PC* **Synthèse à l'oral – Dossier n°1**

Colle Q 7 Semaine du 06 janvier

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Ce sujet comporte les 4 documents suivants qui sont d'égale importance :

- Document 1 – F.D.A. Approves Sickle Cell Treatments, Including One That Uses CRISPR, Gina Kolata Document 1 – (extrait et adapté de The New York *Times*, December 8, 2023)
- Document 2 – *The Observer* view on the coming revolution in the prevention of disease and how Document 2 – Britain can't afford to ignore it (extrait de *The Observer*, 5 March 2023)
- Document 3 – UK government urged to consider changing law to allow gene editing of embryos, Robin Document 3 – McKie (extrait de *The Guardian*, 4 March 2023)
- Document 4 – AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns Document 4 – (Pew Research Center, March 14, 2022)

Document 1 – F.D.A. Approves Sickle Cell Treatments, Including One That Uses CRISPR

On Friday, the Food and Drug Administration approved the first gene editing therapy ever to be used in humans, for sickle cell disease, a debilitating blood disorder caused by a single mutated gene. The agency also approved a second treatment using conventional gene therapy for sickle cell that does not use gene editing.

For the 100,000 Americans with the disease, most of them Black, the approvals offer hope for finally living without an affliction that causes excruciating pain, organ damage and strokes.

While patients, their families and their doctors welcome the F.D.A.'s approvals, getting either therapy will be difficult, and expensive.

"It is practically a miracle that this is even possible," said Dr. Stephan Grupp, chief of the cellular therapy and transplant section at Children's Hospital of Philadelphia. Dr. Grupp, who consults for Vertex, said his medical center was hoping to begin treating sickle cell patients next year.

But, he added, "I am very realistic about how hard this is."

The obstacles to treatment are myriad: an extremely limited number of medical centers authorized to provide it; the requirement that each patient's cells be edited or have a gene added individually; procedures that are so onerous that not everyone can tolerate them; and a multimillion-dollar price tag and potential insurance obstacles.

As a result, sickle cell experts said, only a small fraction of patients in the United States are expected to receive the new treatment (to say nothing of the millions of sickle cell patients overseas, particularly in Africa, for whom it may be completely out of reach for now). The F.D.A. estimates that about 20,000 patients — who are 12 and older and have had episodes of debilitating pain — will be eligible for the therapies.

The gene editing treatment, called Exa-cel and using the brand name Casgevy, was jointly developed by Vertex Pharmaceuticals of Boston and CRISPR Therapeutics of Switzerland. It uses CRISPR, the Nobel Prize-winning gene editing tool, to snip patients' DNA. For a small number of subjects in clinical trials, it corrected the effects of the mutation, which results in red blood cells that are shaped like sickles or crescents that become caught in blood vessels, blocking them. […]

The other treatment, called Lyfgenia and made by Bluebird Bio of Somerville, Mass., uses a common gene therapy method to add a good hemoglobin gene to patients' DNA.

Vertex says its price to edit a patient's genes will be $2.2 million; for, Bluebird it will be $3.1 million.

But living with the disease is also extremely costly: On average, $1.7 million for those with commercial insurance over a patient's lifetime. Patients themselves may pay about $44,000 out of pocket on average over the course of their lives.

For patients and the doctors who treat them, it is tantalizing to think of being free from the complications of sickle cell. So despite the many unknowns, medical centers say they are compiling lists of interested patients who are ready to pursue treatment when it becomes available. […]

Gina Kolata, *The New York Times*, December 8, 2023

Document 2 – *The Observer* view on the coming revolution in the prevention of disease and how Britain can't afford to ignore it

Hundreds of researchers, lawyers and ethicists from across the world will tomorrow gather at the Third International Summit on Human Genome Editing at the Francis Crick Institute in London. For three days, they will debate developments in a field that promises to have considerable consequences for medicine for the rest of this century.

As they will make clear, human genome editing will soon allow doctors and scientists to alter the structure of genes and in turn induce changes in physical traits, including reducing disease risk.

Those attending will be hoping for a sober debate on this rapidly developing field, and will strive to avoid the kind of controversy that engulfed the previous summit in Hong Kong in 2018, when renegade scientist He Jiankui announced to a stunned audience that he had changed the genetic makeup of three girls in a bid to make them resistant to HIV. This modification, made when they were embryos, could then be passed on to future generations.

Jiankui was jailed for his illegal activities, yet the shadow that he cast over the science of gene editing lingers. Thanks to his activities, debates on the subject have been diverted to focus mainly on the dangers of creating designer babies and the use of the technology to enhance human capabilities. Examples of the latter include proposals to create soldiers with infrared vision or astronauts who can withstand the worst effects of radiation on lengthy space journeys.

Debating these issues is important, for it is certainly not clear how far we should alter human genes to augment the physical attributes of future generations. Nevertheless, these debates obscure the most obvious aspect about human genome editing – that it carries a real hope of tackling a host of life-threatening ailments that have defied past attempts to cure them. These include inherited conditions such as cystic fibrosis, sickle cell anaemia, muscular dystrophy, various cancers, diabetes, some forms of hereditary blindness and other debilitating conditions.

By taking an embryo and altering its DNA so that it no longer carries a gene that will predispose it to one of these diseases would ensure that future generations will be freed from the burden of inherited illness. We should not underestimate the relief this would bring. In the UK, around 2.4 million people live with a genetic condition. Human genome editing offers hope for many of them – although not as the law stands. In the UK, as in most countries worldwide, it is illegal to perform genome editing on embryos that lead to pregnancy.

Permitting gene editing of embryos would be a game-changer for millions of people, although it should be acknowledged that many will be opposed to such a move for cultural, religious, and ethical reasons. Some will argue that we do not have the right to tinker with the makeup of future generations. Others will claim the technology will only be available to the affluent. These are all critically important points that need to be resolved as a matter of urgency.

Treatments involving human genome editing are likely to be available within a few years, scientists predict. When they do arrive, there will be many affected families who will rightly seek access to them as soon as possible.

Given the state of UK legislation controlling the genome editing of embryos, we need to have a national discourse, backed by parliamentary debate, on the issues as a matter of urgency. Genome editing is about to revolutionise medicine. We need to be prepared for the changes that it will bring to the treatment of illness and to facilitate its swift deployment to affected individuals.

The Observer, 5 March 2023

Document 3 – UK government urged to consider changing law to allow gene editing of embryos

Ministers must consider changing the law to allow scientists to carry out genome editing of human embryos for serious genetic conditions – as a matter of urgency. That is the key message of a newly published report by a UK citizens' jury made up of individuals affected by genetic conditions.

The report is the first in-depth study of the views of individuals who live with genetic conditions about the editing of human embryos to treat hereditary disorders and will be presented at the Third International Summit on Human Genome Editing, which opens at the Crick Institute in London this week.

Scientists say that in a few years, they will be ready to use genome editing techniques to alter genes and induce changes in physical traits, such as disease risk, in future generations. In the UK, around 2.4 million people live with a genetic condition. These include cystic fibrosis, sickle cell disease, muscular dystrophy, various cancers, and some forms of hereditary blindness.

"Genome editing offers the prospect of preventing such conditions affecting future generations but there needs to be a full national debate on the issues," said Prof Anna Middleton of Cambridge University, the project's leader. "These discussions need to start now because genome editing is advancing so quickly. Many affected individuals want to debate the ethical issues and explore what implementation might look like."

Genome editing acts like a pair of molecular scissors that can cut a strand of DNA at a specific site, allowing scientists to alter the structure of a gene, a form of manipulation that does not involve the introduction of DNA from other organisms. In the UK, as in most countries worldwide, it is illegal to perform genome editing on embryos that lead to pregnancy.

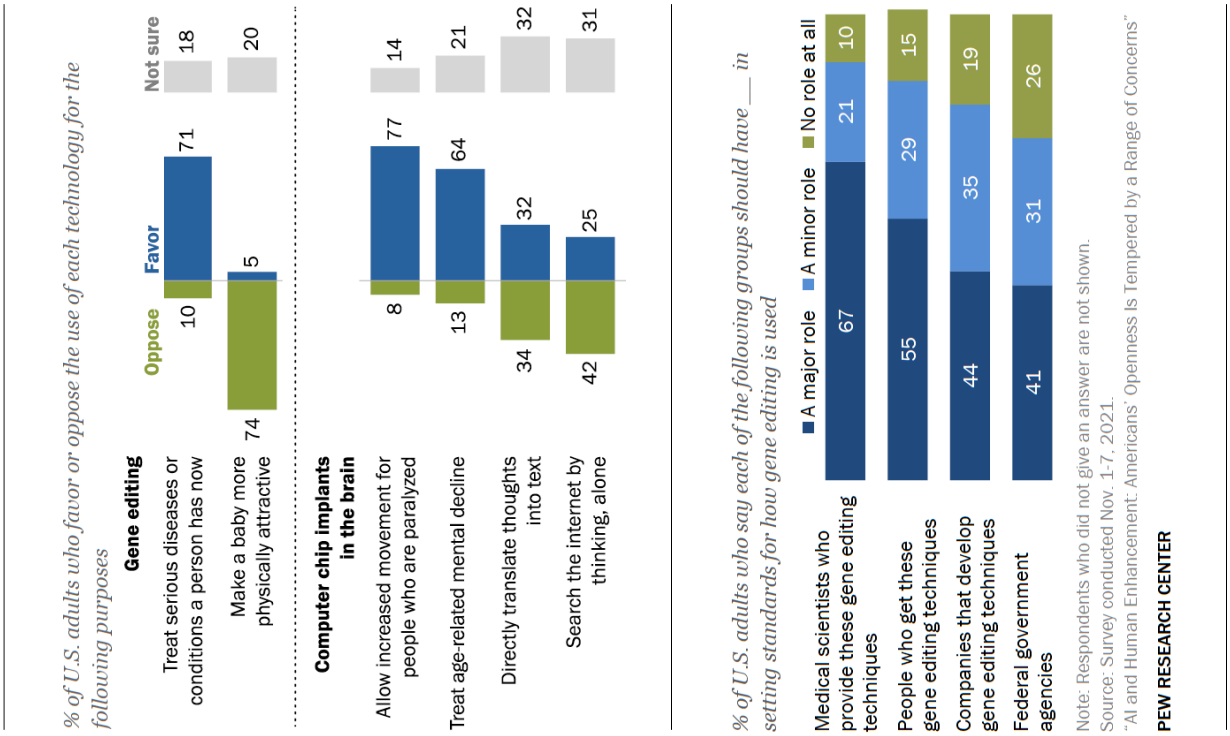
However, clinical trials of genome editing treatments are progressing in many countries, and a citizens' jury recently gathered at the Wellcome Genome Campus, near Cambridge, to discuss under what circumstances the British government should consider changing that law. The 21 jurors all had personal experience of a genetic condition. Some were parents of children who died from a genetic condition and others had an inherited condition, such as cystic fibrosis.

After four days of presentations by scientists, lawyers and other experts, the group overwhelmingly voted to urge the government to consider changing the law to allow genome editing of embryos.

"The ethical discussions have been derailed by an abstract focus on designer babies when we have patients dealing with life-threatening diseases who want their voices heard," Middleton said. "People affected by genetic disorders recognise it's time to embrace a genuine discussion on whether embryo research should be enabled and what a pathway to implementation looks like. They have made it clear we should proceed down that road with urgency."

Robin McKie, *The Guardian*, 4 March 2023

Document 4 – AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns



Pew Research Center, March 14, 2023