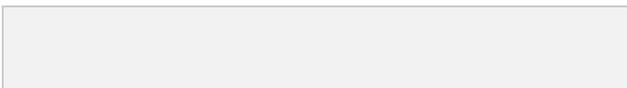


United Nations Educational, Scientific and Cultural Organization (UNESCO)

Background Guide Topic:
Monitoring CRISPR



Director's Note

Dear Delegates,

Welcome to the United Nations Educational, Scientific and Cultural Organization for JMMUN 2021!

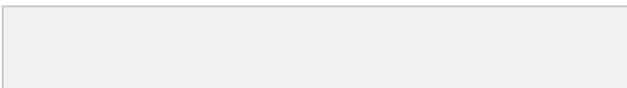
My name is Misato Koganei, and I am a junior at Senzoku Gakuen High School. I've been a part of the MUN club at Senzoku for five years, and I served as co-Director of a committee at last year's JMMUN. I am immensely delighted and honored to have the opportunity to serve as the Director of UNESCO this year at JMMUN 2022!

Born and raised in urban areas, I spent a majority of my childhood visiting museums; at museums, I observed, deduced, and learned random facts, as any museum visitor would. Eventually, my fondness for observation and deduction led to me enrolling in the science track for my high school years. I love chemistry, and I'm hoping to pursue a career in biochemistry or medicine! Aside from schoolwork, I enjoy baking, binge-watching shows, and ranting about anything. Outside of school, I am currently the vice president of one of the largest student-based volunteer organizations in the Kanto region, regularly doing beach cleanups at Enoshima. I have also been a part of the Tokyo chapter of PERIOD, a non-profit dedicated to addressing menstrual inequality and promoting menstrual equity.

I would like to remind delegates to research thoroughly and be engaged during the conference, as per usual. I, along with the co-director of this committee, will do everything we can to create a dynamic MUN experience for delegates. Please do not hesitate to reach out to me or the co-Director! I look forward to having engaging and passionate discussions concerning one of the most fascinating scientific advancements in the 21st century with you all!

Sincerely,

Misato Koganei
Director for the United Nations Educational,
Scientific and Cultural Organization (UNESCO)
Japan Metropolitan Model United Nations 2022



Introduction of the Committee

The United Nations Educational, Scientific and Cultural Organization was founded on November 16th, 1945 with the hope of constituting the “intellectual and moral solidarity of mankind”¹. This statement lives on in UNESCO’s past achievements and current projects.

UNESCO’s programs are categorized into five major themes: Education, Culture, Natural Sciences, Social and Human Sciences, and Communication and Information. Along with over fifty field offices each conducting projects fit to each country’s unique background, UNESCO is advancing cooperation in education, the sciences and culture on an international level. As a result of UNESCO’s proactive efforts, the Organization has accomplished amazing feats, such as the global coordination of tsunami early-warning systems and the preservation of thousands of World Heritage Sites.

The United Nations Educational, Scientific and Cultural Organization for JMMUN 2022

¹ *UNESCO in brief - Mission and Mandate*. UNESCO. (2021, July 12). <https://en.unesco.org/about-us/introducing-unesco>.

will focus on the Natural, and Social and Human Sciences, with an emphasis on the genome editing technique Crispr-Cas9, the bioethics of genetic editing and global legislations concerning genetic editing.

Key Terms

Genome²

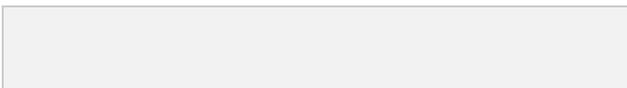
The entire set of genetic instructions found in a cell. In humans, the genome consists of 23 pairs of chromosomes found in the nucleus, as well as a small chromosome found in the cells’ mitochondria.

Genome Editing³

A method that allows scientists to change the DNA of several organisms. CRISPR-Cas9 is an example of a genome editing tool. Many scientists who perform genome editing now use CRISPR since it is cheaper, faster, and more accurate than conventional genome editing methods. Genome editing falls under genetic engineering.

² *Genome*. Genome.gov. (n.d.). <https://www.genome.gov/genetics-glossary/Genome>.

³ *What is genome editing?* Genome.gov. (n.d.). <https://www.genome.gov/about-genomics/policy-issues/what-is-Genome-Editing>.



Genetic Engineering⁴

The process of using recombinant DNA (rDNA) technology to alter the genetic makeup of an organism.

Crispr-Cas9⁵

CRISPR stands for “clustered, regularly interspaced palindromic repeats” and is a technology that allows easy alterations of DNA sequences and modification of gene function. Cas-9 is an enzyme capable of cutting DNA strands at a specific location. This technology is currently the most accurate and versatile method of gene modification, attracting the attention of researchers around the world.

In Vitro Fertilization (IVF)⁶

A type of assisted reproductive technology (ART)⁷. Works by combining a series of

⁴ *Genetic engineering*. Genome.gov. (n.d.). <https://www.genome.gov/genetics-glossary/Genetic-Engineering>.

⁵ *Crispr/Cas9 - gene-editing technology takes off* (2021, July 26) https://sustainabledevelopment.un.org/content/documents/955511_Soltau_CRISPR-Cas9%20_%20gene-editing%20technology%20takes%20off.pdf

⁶ Parenthood, P. (n.d.). *What is in-vitro-fertilization (ivf)?* Planned Parenthood. <https://www.plannedparenthood.org/learn/pregnancy/fertility-treatments/what-ivf>.

⁷ U.S. Department of Health and Human Services. (n.d.). *Assisted Reproductive Technology (ART)* Eunice Kennedy Shriver National Institute of Child Health and Human Development. Retrieved October

medicinal and surgical procedures that assist fertilization, embryo development, and implantation. It is usually a complex series of procedures used to help with fertility or prevent genetic problems and assist with the conception of a child.⁸

Gene Therapy⁹

A method to modify or manipulate the expression of a gene to treat or cure disease. There are multiple methods of gene therapy, and these methods are currently being considered to be used to treat genetic and infectious diseases.

Bioethics¹⁰

The multi-disciplinary implication and application of morals and ethics to the study of natural science and healthcare.

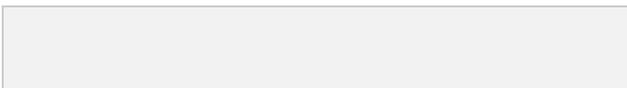
20, 2021, from <https://www.nichd.nih.gov/health/topics/infertility/conditioninfo/treatments/art>.

⁸

Mayo Clinic- In Vitro Fertilization (IVF) <https://www.mayoclinic.org/tests-procedures/in-vitro-fertilization/about/pac-20384716>

⁹Center for Biologics Evaluation and Research. (n.d.). *What is gene therapy?* U.S. Food and Drug Administration. <https://www.fda.gov/vaccines-blood-biologics/cellular-gene-therapy-products/what-gene-therapy>.

¹⁰ Center for Practical Bioethics (2021, July 26) <https://www.practicalbioethics.org/what-is-bioethics>.



Adult Somatic Cell¹¹

Somatic cells refers to all cells excluding the germ line; the germ line is the cells in the sexual organs that produce eggs and sperms.

Current Situation

In recent years, there have been rapid advancements in genetic engineering, particularly, the invention of CRISPR-Cas9.

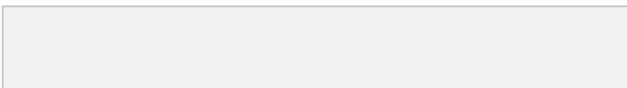
Applications of CRISPR range from bioproduction to editing human embryos. The ability to edit the human genome and even the human embryo have called for a systematic, unified and cautious approach to genetic engineering among scientists and researchers. Currently, human gene therapies are being considered to treat incurable genetic diseases such as Duchenne Muscular Dystrophy and Cystic Fibrosis.

“The very rapid adoption of the technology, and its relative simplicity, adds urgency to discussions around how and when it should be used, as well as the need for monitoring and oversight.”¹²

Scientists are now applying the technology of genetic engineering not only to humans but also to animals and plants as well. They are now able to transfer genetic material from one or more animals or plants and genetically engineer them into a different species. Genetic engineering is now used in many ways. Farm animals can be modified to have healthier flesh and better fitted qualities for the modern factory farms. Genetically engineered animals could also be used to help find cures for genetic diseases. Moreover, endangered animal species could be cloned to ensure the biological diversity of wildlife. However, the consequences of the engineering technology is unknown, and many critics argue that these technologies would be undoing what nature has created over millions of years.

¹¹ National Human Genome Institute 1Somatic Cells
<https://www.genome.gov/genetics-glossary/Somatic-Cells>

¹² Friedrich Soltau (2016) CRISPR/Cas9 - gene-editing technology takes off pg.1
https://sustainabledevelopment.un.org/content/documents/955511_Soltau_CRISPR-Cas9%20_%20gene-editing%20technology%20takes%20off.pdf



Case Studies

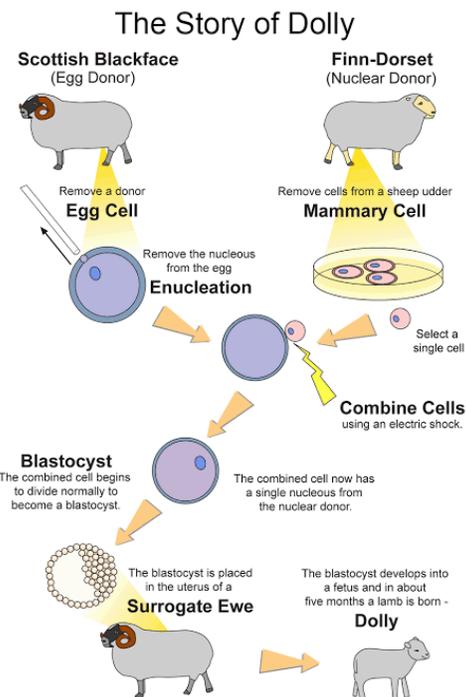
While the challenges any global regulatory body faces in the wake of the CRISPR/Cas9 technological boom are myriad, this session of the UNESCO committee would like to focus on the following areas.

Subtopic I: Animal Cloning and Genome Editing in Animals

Since the cloning of Dolly the Sheep in 1996, animal cloning has taken huge strides. There has been an ongoing debate about the ongoing pursuit and the ethics of cloning. Researchers supporting cloning believe that the existence and acceptance of identical twins contradicts statements that cloning is violating genetic uniqueness, and that the future of humans is going to improve.

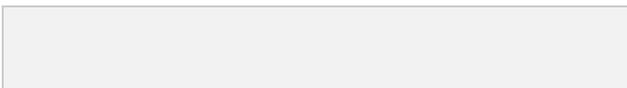
Certain scientists believe that the gene pool will be refined with better selection of genetic traits, and that any side effects caused by this are able to be regulated through law enforcement. On the other hand, researchers who are against this notion state that it is indeed a violation of natural genetic variations and that side effects to both gene pool and society are inevitable.

Case study 1: Dolly the Sheep¹³



In 1996, researchers Keith Campbell, Ian Wilmut and colleagues at the Roslin

¹³ Faye Farmer (September 29, 2009) The Story of Dolly
<https://askabiologist.asu.edu/content/story-dolly>



Institute in Edinburgh, Scotland cloned a sheep named Dolly. She was cloned from a mammary gland cell of an adult Finn-Dorset ewe.¹⁴ It is known for being the first mammal to be cloned from an adult somatic cell. Her birth proved that specialized cells could be used to create an exact copy of the animal, and that adult somatic cells could be altered to behave like a cell from a fertilized embryo.

Case study 2: Using CRISPR to decrease cholesterol levels in monkeys

In 2021, researchers from Verve Therapeutics Perelman School of Medicine at the University of Pennsylvania developed CRISPR gene editing techniques that decreased cholesterol levels in the blood tests of monkey¹⁵

In this experiment, researchers used a base editing technology that allowed them to substitute a single nucleotide with another in the DNA without cutting the double helix. The researchers replaced an adenine with a guanine and a thymine with a cytosine, which completely disabled the gene.

¹⁴ The University of Edinburgh The life of Dolly <https://dolly.roslin.ed.ac.uk/facts/the-life-of-dolly/index.html>

¹⁵ Yirka, B. (2021, May 21). *Using CRISPR to lower cholesterol levels in monkeys* Phys.org. Retrieved December 13, 2021, from <https://phys.org/news/2021-05-crispr-cholesterol-monkeys.html>.

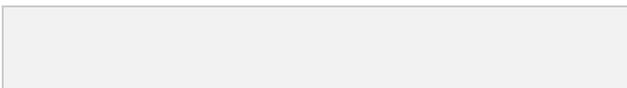
After a one time injection into the liver of cynomolgus monkeys and testing the monkey's cholesterol levels regularly, the researchers found that after a week, levels of PCSK9 protein had decreased by 90% and low density lipoprotein cholesterol level had decreased by roughly 60%. Both of these percentages lasted 10 months.

Researchers think this genome editing tool is ready to be tested on humans, which will help develop a cure for diseases connected to cholesterol levels.

Case study 3: The clone of Celia the Pyrenean Ibex

In 2003, scientists from Spain successfully cloned a Pyrenean Ibex¹⁶, a species of mountain goats that went extinct in 2000. Roughly a year before Celia, the last Pyrenean Ibex thought to be alive, died, scientists took the DNA of Celia's ear, and froze the tissue to put in storage. Once Celia died, the scientists made 500 cloned embryos, and implanted 154 of them into female goats. Only 5 ended up pregnant and 1 gave birth.

¹⁶ Smith, K. N. (2021, January 23). *The species that went extinct twice* Forbes. Retrieved December 13, 2021, from <https://www.forbes.com/sites/kionasmith/2021/01/23/the-species-that-went-extinct-twice/?sh=5d5aa1eb3312>.



Though the kid's life span was a short seven minutes¹⁷ due to its inability to breathe, this was the first time an extinct animal was cloned.

This experiment opened up discussion about cloning other extinct animals such as the woolly mammoth, and in later years, the discussion of the usage of CRISPR to "de-extinct" animals.

Subtopic II: Human Genome Editing

Case Study 1: Human genome editing experiments conducted by researcher He Jiankui

In a series of YouTube videos, researcher He Jiankui announced the birth of genome-edited babies¹⁸.

Around late 2017, He set out to produce human babies from genome-edited embryos.

¹⁷ Redford, K. H. (2021, November 27). *Resurrecting the mammoth could be possible – but we shouldn't bother*. BBC Science Focus Magazine. Retrieved December 13, 2021, from <https://www.sciencefocus.com/nature/de-extinction-conservation/>.

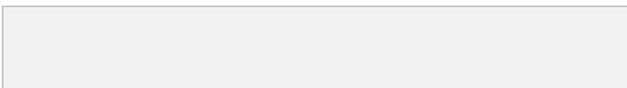
¹⁸ Greely, H. T. (2019, August 13). *CRISPR'd babies: HUMAN germline genome editing in the 'HE jiankui affair'**. OUP Academic. <https://academic.oup.com/jlb/article/6/1/111/5549624#165508197>.

As stated in medical documents¹⁹, from late 2017 to 2018, a research team at the Southern University of Science and Technology were looking for couples who were willing to participate in an attempt to create the world's first genome-edited babies. The study, led by He, attempted to produce babies that could not contract AIDS. The babies would have a 32-base-pair deletion which would lead to a non-functional CCR5 protein, thus making the babies theoretically immune to HIV.

As a result of this experiment, healthy twin babies Lulu and Nana were born in October 2018.²⁰ Researchers found, however, that the CRISPR constructs did not do what it was intended to do. Indeed, changes were made to the twins' CCR5 genes which would lead to the production of non functional CCR5 proteins, but the results showed that the twin's genomes were altered in a way never seen before (details of this alteration have not been revealed).

¹⁹ Chinese clinical TRIAL REGISTER (ChiCTR) - the world health Organization international clinical trials registered organization REGISTERED PLATFORM. (n.d.). <https://www.chictr.org.cn/showprojen.aspx?proj=32758>.

²⁰ Belluck, P. (2019, April 14). *Gene-Edited babies: What a Chinese scientist told an AMERICAN MENTOR*. The New York Times. <https://www.nytimes.com/2019/04/14/health/gene-editing-babies.html>.



He's study is still under much scrutiny ²¹ today. Following He's announcement in 2018, a preliminary investigation was conducted by the Guangdong Province Investigation Task Force; moreover, in response to the investigation, the Southern University of Science and Technology decided to end He's work contract with the university²². In late 2019, He was fined and sentenced to three years in prison. ²³

Case study 2: The world's first formal licensing of an In Vitro Fertilization (IVF) treatment

In February 2016, the British Human Fertilization and Embryology Authority (HFEA) authorized a request issued by a team of British researchers asking to apply

CRISPR in embryos used for in vitro fertilization ²⁴.

The research team, led by developmental biologist Kathy Niakan, planned to conduct a series of experiments that altered the genes in the human embryo that are active within several days of fertilization. The experiments were hoped to not only help researchers understand how human embryos form within the early stages of fertilization, but to also help develop safer and methods of treatment for infertility.

Unfortunately, the result of these experiments were unfavorable ²⁵. The findings²⁶ revealed that around half of the edited embryos contained unintended edits in its genome. The results of Niakan's

²¹ Regalado, A. (2020, April 2). *EXCLUSIVE: Chinese scientists are CREATING CRISPR babies*. MIT Technology Review. <https://www.technologyreview.com/2018/11/25/138962/exclusive-chinese-scientists-are-creating-crispr-babies/>.

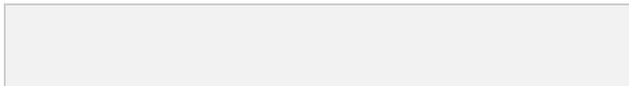
²² Chinese scientist who gene-edited babies fired by University. (2019, January 21). Retrieved October 20, 2021, from <https://www.reuters.com/article/us-china-health-babies-idUSKCN1PF0RA>

²³ *He JIANKUI jailed for illegal human EMBRYO GENE-EDITING*. Xinhua. (n.d.). http://www.xinhuanet.com/english/2019-12/30/c_138666754.htm.

²⁴ Callaway, E. (2016, February 1). *UK scientists gain licence to edit genes in human embryos* Nature News. <https://www.nature.com/articles/nature.2016.19270>.

²⁵ Mullin, E. (2021, January 26). *Scientists edited human embryos in the lab, and it was a disaster*. Medium. <https://onezero.medium.com/scientists-edited-human-embryos-in-the-lab-and-it-was-a-disaster-9473918d769d>.

²⁶ Alanis-Lobato, G., Zohren, J., McCarthy, A., Fogarty, N. M. E., Kubikova, N., Hardman, E., Greco, M., Wells, D., Turner, J. M. A., & Niakan, K. (2021, June 1). *Frequent loss of heterozygosity in CRISPR-CAS9-EDITED early human embryos*. PNAS. <https://www.pnas.org/content/118/22/e2004832117>.



experiment alarmed researchers looking to use CRISPR treatments for “on-target” editing, and reaffirmed the need for a more cautious approach for CRISPR treatments.

Currently in the United Kingdom, it is illegal to edit the genomes of embryos used to conceive children²⁷.

Subtopic III: Bioethics and CRISPR

Case study 1: Do-it-yourself gene editing

At a biotech conference in San Francisco, Joshua Zayner, CEO and founder of a bio-hacking startup The Odin, injected himself with a syringe in front of the audience, proclaiming that the contents of the syringe will modify his muscle genes to make them bigger. Zayner, along with dozens of other scientists and “biohackers”, have been receiving DNA injections and trying new experimental gene therapies. Zayner, however, after remaining on the FDA’s radar for several years²⁸, was under

²⁷ UK Parliamentary Office publishes brief on human germline genome editing. BioTechniques. (2020, June 20). Retrieved December 13, 2021, from <https://www.biotechniques.com/crispr/uk-parliamentary-office-publishes-brief-on-human-germline-genome-editing/>.

²⁸ Lee, S. M. (2016, December 6). *DNA biohackers are giving The FDA a headache with Glow-in-the-dark Booze*. BuzzFeed News.

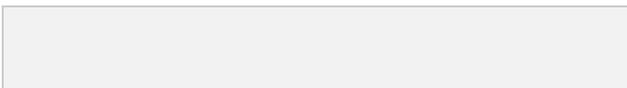
investigation in 2019 for conducting medical experiments without a license²⁹ (the investigation was closed several months later). Gene-editing and gene engineering kits in fact do exist, just not for humans. The retail of do-it-yourself gene editing kits is already illegal in certain areas, and UNESCO has called for a ban on tampering with human DNA³⁰. However, legislators’ prime concern is that consumers may harm themselves by imitating scientists such as Zayner³¹.

The application of genome editing in animals and plants “ puts in front of all of us a huge responsibility, to consider carefully both the unintended consequences as well as

²⁹ Samuel, S. (2019, May 19). *A celebrity biohacker who sells Diy Gene-editing kits is under investigation* Vox. <https://www.vox.com/future-perfect/2019/5/19/18629771/biohacking-josiah-zayner-genetic-engineering-crispr>.

³⁰ UNESCO panel of experts calls for ban on “editing” of human DNA to avoid unethical tampering with hereditary traits UNESCO. (2016, March 22). <https://en.unesco.org/news/unesco-panel-experts-calls-ban-editing-human-dna-avoid-unethical-tampering-hereditary-traits>.

³¹ Regalado, A. (2020, April 2). *Don't change your DNA at home, says America's FIRST CRISPR LAW*. MIT Technology Review. <https://www.technologyreview.com/2019/08/09/65433/dont-change-your-dna-at-home-says-americas-first-crispr-law/>.



the intended impacts of a scientific breakthrough”, mentions Jennifer Doudna, in her TED Talk in 2015³². Doudna, the inventor of CRISPR-Cas9, also discusses the ethical implication of being able to change the DNA in our genes, and how she and her colleagues have called for a hiatus in the medicinal application of CRISPR in human embryos.

The distribution and conventional use of gene editing kits for humans may seem several light-years away, but if and when such kits become available to the public, there will be a need to ensure the safety and the scientific integrity of those who utilize and manufacture gene editing kits.

Case study 2: Superhumans

Genetic engineering and CRISPR is one of the most popular topics in science today. Genetic engineering is indeed a fascinating field of science, and with recent advances such as CRISPR, researchers are yet to identify distinctive features in DNA that may pave the way for breakthroughs in genetic engineering. Stephen Hawking

wrote: “I am sure that during this century, people will discover how to modify both intelligence and instincts such as aggression,” adding, “...some people won’t be able to resist the temptation to improve human characteristics, such as memory, resistance to disease and length of life.”³³ Hawking also wrote about the possibility of “superhumans”. Unsurprisingly, Hawking’s opinions sparked controversy, generating speculation of gene-edited super-soldiers.

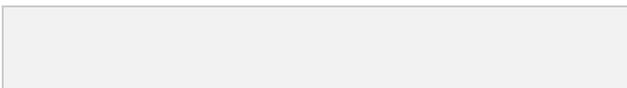
In late 2020, according to John Ratcliffe, the US Director of National Intelligence, US intelligence showed that China has been conducting research on its soldiers in hopes of producing genetically-enhanced super-soldiers³⁴. This is yet to be confirmed. Shockingly, days later, France gave the go-ahead for its military to explore the possibility of developing enhanced (not limited to genetic enhancements) soldiers³⁵.

³² Chinese clinical TRIAL REGISTER (ChiCTR) - the world health Organization international clinical trials registered organization REGISTERED PLATFORM. (n.d.). <https://www.chictr.org.cn/showprojen.aspx?proj=32758>.

³³ Guardian News and Media. (2018, October 14). *Essays reveal Stephen Hawking PREDICTED race of 'superhumans'*. The Guardian. <https://www.theguardian.com/science/2018/oct/14/stephen-hawking-predicted-new-race-of-superhumans-essays-reveal>.

³⁴ Guardian News and Media. (2020, December 4). *China conducting biological tests to create SUPER Soldiers, US spy chief says*. The Guardian. <https://www.theguardian.com/world/2020/dec/04/china-super-soldiers-biologically-enhanced-john-ratcliffe>.

³⁵ Guy, J. (2020, December 9). *French Army gets ETHICAL go-ahead for bionic Soldiers* CNN.



In the past, there have been experiments targeted to increase muscle growth. For example, experiments conducted by a research team at Johns Hopkins identified a gene called GDF-8 which regulates the production of skeletal muscle. After knocking the GDF-8 gene out from the genetic code of the mice, researchers found that the muscle weight of the mice had doubled and almost tripled³⁶. In response to such experiments on increasing muscle strength, researchers are looking into gene therapy treatments for diseases that escalate muscle weakness and loss of muscle mass, namely, Muscular Dystrophy.

Genetically-enhanced soldiers, or “superhumans”, being a relatively new concept, has not yet been properly legislated or discussed in an international forum. Undoubtedly, the ethics of genetically enhancing humans for the purpose of augmenting their physical abilities is murky, and may even violate the Nuremberg Code³⁷.

<https://edition.cnn.com/2020/12/09/europe/french-army-soldiers-technology-ethics-scli-intl-scn/>.

³⁶ McPherron, A. C., Lawler, A. M., & Lee, S.-J. (n.d.). *Regulation of skeletal muscle mass in mice by a New TGF- β superfamily member*. Nature News. <https://www.nature.com/articles/387083a0#citea>.

³⁷ The Nuremberg Code. (n.d.). <http://www.cirp.org/library/ethics/nuremberg/>.

Past Actions

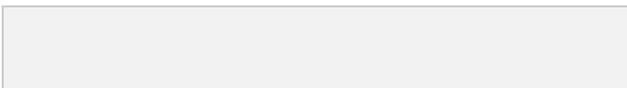
In 1993, The International Bioethics Committee (IBC) was established by the then Director-General of UNESCO, Dr Federico Mayor Zaragoza. Following the establishment of the Committee, the Director General was tasked with “preparing an international instrument for the protection of the human genome”³⁸. At UNESCO’s 29th General Conference in 1997, the Universal Declaration on the Human Genome and Human Rights³⁹ was finally adopted and endorsed by the General Assembly the following year.

In response to the concerns of the rapidly developing field of genetic research, in 2003 at UNESCO’s 32nd General Conference, the International Declaration on Human Genetic Data⁴⁰ was adopted. This declaration and the

³⁸ *Universal Declaration on the Human Genome and Human Rights*. UNESCO. (2020, November 4). <https://en.unesco.org/themes/ethics-science-and-technology/human-genome-and-human-rights>.

³⁹ *Universal Declaration on the Human Genome and Human Rights*. UNESCO. (n.d.). http://portal.unesco.org/en/ev.php-URL_ID=13177&URL_DO=DO_TOPIC&URL_SECTION=201.html.

⁴⁰ *International Declaration on Human Genetic Data* UNESCO. (n.d.). http://portal.unesco.org/en/ev.php-URL_ID=17720&URL_DO=DO_TOPIC&URL_SECTION=201.html.



Universal Declaration on the Human Genome and Human Rights currently remain to be “the only international points of reference in the field of bioethics”⁴¹.

The most recent declaration adopted by UNESCO’s General Conference is the Universal Declaration on Bioethics and Human Rights⁴², which was adopted in 2005.

The United Nations, while valuing the therapeutic value of genome editing, has repeatedly expressed concern for interventions on the human genome. Moreover, the UN has cautioned against the risks of do-it-yourself genetic testing, which requires professional counselling in order for subjects to act on their results.⁴³

⁴¹ *International Declaration on Human Genetic Data* UNESCO. (2020, November 4). <https://en.unesco.org/themes/ethics-science-and-technology/human-genetic-data>.

⁴² *Universal Declaration on Bioethics and Human Rights*. UNESCO. (n.d.). http://portal.unesco.org/en/ev.php-URL_ID=31058&URL_DO=DO_TOPIC&URL_SECTION=201.html.

⁴³ United Nations. (2015, October 5). *UN panel warns AGAINST 'designer babies' and eugenics in 'editing' of human DNA* | | UN NEWS. United Nations. <https://news.un.org/en/story/2015/10/511732-un-panel-warns-against-designer-babies-and-eugenics-editing-human-dna>.

More recently, in 2019, a WHO expert panel called for the need of a registry on human genome editing research, and requested that the WHO start working on the establishment of the aforesaid registry immediately.⁴⁴

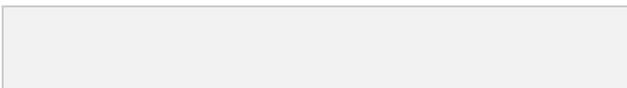
Questions to Consider

- How could scientists better inform the public and the media of advancements in genetic engineering? How could those who lack understanding in genetic engineering better inform themselves?

- There are hundreds of binding and non-binding declarations, statements, regulations⁴⁵, legislations, etc. regarding the legal and ethical barriers of genome editing, especially that of humans. Unfortunately, with hundreds of official documents and the nature of the rapidly developing field, it is becoming increasingly difficult to legislate

⁴⁴ World Health Organization. (2019, March 19). *Who expert panel paves way for strong international governance on human genome editing* World Health Organization. <https://www.who.int/news/item/19-03-2019-who-expert-panel-paves-way-for-strong-international-governance-on-human-genome-editing>.

⁴⁵ *Global gene editing regulation tracker* Global Gene Editing Regulation Tracker. (2020, February 20). <https://crispr-gene-editing-regs-tracker.geneticliteracyproject.org/>.



and monitor genome editing. Where would your country draw the line between legal and illegal? How would your country monitor genome editing projects conducted for academic purposes? Closely consider regulations and statements issued by your country in the past.

- New developments in biotechnology have allowed people to alter animal welfare as well as outcomes of stock. Researchers and organizations can now clone livestock, pets, endangered and extinct species. This may seem like an effective way to breed genetically (good) animals. However, there are side effects both known and unknown. Cloning affects the ecosystem, and there are unexplored effects to both the donor and the clone. Should people be able to interfere with natural cycles and clone animals for their personal or societal benefit? Where should we draw the line between acceptable and unacceptable? If so, where?

Guidelines for Position Papers

Position papers must clearly articulate the current situation of your country and briefly explain the past actions it has taken, further denoting possible solutions. Papers may also include international resolutions and strategies; however, the main focus **must** be

on your country. Every year, a handful of delegates submit position papers with very basic information about their countries, such as geographical location and major trade exports. Unless such information directly relates to the topic, it should not be addressed in position papers at all.

Closing Remarks

Thank you for reading through this background guide.

Please do not hesitate to reach out if you have any questions or inquiries!

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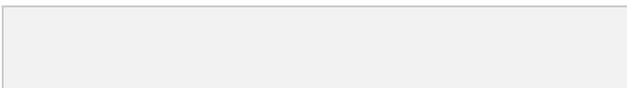
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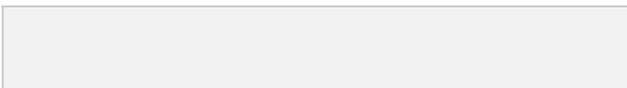
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