China's Gene Editing Rules

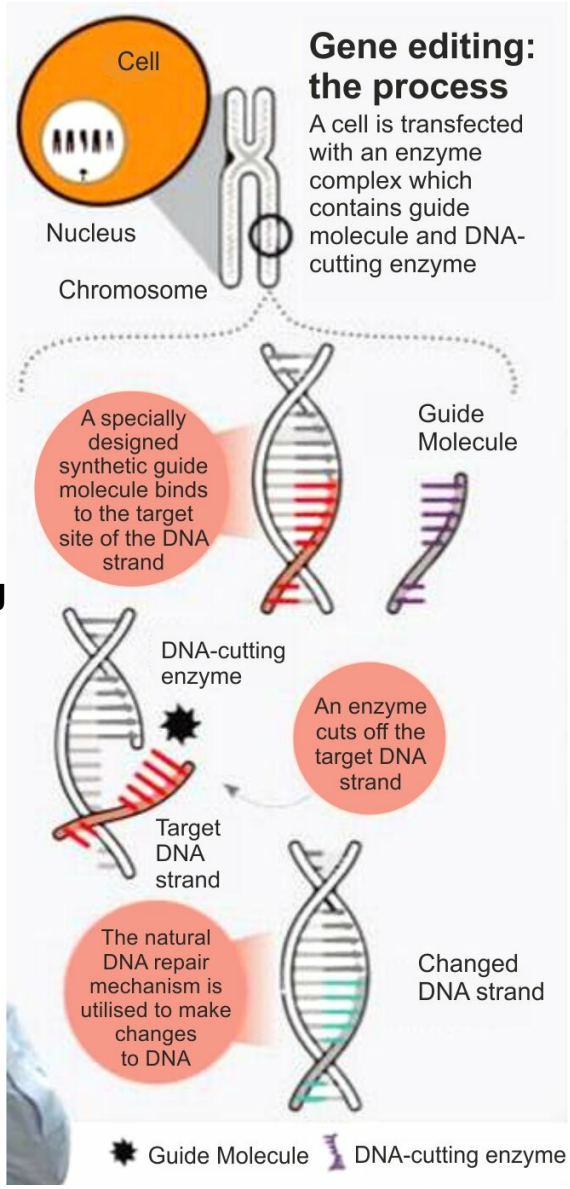
China has decided to introduce new Gene-editing rules.

- Rules require researchers to obtain **prior approval from the government** before undertaking clinical trials.
- Those found violating the rules will be punished and this includes a **lifetime ban on research**.
- The rules would also require **all future trials to be approved** by administrative authorities as well as ethical committees.

Background

- Last year, a chinese researcher, He Jiankui, has claimed that he used CRISPR **(Clustered Regularly Interspaced Short Palindromic Repeats)** to produce the world's first gene-edited babies to make babies immune to infection by the human immunodeficiency virus (HIV).
- After the news of gene-edited babies came Chinese national health commission investigated and found that Dr. He had violated the national regulations against using gene-editing for reproductive purposes.
- China has now decided to come up with stricter norms regarding gene editing.

Gene Editing



- Gene editing is also called as **genetic modification, genetic manipulation or genetic engineering**.
- **Genome editing is a group of technologies that give scientists the ability to change an organism's DNA (Deoxyribonucleic acid).** These technologies allow genetic material to be added, removed, or altered at particular locations in the genome.
- Gene Editing is widely practised in agriculture, to increase productivity or resistance to diseases, etc.

What is CRISPR?

- **Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)** is a gene editing technology, **which replicates natural defence mechanism in bacteria to fight virus attacks,** using a special protein called Cas9.

- CRISPR-Cas9 technology behaves like a **cut-and-paste mechanism on DNA** strands that contain genetic information. The specific location of the genetic codes that need to be changed, or edited, is identified on the DNA strand, and then, using the **Cas9 protein, which acts like a pair of scissors,** that location is cut off from the strand.
- A DNA strand, when broken, has a natural tendency to repair itself. Scientists intervene during this auto-repair process, supplying the desired sequence of genetic codes that binds itself with the broken DNA strand.
- CRISPR-Cas9 is a simple, effective, and incredibly precise technology with potential to revolutionise human existence in future.

Issues

- Dr. He used the CRISPR–Cas9 gene editing technique to disable a gene called CCR5 (C-C chemokine receptor type 5), which **encodes a protein that allows HIV to enter and infect cells**.
- Though no guidelines have been drawn up so far regarding gene editing.
- There is a **general consensus** in the scientific and ethics communities that the CRISPR–Cas9 gene-editing technique should not be used clinically in embryos..
- Importantly, **human clinical trials have not been carried out** anywhere in the world to test whether disabling the gene completely prevents HIV infection.
- In the absence of any clinical trial data as well as consensus to use this tool to prevent HIV infection, performing it on babies as a form of medical **intervention is unethical**.

CCR5

- C-C chemokine receptor type 5, also known as CCR5 or CD195, is a protein on the surface of white blood cells that is involved in the immune system as it acts as a receptor for chemokines.
- CCR5, which encodes a protein that allows HIV to enter and infect cells. The CCR5 gene protective role against the West Nile virus is well established.
- The CCR5 gene also helps to protect the lungs, the liver and the brain during certain serious infections and chronic diseases.
- The gene is known to prompt the immune system to fight the influenza virus in the lungs.