WHO

BACKGROUND GUIDE

EMUN

Episteme

Letter from Executive Board

Shivering in angst, perceptions of sackcloth and ash engulfing every possible scintilla on rationality continue to exist. The very fate of the world lies in the salty hands of the delegates sitting in committee today and the succeeding space-ground bloodshed eager to prevail. Will the representatives have the strength to conquer the mighty power of weapons able to withstand cosmic conditions and lay serene in circumstances unknown to the human brain?

Mics held high, pluck cards even higher! Delegates mark time with bated breaths, yearning to discover a solution to an ever-dripping issue. Band-aid quick fixes are not an option when the weight of the globes' souls resides across the wingspan of the delegate's shoulders. The obligation to salvage an answer, a resolution, or any possible method to defend the lives of millions.

Delegates! Do you have what it takes to face the challenges of the World Health Organization? We wish you the best of luck, and we promise to make your experience at EMUN worth your while!

It is a pleasure to be moderating the WHO at EMUN 2022. As the EB, it is our duty to inform you of what we expect from you as participants. Primarily, we would like you to utilize this document as a guide to your research and research further using this document as a base. We would encourage you to use UN-recognised sources for news and information, along with UN material itself. It is encouraged by us that you use statistics and data to back up your statements, as this serves as fuel to better explain the point you are trying to make. All in all, research well and get ready for a cracker of a conference!

Kind regards,
Rama Krishna Pinjala, Chairperson
Neha Kolluri, Vice Chairperson

Role of WHO:

The World Health Organization is responsible for providing leadership and guidance on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries, and monitoring and assessing health trends.

WHO's Triple Billion targets outline an ambitious plan for the world to achieve good health for all using science-based policies and programs. As the only UN agency dedicated to global health, WHO works to harness global knowledge and resources to help Member States improve health for all.

WHO works with various partners in multiple informal and formal cooperative arrangements to achieve the Organization's health objectives jointly. Every part of WHO's work involves strong collaboration with government leaders. Political will and leadership are essential agents of change.

Agenda

Deliberation on the use of advanced gene sequencing and the effectiveness of its human trials in the health sector.

Whole-Genome Sequencing:

- Whole-genome sequencing (WGS) is a comprehensive method for analyzing entire genomes.
- Genomic information has been instrumental in identifying inherited disorders, characterizing the mutations that drive cancer progression, and tracking disease outbreaks.
- Rapidly dropping sequencing costs and the ability to produce large volumes of data with today's sequencers make whole-genome sequencing a powerful tool for genomics research.

Advantages of Whole-Genome Sequencing

- Provides a high-resolution, base-by-base view of the genome
- Captures both large and small variants that might be missed with targeted approaches
- Identifies potential causative variants for further follow-up studies of gene expression and regulation mechanisms
- Delivers large volumes of data in a short amount of time to support the assembly of novel genomes

3 types of Genome Sequencing

Sanger sequencing, fragment analysis, and NGS enable a multitude of cutting-edge applications that are helping advance scientific understanding of genomes.

There are currently three widely adopted approaches to sequencing: whole genome, exome, and transcriptome sequencing. The specific approach being used for any given study will determine which NGS platform is used.

For example, due to its significant expense, whole genome sequencing, in which the entire genome is sequenced, is an arduous and costly methodology to adopt.

However, for collecting large amounts of DNA sequence data from individual human subjects, the more expensive Sanger sequencing is still widely used because of its capacity for longer read lengths. An important limitation, however, is the extremely large sample size required to provide adequate power for data analysis in most whole genome studies.

Therefore, more cost-efficient methods are needed and the scope of these studies is often driven by the availability of resources and funding.
Whole genome and also exome sequencing (in which only the transcribed regions of the genome are sequenced) both attempt to find polymorphisms that may predict drug outcomes or explain mono-genic disorders. For these types of studies, NGS is now rapidly replacing microarray expression analysis, given the capacity of NGS platforms to sequence more complex and smaller genomes.

Human Trials:

Clinical trials are research studies performed on people that are aimed at evaluating a medical, surgical, or behavioral intervention. They are the primary way that researchers find out if a new treatment, like a new drug or diet, or medical device (for example, a pacemaker) is safe and effective in people.

In relevance to the agenda, Human trials are specific to gene editing and other new methods that are released into society. The development of CRISPR - Cas9 genome editing opens up new possibilities in precision medicine. Current trials are underway in seven treatment areas.

CRISPR is a technology that can be used to edit genes and, as such, will likely change the world. The essence of CRISPR is simple: it's a way of finding a specific bit of DNA inside a cell.

After that, the next step in CRISPR gene editing is usually to alter that piece of DNA. However, CRISPR has also been adapted to do other things too, such as turning genes on or off without altering their sequence.

The Cas9 protein is the most widely used by scientists. This protein can easily be programmed to find and bind to almost any desired target sequence, simply by giving it a piece of RNA to guide it in its search.

When the CRISPR Cas9 protein is added to a cell along with a piece of guide RNA, the Cas9 protein hooks up with the guide RNA and then moves along the strands of DNA until it finds and binds to a 20-DNA-letter long sequence that matches part of the guide RNA sequence. That's impressive, given that the DNA packed into each of our cells has six billion letters and is two meters long.

Cloning:

Cloning describes the processes used to create an exact genetic replica of another cell, tissue, or organism. The copied material, which has the same genetic makeup as the original, is referred to as a clone.
Reproductive cloning may enable researchers to make copies of animals with potential benefits for the fields of medicine and agriculture. Reproductive cloning is a very inefficient technique and most cloned animal embryos cannot develop into healthy individuals.
Researchers have observed some adverse health effects in sheep and other mammals that have been cloned. These include an increase in birth size and a variety of defects in vital organs, such as the liver, brain, and heart. Other consequences include premature aging and problems with the immune system. Another potential problem centers on the relative age of the cloned cell's chromosomes.

The Human Genome Project:

Human Genome Project, completed in 2003, the 13-year project identified 20,000 to 25,000 genes and determined the sequence of the 3 billion chemical base pairs that make up human DNA as well as the regions that control them.
Human whole genome sequencing (WGS) is starting the beginning of a new era in personalized medicine to improve public health. By allowing the entire genome of a person to be sequenced, every gene can be turned into digital data for analysis. While this results in a large amount of data, genetic variations also result in big opportunities. Once a person has genomic sequencing data, it can be analyzed to easily determine if they carry genome sequences for particular single genetic disorders like cystic fibrosis or sickle cell anemia.

With advances in bioinformatics, next-generation sequencing (NGS) findings are starting to guide treatments for common genetic conditions such as cancers (colorectal cancer and melanoma) and are also being used to determine which medications are safe (and which are not) on a person-by-person basis.
DNA sequencing using Next-Generation Illumina Technology, Next generation sequencing (NGS) is a sequencing method developed by Illumina which is a biotechnology company, this technology offers speed and scalability it can be used to determine the sequence in entire genomes or in targeted regions. It can also help in utilizing RNA sequencing for gene expression analysis, Sequence cancer samples.

DNA Mutation:

A mutation is a change in the DNA sequence of an organism. Mutations can result from errors in DNA replication during cell division, exposure to mutagens, or a viral infection. Your DNA tells your body how to form and function. Genetic mutations could lead to genetic conditions like cancer, or they could help humans better adapt to their environment over time.
Radiation exposure is also a cause of mutations, the radiation penetrates through the structures of the cells and damages the arrangement of the DNA, which further leads to improper growth and development of the body. An example is the mutations caused in animals after the Chornobyl Nuclear Accident.

4 types of Mutation:

- Germline mutations occur in gametes.
- Somatic mutations occur in other body cells.
- Chromosomal alterations are mutations that change chromosome structure.
- Point mutations change a single nucleotide.

Stem Cell Research:

Stem cells are the body's raw materials — cells from which all other cells with specialized functions are generated. Under the right conditions in the body or a laboratory, stem cells divide to form more cells called daughter cells. These daughter cells become either new stem cells or specialized cells (differentiation) with a more specific function, such as blood cells, brain cells, heart muscle cells, or bone cells. No other cell in the body has the natural ability to generate new cell types.
Why is there such an interest in stem cells?

Researchers hope stem cell studies can help to:

- Increase understanding of how diseases occur.
- Generate healthy cells to replace cells affected by the disease (regenerative medicine).

- Test new drugs for safety and effectiveness.

Where do stem cells come from?
There are several sources of stem cells:

- Embryonic stem cells.
- Adult stem cells.
- Adult cells are altered to have the properties of embryonic stem cells.
- Perinatal stem cells.

Why is there a controversy about using embryonic stem cells?

Embryonic stem cells are obtained from early-stage embryos — a group of cells that forms when eggs are fertilized with sperm at an in vitro fertilization clinic. Because human embryonic stem cells are extracted from human embryos, several questions and issues have been raised about the ethics of embryonic stem cell research.
The National Institutes of Health created guidelines for human stem cell research in 2009. The guidelines define embryonic stem cells and how they may be used in research and include recommendations for the donation of embryonic stem cells. Also, the guidelines state that embryonic stem cells from embryos created by in vitro fertilization can be used only when the embryo is no longer needed.
Embryonic stem cells might also trigger an immune response in which the recipient's body attacks the stem cells as foreign invaders. The stem cells might simply fail to function as expected, with unknown consequences. Researchers continue to study how to avoid these possible complications.

What is therapeutic cloning, and what benefits might it offer?

Therapeutic cloning, also called somatic cell nuclear transfer, is a technique to create versatile stem cells independent of fertilized eggs. In this technique, the nucleus is removed from an unfertilized egg. This nucleus contains genetic material. The nucleus is also removed from the cell of a donor.
This donor nucleus is then injected into the egg, replacing the nucleus that was removed, in a process called nuclear transfer. The egg is allowed to divide and soon forms a blastocyst. This process creates a line of stem cells that is genetically identical to the donor's cells — in essence, a clone.
Some researchers believe that stem cells derived from therapeutic cloning may offer benefits over those from fertilized eggs because cloned cells are less likely to be rejected once transplanted back into the donor and may allow researchers to see exactly how a disease develops.

Antimicrobial Resistance:

Antimicrobial resistance is the ability of a disease or pathogen to not respond to any sort of treatment or medication, the member states can discuss how gene sequencing has helped so far, and how we can improve it further in time.

Data on antimicrobial-resistant pathogens is essential to spread awareness for public safety and to monitor the effectiveness of interventions. AMR surveillance currently relies on the microbiological characterization of isolates and phenotypic antimicrobial susceptibility testing (AST).

AMR is believed to have an indirect economic impact of 1-3 trillion US dollars in terms of disability, premature deaths, and reduced effective labor by 2030 if no action is taken to counter the rise of AMR.

Case Studies:

Korea's Bold Moves:

The Welfare Genome Project (WGP) conducted in South Korea provided 1,000 healthy Korean volunteers with detailed genetic and health reports. WGP was launched in 2016 as the first large-scale genome project with public participation in Korea. The project produced genetic materials, genotype information, clinical data, and lifestyle survey answers from participants aged 20-96.

Korea bans studies that involve CRISPR cas9 for both research and clinical purposes, follows a 2-step validation process, and requires the researchers to state the purpose and disease category (if any) to get permission to conduct research and trials.

India's best-kept secrets:

In 2004, doctors at the Bhopal Memorial Hospital and Research Centre (BMHRC), established exclusively for treating the victims of the 1984 gas leak, recruited unsuspecting survivors for clinical trials without their knowledge or consent; 14 participants died during the course of the trials.

Together with the episode in Indore's Maharaja Yashwantrao Hospital (that Mint reported on 10 October), where 32 people died in clinical trials between 2005 and 2010, this incident highlights irregularities and ethical violations in some trials conducted by clinical research firms and pharma companies—the dark underbelly of the booming clinical trial business in India.

Questions to be answered:

1. How can the methods involved be made more cost-efficient?

2. How can the WHO standardize the methodologies discussed into guidelines for all the concerned countries to follow?

3. How can we store and ensure the privacy of the data collected from the analysis?

4. How successful have therapeutic cloning and other forms of cloning been?

5. How ethical are clinical trials and how do they affect the mental and physical states of the victims?

Links and Documents to help in Research:

GDPR:
https://gdpr-info.eu/

Privacy in genomics:
https://www.genome.gov/about-genomics/policy-issues/Privacy

The Encyclopaedia of DNA Elements (ENCODE):
http://surl.li/dunpq

Health Gene Editing Index:
http://surl.li/dunpz

Stem Cells:
http://surl.li/bilfr

Genomics - WHO:
http://surl.li/dunqe

Accepted Sources of Information:

1. Official UN articles and documents
2. News articles from the state media
3. News articles from Al Jazeera, Reuters.
4. Presidential and Government Statements
5. Government websites