Gene editing in a human embryo

Why in news?

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A Chinese researcher recently made a claim that he had altered the genes of a human embryo that eventually resulted in the birth of twin girls.

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What is the technology behind?

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- Genes contain the bio-information that defines any individual.
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- The information encoded in the genetic material can be attributed to –
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1. Height, skin or hair colour
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2. Intelligence or eyesight
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3. Susceptibility to certain diseases
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4. Behavioural traits
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- CRISPR (short for Clustered Regularly Interspaced Short Palindromic Repeats) technology is a relatively new, and the most efficient tool for gene “editing” developed in the last one decade.
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- The technology replicates a natural defence mechanism in bacteria to fight virus attacks, using a special protein called Cas9.
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- The specific location of the genetic codes that need to be changed is identified on the DNA strand.

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- Using the Cas9 protein, which acts like a pair of scissors, the specified location is cut off from the strand.
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- A DNA strand, when broken, has a natural tendency to repair itself.
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- Scientists intervene during this auto-repair process, supplying the desired sequence of genetic codes that binds itself with the broken DNA strand.
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How useful it has been so far?

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- CRISPR-Cas9 is a simple, effective, and incredibly precise technology.
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- The most promising use of the CRISPR technology is in treatment of diseases.
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- For example, in sickle cell anaemia, a single gene mutation makes the blood sickle-shaped, which can be reversed using gene editing technology.
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- In the case of the new-born Chinese babies, the genes were “edited” to ensure that they do not get infected with HIV.
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- However, leading scientists in the field have for long been calling for a “global pause” on clinical applications of the technology in human beings, until internationally accepted protocols are developed.
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What is the ethical dilemma involved?

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- **Verification** - Tampering with the genetic material can have unintended and unknown consequences.
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- The scientific community has no way to verify the claims on whether the gene editing was carried out in the proper manner.
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- **Precision** - There is a possibility that some other genes also get targeted, resulting in unintended impacts.

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- **Approval** - In most countries of the world, such experiments are banned and are punishable by law.
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- Without regulatory approvals, there will be data and information gaps about the experiments on gene editing.
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- **Consequence** - The recent research has edited the genes of an embryo, which would be passed on to the offspring and make changes in the genome of the next generation.
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- Thus there is a possibility to produce designer babies with very specific traits in the future.
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Source: Indian Express

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