

Genetics and Ethics

— a 12U Biology ISP Online Text Version

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BACKGROUND

Humans' exploration to genetics can be traced back to 1859, when Charles Darwin published "*On the Origin of Species*" and to 1866 Gregor Mendel published his findings on inheritance. They helped humans to gain our first scientific insight on where we come from and how did we become who we are.

In the 20th Century, the frontier of genetics rapidly grew. In 1968, James Watson published his research on the double helix structure of DNA, which he discovered in 1953. In 1977, Richard Roberts and Philip Sharp independently found the split genes, in which they concluded that genes can be altered during transcription, resulting very rapid mutations. While the scientific frontier was expending rapidly, the first biotechnology, California-based startup Cetus was founded in 1971. Cetus began by offering fast screening services (a type of medical practice of identifying changes in chromosomes) to catalyze the pace of antibiotics development and other medical fields. In 1981, Fred Sanger sequenced for the first time, human mitochondrial DNA and reached a remarkable 99.93% accuracy. 18 years later, in 1999, first human chromosome was sequenced. These sequences open up the gate toward understanding human genetics in a DNA level.

However, human did not stop. We wanted more than just observe. We wanted to control. In 2005, Craig Venter, who sequenced human genome for the first time in history, founded "Synthetic Genomics", of which mission is "to engineer new life form". In 2010, his research team announced that

they had created “synthetic life form”. Its DNA was created digitally, and was inserted into a living bacterium.

“Either he is one of this era's most electrifying scientists, or he's one of the most maddening.” — Washington Post

ETHICAL DIVERGE

Now humans are the gods. We now possess the power to potentially understand and create life forms. An biological revolution seems to be an inevitable trend in the 21st Century. However, it also yields one of the most pressing issues today: how to draw the ethical line while playing the “God”?

Louise Joy Brown, the first in-vitro baby (commonly known as “test tube baby”), was born in July of 1978. Despite people’s excitement of historical scientific breakthrough, the concerns of bioethics radically came in to people’s sight.

Fast forward to 2000, the first “designer baby”, Adam Nash, was born in Colorado, USA. Adam was free from Fanconi Anemia, a disease that decreases production of all types of blood cells, which was passed on in his family. Unlike most children’s birth, Adam’s birth’s intention was to cure his 6-year-old sister, Molly Adam, who unfortunately had Fanconi Anemia. The doctor used In-Vitro Fertilization (IVF) technology to extract the embryo stem cells and transplanted to Molly’s body, who luckily survived and became the first person to be benefitted from a designer baby.

This year, on Feb 24th, British House of Lords voted and approved of using “three-parent IVF” in medical practices. Three-parent IVF is used when the embryo is discovered to have inherited mitochondrial diseases, where the nucleus is injected into a third parent’s health cytoplasm, producing the offspring free from the natural disabilities. It prevents severe conditions

including muscular dystrophy, mental retardation, and problems affecting heart and other vital organs.

Inevitably controversial, although the process of three-parent IVF prevents such disadvantages, it can also be applied to other areas to remove “unwanted” traits like certain hair colours or looks. Preimplantation Genetic Diagnosis (PGD), is a procedure that identifies genetic defects in an embryo and conceived using IVF technology. Empowering the new policy, parents can utilize such technology to achieve their goal of producing “perfect baby”. To extend, it is a bold yet plausible concern that if we continue this road, everyone will eventually look the same, be the same and act the same in the distant future.

“Dear Designer Baby, Your mother and I created you but then decided to give you a little help by inserting some desired genes. We thought you should look as nice as possible, so you’re quite handsome now. We thought it might help if you were a little smarter than others, and so you are. And you should be slim, not fat. We love you, so we made you a better person. Hope you like yourself. Love, Dad.”

--Austin E. Sakong, Woodbridge, N.J.

Marcy Darnovsky, the director of the campaign group the Centre for Genetics and Society, called the decision Britain made was a “historical mistake”. Like computer programming, in a complex structure where everything is linked with one another, a tweak of some sort can often cause unexpected changes in other places. Darnovsky said legally allowing practices like three-parent IVF could “introduce genetic changes that will be passed down to future generations”.

CURRENTLY

US in a glimpse

In the US, a few states have enacted laws regulating human embryo researches. For example, Maine prohibits experimentation on human fetus that “whether intrauterine or extrauterine...for scientific experimentation or for any form of experimentation”. Michigan, similarly, prohibits researches that “substantially jeopardizes the life or health of the embryo”. However, there are no federal nor constitutional laws help guide the issue of genetic diagnosis and interventions.

Bratislav Stankovic, a professor at University of Information Science and Technology, issued his concerns about sex selection. Despite the U.S. and U.K. do not believe non-medical sex selection should be regulated, he pointed out the US demographics of Asian immigrants “have a tradition of overwhelmingly favouring male offspring” implies it is important for us to regulate any sex-linked medical or non-medical PGD practices.

Canada in a glimpse

Canada has laws, Assisted Human Reproduction Act (AHR Act), prohibiting some controversial genetic practices. According to Health Canada’s website, “the AHR Act allows human embryo research only if the embryo to be used in the research is no longer needed for reproductive purposes and both gamete donors and the individual(s) for whom the embryo was created have given their consent for its research use in accordance with the regulations”. However, it is legal here in Canada to undergo genetic testing such as PGD.

FUTURE OUTLOOK

It is probable that ethical issues would not stop the pace of technological advancements for the incentives that is in favour of human nature. For example, the inventions of new weapons are not diminished, despite their potential danger of mass-scale destructions, like the development of nuclear weapons and unmanned combat aerial vehicles.

To Kevin Kelly, the most appreciated futurist, technological advancement is remarkably similar to evolution, while humans are the “reproductive organs of technology”. He concluded that “evolution doesn't care about what makes sense; it cares about what works”. According to his theory, the trend of any way to make human life better is inevitable.

There is no simple solution to an ethical issue. There will be incidences oppose to the change. However, with the aid of time, humans will eventually discover what is in our best interest.

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