Chimeras of Nature

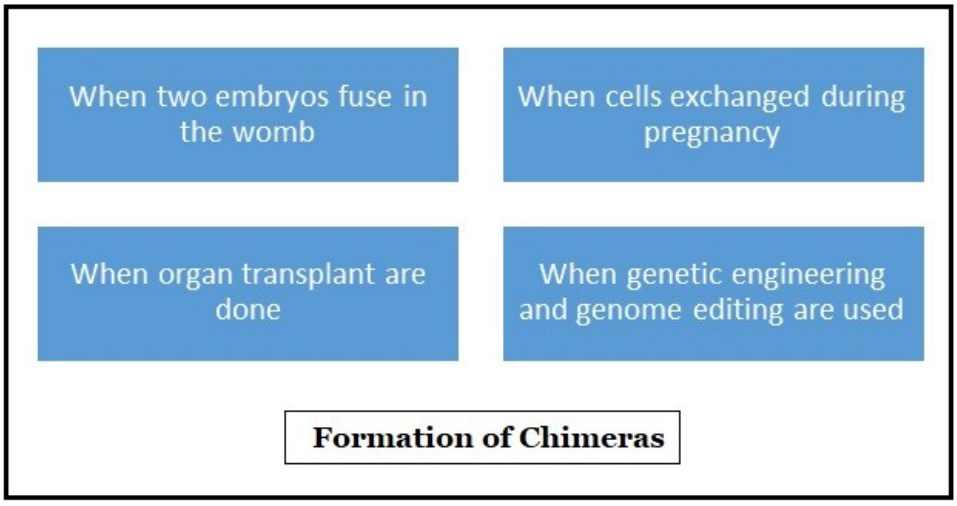
Why in news?

In a recent landmark study, scientists reported the successful generation of a live chimera in non-human primates.

What is chimera?

> *In Greek mythology, a chimera was a fearsome creature with the combined features of a lion, a goat, and a snake.*

- **Chimerism-** It is defined as a phenomenon of occurrence of more than one type of different and distinguished genotype in an organism.
- **Chimera-** It is defined as an organism composed of cells with different genotypes altogether.
- **Formation of chimera**- They can arise in several ways



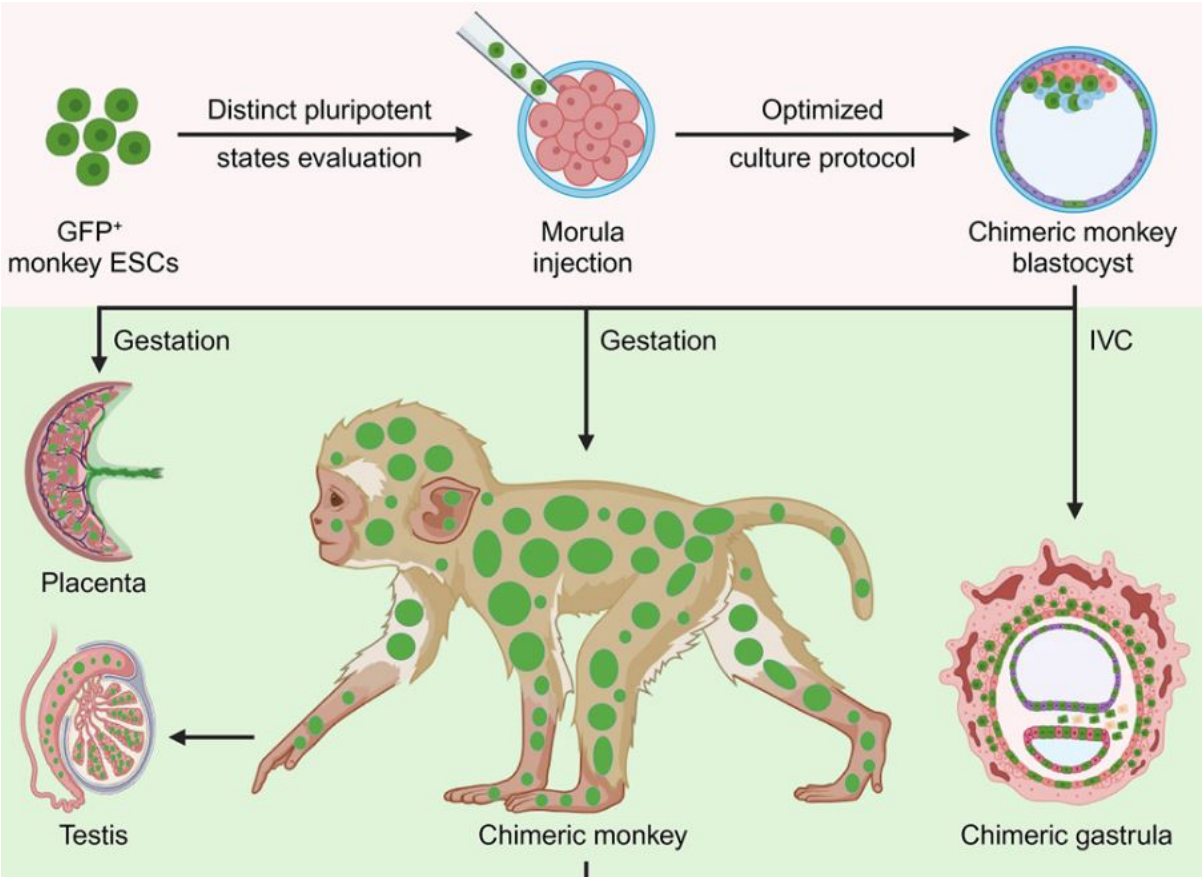
- **Natural chimeras**- It also occurs in natural ways.
  - Example- Anglerfish, Sponges, Yellow Crazy Ants etc.,
- **Genetic Chimeras-** It happens when an individual is derived from two or more zygotes.

Types	About
Animal chimeras	It results from the merger of two or more embryos. They may possess blood cells of different blood types and subtle variations in form.

Plant chimeras	It can have distinct types of tissue originating from the same zygote due to mutation during ordinary cell division.
Hybrid chimeras	An individual where each cell contains genetic material from two organisms of different breeds, varieties, species or genera.
Organ transplantation	The tissues from a different genome are introduced to an individual. Example- Bone marrow transplantation can determine the recipient's ensuing blood type.

What are the key findings of the study?

- The stem cells from a *cynomolgus monkey* (crab-eating or long-tailed macaque) is combined with a genetically distinct embryo from the same monkey species.
- The cells were also infused with a *green fluorescent protein* so the researchers would be able to determine which tissues had grown out of the stem cells.
- The resulting chimeric monkey had cells of both genotypes in various tissues.
- It reported the successful generation of a live chimaera in non-human primates, which are evolutionarily close to humans.
- This is the *1st time* scientists have succeeded in producing a live infant chimeric monkey.



What are the advantages and challenges of the chimeras?

Advantages	Challenges

• **Organ transplantation**- Animals have been used to fulfil the organ demands by providing insulin, heart valves, etc. - Human pig chimeras can potentially grow human-like organs that can be transplanted without rejection. • **Drug discovery**- It can help researchers to test new drugs and therapies in more realistic models of human diseases. - Human brain cells transplanted into mice can improve their cognitive abilities and mimic some aspects of human neurological disorders. • **Evolutionary studies**- It can reveal insights into evolution and development of different species. - Human-monkey chimeras can help to understand the similarities and differences between primates and human and how they diverged from common sense.	• **Health issues**- They may face health problems, such as infertility, autoimmune diseases, and psychological stress, due to the presence of cells from different species. • **Cross species disease**- They may pose a risk of transmitting cross-species diseases to humans or other animals, especially if they have human-like organs or immune systems. • **Human identity**- Chimeras may challenge the moral and legal status of both humans and animals, as they blur the boundaries between species and raise questions about their rights, dignity, and identity. • **Unintended consequences-** They disrupt the natural balance of ecosystems, creating new ethical dilemmas, affecting public perception and acceptance of biomedical research. • **Animal welfare**- The welfare of the animals is at risk due to mixing of human and animal cells.

What lies ahead?

- Chimeras should be created and used with caution and respect, and under strict regulations and oversight.
- Scientists involved in this field need to continue to discuss and consider the implications of their research with the broader community.

References

1. The Hindu- First monkey chimera
2. Conversation- Benefit of human animal hybrids