully. This is the reason

why the world continues to battle with (seemingly) simple problems created by influenza virus and deadly problems created by virus like HIV (which gives rise to AIDS) or smallpox. Laboratories which conduct experiments on virus have multiple levels of isolation and rigorous security protocol for storage, experiments, and destroying of virus and virus products after conducting experiments. Only very highly trained personnel are allowed to work in such laboratories. There are multiple security checks so that accidents do not happen. Yet accidents do happen and lives are put to danger inadvertently from time to time.

Fortunately or unfortunately, genetic manipulation of virus, bacteria, plants, animals, and humans have now become infinitely more easy compared to 1970s when such manipulations started. Alertness about possible dangers have reduced because such procedures have now become routine. What is more, experiments on non-virus entities are often conducted under much relaxed safety protocols because plant, animal, or human cells are often not considered as dangerous as virus.

Consider, for example, a bacterium known as *Escherichia coli*, or *E. Coli* in short. These bacteria are part of the human gut. They are also very common in the guts of warm-blooded animals. Most *E. coli* strains are harmless, but some of them are very harmful and a good number of food-poisoning among humans takes place because of them. Many companies recall and destroy company-made food items from time to time because they discover contamination of certain batches of their food with these harmful strains of *E. Coli*. This, in spite of modern food processing in totally aseptic conditions, without touch of human hands.

Since it is easy to manipulate the genetic material of *E. Coli*, it has become the work-horse of those who do gene manipulation experiments worldwide. The problem is that many of these countries do not have sufficiently rigorous protocols for control, isolation, and destruction of dangerous products of such experiments. Worse, many of these countries are controlled by authoritarian regimes or dictators for whom safety of their country-men -- or

human life -- has no value. They can easily set up laboratories manned by teams of scientists who can conduct such experiments without following protocols, and without the world knowing about their work.

Meanwhile, genetic modification of virus, bacteria, plants and animals continue worldwide for commercial gain. Many of these are related to the economic production of medicines. What alarms many people -- however -- is that genetically modified plants and animals are gradually becoming part of commercially produced food.



The fish shown in the above picture (released by <http://www.glofish.com/>) have been modified so as to glow. What would happen when they mate with non-glowing fish of the same species is not known.

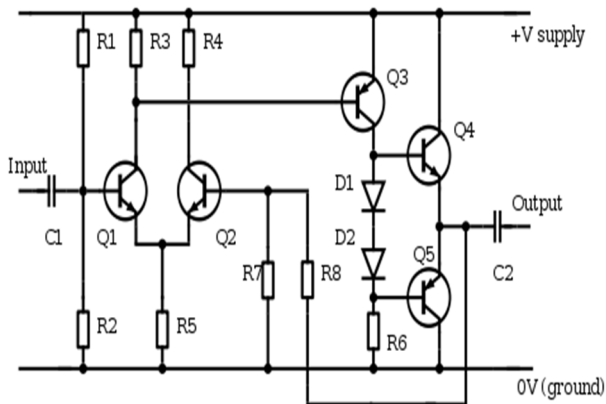
The long-term impact of consuming genetically modified plant and animal products is not known, but they are gradually entering animal and human food-stream worldwide. The problem here is that people are commercially harvesting a double-edged technology decades before there is any clear understanding of the long-term impact of these modifications.

Manipulation of Human Genes

The Genetic Engineering community has always restricted manipulation of human genes to the extremely essential matters because not even one per cent of human genes are properly understood. With an estimated minimum of 100,000 to 125,000 genes per human cell (made up of 3 billion bases named A, C, G, or T) even the present-day accelerated methods to studying them are not

sufficient to understand all of them in decades to come.

What is more, while the function of a few human genes have been determined, these are generally functions in-isolation. The precise impact of a given gene on the system as a whole is often much more complex than its property in isolation. Thus here is a territory where 'some' information is available, but the system as a whole continues to be an uncharted territory.



The picture above represents an extremely simple solid-state amplifier.

The removal of even a single component can render the circuit as non functional. A human cell is a million million times more complex than the above electronic circuit. Even a millionth of its total functionality has not been understood yet. New discoveries surprise scientists regularly. What is more, a tampered cell (if not destroyed properly) remains there to infect other cells to perpetuate genetic problems that are impossible to arrest or contain.

Let us go back to the above circuit once again. Within the cell is the nucleus. Within nucleus are chromosomes. Upon Chromosomes are the 100,000 or more more human genes. Not even one percent of them have been properly understood. Their mutual interaction is much less understood, particularly when it comes to long-term interaction. Thus, just as tampering with the above circuit generally destroys it, tampering with a million million times complex human cell can have plenty of unexpected results. More so because cells are LIVING entities that can transfer these errors to an endless number of other living and cells that keep reproducing endlessly. This is

why medical experiments in genetics have been done with extreme caution and control. However, a recent experiment with human genes has sent ripples of shock in the scientific world.

Junjiu Huang, a gene-function researcher at Sun Yat-sen University in Guangzhou, China, recently reported that they did 'edit' genes in human embryos. A whole team worked under Huang to modify the gene responsible for β -thalassaemia, a blood disorder, using a gene-editing technique known as CRISPR/Cas9. They then sent the results for publication in two standard journals: Nature and Science. Both of them refused to publish the paper reportedly because they found great ethical objection to the experiment. Finally Huang published the research-paper in a less-known online journal, Protein & Cell.

The scientific community worldwide is alarmed about this paper because the gene-editing was done on live human embryos and not on isolated cells. According to Huang, they used non-viable embryos (embryos that would never survive in nature) for such editing

of genes and that they have done nothing alarming. However, the genetic research community worldwide claims that once such editing was done on non-viable but living embryos, some will naturally extend the work to viable embryos because this paper has now outlined the method using which it can easily be done by others.

Already a number of teams in China are reported to be working on editing genes of live human embryos. Since there are no established protocols for such research, and since such protocols cannot (and are not) strictly enforced in many countries, the scientific community has taken strong exception to gene-editing experiments in live human embryos.

Frankenstein's Monster

Frankenstein's monster is a fictional character that first appeared in Mary Shelley's 1818 novel Frankenstein. The name is now used for any scientifically created character that is a monstrosity.

With the editing of genes in live human embryos being made so accessible, and the technique made available for public consumption, plus multiple teams already working in China to extend the techniques, matters are not to be taken lightly. Once a technique becomes available, there are always people who can and who will misuse it. That is the worry that the scientific community now has.

Few things particularly worry them: first, what would be the long-term results of editing the genes of embryos. Second, if someone edits genes of a viable embryo, and if that embryo is allowed to be born as a child, and if the child develops unseen handicaps, diseases, or monstrosity, who shall be held responsible for creating it. Who shall be the parents. What shall be done with it because unlike animals with grave defects this 'human' with defects or monstrous characters cannot be eliminated (killed) because it is a 'human' being with rights to life.

Worse, what would be the human and human rights status if such editing techniques are used for (for example)

creating a synthetic character that is part human, part vegetation, and part animal. These are real possibilities seeing how methods of 'editing' human genes are being made available in public without protocols to control and regulate it.

Summary

It is good that the scientific community has started a heated debate on this subject. Not all research is benevolent, just as -- for example -- not all use of atomic energy is good for society. Just as rogue scientists can misuse atomic energy, rogue scientists can much more easily misuse embryonic gene-editing. While atomic energy is a limited thing in the hands of people, and while it can be detected and controlled, editing of human embryos and its subsequent results cannot be detected easily. Worse, its results cannot be 'eliminated' seeing we are talking of real human beings born via such techniques.

About The Authors



Dr. Saneesh Cherian is an evangelist-teacher-writer from Plymouth Brethren Background. He studied under some of the greatest Brethren teachers of this generation at the Brethren Bible Institute during his BTh years.

He then went on to study for MDiv, ThD and PhD under scholars of repute. He made a substantial academic contribution by serving as the Academic Dean of several Bible Seminaries.

He is the author of more than 100 books and 1000 articles. This includes epochal works such as Systematic Theology and Christian Apologetics (800 pages each), Bible Encyclopedia (4 volumes), Dictionary of Theology, etc. He is also the Managing Editor of the prestigious Verpad (Separation) magazine.

A large number of his books are now available for free downloading from our websites.

Dr. Johnson C. Philip is a senior Christian communicator, expositor, and apologist. A specialist in Quantum-nuclear Physics, he has done advanced studies in physics, archeology, communications and numismatics. He has authored more than 100 books and 10,000 articles.



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The authors stand unashamedly and without wavering on the following fundamental principles: Bible Alone (Sola Scriptura), Faith Alone (Sola Fide), Grace Alone (Sola Gratia), Christ Alone (Solus Christus). With this in mind we bring to you a set of writers who stand strong on these principles.

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