

## Chimeras of Nature

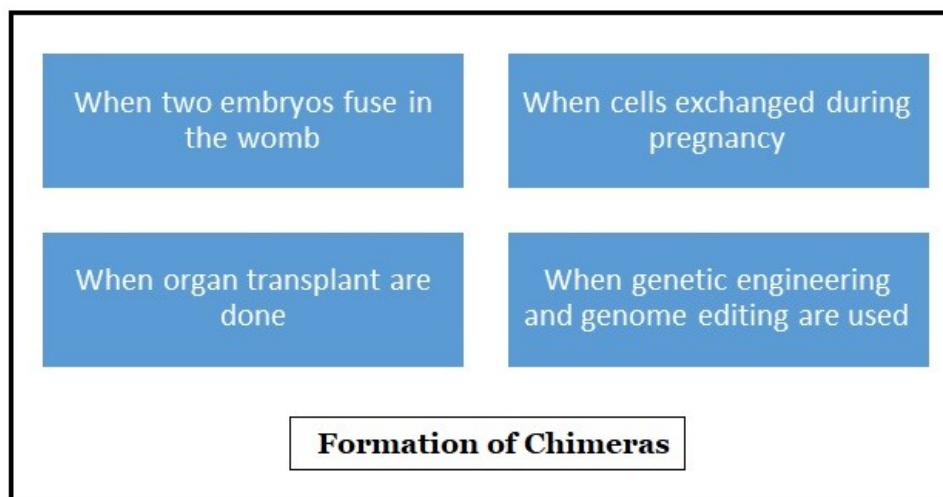
### Why in news?

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



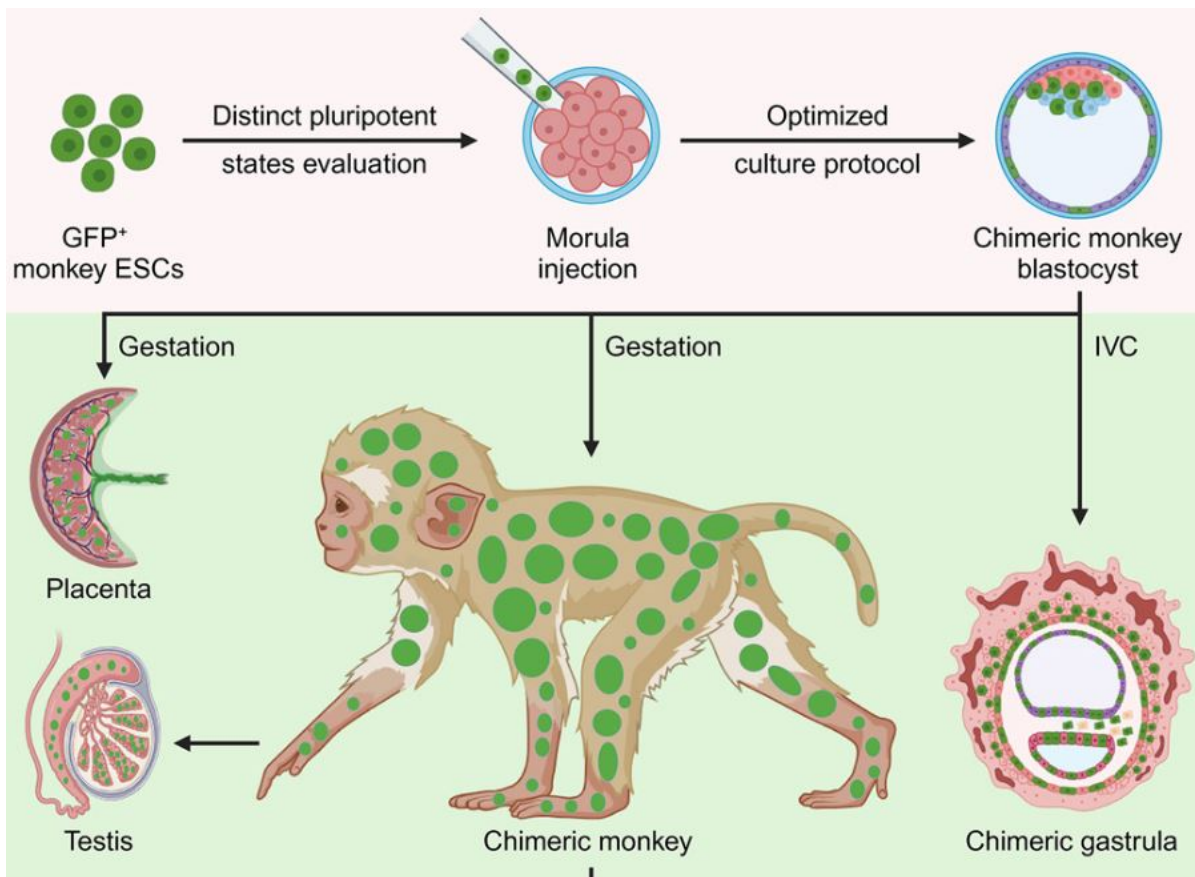
- **Natural chimeras-** It also occurs in natural ways.
  - Example- Anglerfish, Sponges, Yellow Crazy Ants etc.,
- **Genetic Chimeras-** It happens when an individual is derived from two or more zygotes.

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

|                              |  |
|------------------------------|--|
| <b>Plant chimeras</b>        | It can have distinct types of tissue originating from the same zygote due to mutation during ordinary cell division.   |
| <b>Hybrid chimeras</b>       | An individual where each cell contains genetic material from two organisms of different breeds, varieties, species or genera.                                  |
| <b>Organ transplantation</b> | The tissues from a different genome are introduced to an individual.<br>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 1<sup>st</sup> time scientists have succeeded in producing a live infant chimeric monkey.



**What are the advantages and challenges of the chimeras?**

|                   |                   |
|-------------------|-------------------|
| <b>Advantages</b> | <b>Challenges</b> |
|-------------------|-------------------|

|   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• <b>Organ transplantation</b>- Animals have been used to fulfil the organ demands by providing insulin, heart valves, etc. <ul style="list-style-type: none"> <li>- Human pig chimeras can potentially grow human-like organs that can be transplanted without rejection.</li> </ul> </li> <li>• <b>Drug discovery</b>- It can help researchers to test new drugs and therapies in more realistic models of human diseases. <ul style="list-style-type: none"> <li>- Human brain cells transplanted into mice can improve their cognitive abilities and mimic some aspects of human neurological disorders.</li> </ul> </li> <li>• <b>Evolutionary studies</b>- It can reveal insights into evolution and development of different species. <ul style="list-style-type: none"> <li>- Human-monkey chimeras can help to understand the similarities and differences between primates and human and how they diverged from common sense.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• <b>Health issues</b>- They may face health problems, such as infertility, autoimmune diseases, and psychological stress, due to the presence of cells from different species.</li> <li>• <b>Cross species disease</b>- 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.</li> <li>• <b>Human identity</b>- 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.</li> <li>• <b>Unintended consequences</b>- They disrupt the natural balance of ecosystems, creating new ethical dilemmas, affecting public perception and acceptance of biomedical research.</li> <li>• <b>Animal welfare</b>- The welfare of the animals is at risk due to mixing of human and animal cells.</li> </ul> |
|---|--|

### 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](#)