Jumping Genes in Gene Editing

The scientists have recently discovered a technique using **"jumping genes"** for genetic editing. It could offer a seamless, safer alternative to CRISPR-Cas9 process.

- The technique could allow edited genes to be more precisely inserted into genomes, possibly addressing concerns with current CRISPR systems that can lead to off-target editing and random deletions or even cancer.
- **Gene editing:** it is the process of altering a part of the DNA code. It can correct or delete parts of that code, or insert new sections, for preventing diseases.
    - **CRISPR tools** currently use enzymes like Cas9 and Cas13 to cut and delete a portion of the genetic code, counting on the cell to use its repair function to glue the cut strands back together.
    - The process is not always effective, sometimes the repairs are incomplete or incorrect, and the damage response prompted by the cutting can have negative side effects.

Transposons or Jumping Genes

- Jumping genes are also known as **transposons**, it randomly jumps from one site to the other, inserting genetic information as they go, using enzymes called transposases.
- It can effectively slide into the DNA without cuts.
- The jumping gene possesses all the **necessary chemical properties** to directly insert, or integrate without a DNA double-strand break.
- Jumping gene **could effectively be programmed** with a guide, and it can insert itself with incredible precision into user-defined sites in the genome.
- Researchers sequenced the edited genome and found that the insertion was precisely done, with no extra copies created elsewhere, a problem that can occur with gene editing that uses CRISPR.
- The researchers found the jumping gene was capable of depositing "genetic cargoes into the genome," delivering sequences up to 10,000 bases long.

- This approach could allow for therapeutic genes to be inserted into the genome in a potentially safer way than is currently possible. It could be a game-changer for certain types of cells, like neurons, which resist gene editing using the “cutting” process.