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SCISSORING THE DNA: THE HINDU EDITORIAL ON 2020 NOBEL PRIZE FOR CHEMISTRY

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That scientists who pioneered the revolutionary CRISPR-Cas9 gene-editing technology, the biggest game-changer in biology in recent years, will win the Nobel Prize was never in doubt; it was only a question of when and who would get recognised for the work done to develop the tool. The Prize awarded to Emmanuelle Charpentier and Jennifer A. Doudna, just eight years after they developed the tool, has finally ended the speculation of who would win it. But most importantly, this year's Prize for chemistry has created history by honouring an all-woman team. It all started when Dr. Charpentier discovered an RNA molecule that is part of bacteria's ancient immune system — CRISPR-Cas — wherein clustered repeated sequences produced by bacteria can remember and destroy viruses by cleaving their DNA. Teaming with Dr. Doudna, she recreated the bacteria's genetic scissors in a test tube and simplified the tool to make it easier to programme the system to precisely cut specific sites of interest in any DNA, including humans. While the tool is most often used to make a cut in the DNA, newer approaches are being attempted to add or make minor changes to the DNA. All these approaches may at some time in the future make it easy to "rewrite the code of life".

The gene-editing technology has opened up a vast window of opportunity. In the last six years, the tool has enabled scientists to edit human DNA in a dish and early-stage clinical trials are being attempted to use the tool to treat a few diseases, including inherited disorders/diseases and some types of cancer. Though in 2016 China began the first human clinical trial to treat an aggressive form of lung cancer by introducing cells that contain genes edited using CRISPR-Cas9, the use of the tool has so far been limited to curing genetic diseases in animal models. Last year, a Chinese researcher used the tool to modify a particular gene in the embryo to make babies immune to HIV infection, which led to international furore. Though no guidelines have been drawn up so far, there is a general consensus in the scientific and ethics communities that the gene-editing technique should not be used clinically on embryos. Unlike in the case of humans, the tool is being extensively used in agriculture. It is being tried out in agriculture primarily to increase plant yield, quality, disease resistance, herbicide resistance and domestication of wild species. The huge potential to edit genes using this tool has been used to create a large number of crop varieties with improved agronomic performance; it has also brought in sweeping changes to breeding technologies. The gene-editing tool has indeed taken "life sciences into a new epoch".

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