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JS²

*Je Science donc
J'écris*

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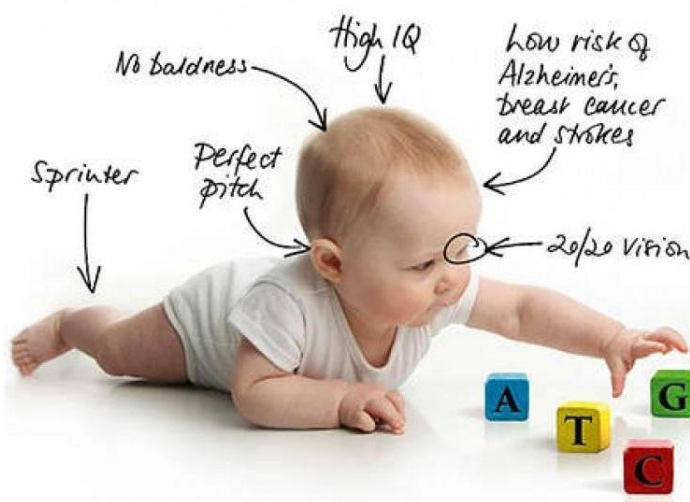
What are the limits of genetic engineering?

In our previous article about Synthetic Biology, we saw that the manipulation of the genome has its limits due to ethical issues ...

To recap, the genetic engineer designs the whole process necessary to edit the genome of an organism by deleting, adding, or modifying DNA sequence. This field regroup several molecular biology techniques ranging from simple genome modification, such as CRISPR technology that allows insertion of one or many genes into an organism via transgenesis, or synthetic biology - that's the base in designing and constructing new biological systems. Nevertheless, the experiments are restricted to certain organisms such as plants, bacteria, fungi and sometimes even certain mammals- e.g: mice. Why is the use of gene editing tools strictly prohibited in humans? We will answer this question through the example of CRISPR which is the worldwide famous gene editing tools.

To start of, here are few problematics: Could the CRISPR tool cause unwanted mutations in the genome? How does our immune system respond to the presence of an unknown element such as CRISPR in our body? Moreover, the use of CRISPR gives raise to many controversies among the scientific community. One of the major issues is that the use of CRISPR can be seen as a tool that allows "human designing". In fact, modifying genes that could be implicated in physical traits such as hair/eye color of future born might be possible with CRISPR. It would also be possible to use this tool to improve the physical and intellectual capacities of a human being: the so called "transhumanism". However, this is still science fiction, as really more than one of the gene is implicated in physical and intellectual characteristics and we are far away of taming their expressions.

Due to these potential drifts, the use of gene editing tools like CRISPR on humans is strictly forbidden in France. Particularly, the Article 16-4 of the Civil Code states meaning No one shall affect the integrity of the human species and modifying the progeny of the human species is prohibited.



Nevertheless, outside France, these limits have already been exceeded. In November 2018, He Jiankui a Chinese scientist claimed that he had created the world's first genetically modified babies by the CRISPR-Cas9 system. These twins nicknamed Lulu and Nana, had their genome modified at the embryonic stage in order to be resistant to HIV infection - by disabling the protein CCR5 responsible of the binding of the virus on cells. This experiment has been widely criticized by the scientific community. In addition to this, He Jiankui has conducted his experiments secretly and without following scientific protocol – like publishing his findings in a peer-reviewed journal.

Another drift of CRISPR is that it can be used by "biohackers". "Biohacking" refers to the use of biotechnologies, outside academic or industrial laboratories, by individuals who want to optimize their physical and mental abilities.

The biohacking start-up The Odin offers CRISPR kits to use on ourselves. Josiah Zayner, the CEO of The Odin has injected himself the CRISPR-Cas9 system against the gene of myostatin (a protein involved in inhibition of muscle growth) in order to increase muscular mass. The risks of such use raise also important ethical issues.

What can one think of this extraordinary tool, the potential for progress, and the dangers it results? "Science without conscience is but the ruin of the soul", says Rabelais. But this is the greatest challenge of our generation lies: to create a balance between the wonderful potential of solutions offered by science and progress, while maintaining a level of consciousness, ethics and responsibility that is still far away.

Sterna-Sarah Chichportich et Pauline Morin
Team iGEM Sorbonne Université 2019

