



Gain-of-function Research

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Why in News

The **Wuhan Institute of Virology** was said to have conducted **gain-of-function research** on coronaviruses which may possibly have caused the lab-leak origin of the **SARS-CoV-2 (Covid-19 pandemic)**.

Key Points

- **Gain-of-function Research:**
 - **About:**
 - In virology, gain-of-function research involves **deliberately altering an organism in the lab, altering a gene, or introducing a mutation** in a pathogen to study its transmissibility, virulence and immunogenicity.
 - This is done by **genetically engineering the virus** and by allowing them to grow in different growth mediums, a technique called **serial passage**.
Serial Passage refers to the process of growing bacteria or a virus in iterations. For instance, a virus may be grown in one environment, and then a portion of that virus population can be removed, and put into a new environment.
 - **Significance:**
 - This would allow researchers to study **potential therapies** and **ways to control the disease** better in future.
 - Gain-of-function studies, which enhance viral yield and immunogenicity (relating to immune response), are **required for vaccine development**.

- **Issues:**

- Gain-of-function research involves manipulations that make certain pathogenic **microbes more deadly or more transmissible**.
- There is also **'loss-of-function' research**, which involves **inactivating mutations**, resulting in a **significant loss of original function**, or no function to the pathogen.

When mutations occur, they **alter the structure** of the virus, resulting in **altered functions** which might weaken the virus or enhance its function.

- Gain-of-function research reportedly carry inherent **biosafety and biosecurity risks** and are thus referred to as **'dual-use research of concern' (DURC)**.

This indicates that while the research may result in benefits for humanity, there is also the potential to cause harm — accidental or deliberate escape of these altered pathogens from labs may even cause pandemics (Like it is said to be in case of **Covid-19**).

- **Situation in India:**

- All activities related to genetically engineered organisms or cells and hazardous microorganisms and products are regulated as per the **“Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells Rules, 1989”**.
- In 2020, the Department of Biotechnology issued guidelines for the establishment of containment facilities, called **'Biosafety labs'**.

The notification provides operational guidance on the **containment of biohazards and levels of biosafety** that all institutions involved in research, development and handling of these microorganisms must comply with.

- **Debate over Gain-of-function:**

- **Proponents:**

- It makes science and governments **battle-ready for future pandemics**.
- Proponents of gain-of-function research believe that “nature is the ultimate bioterrorist and we need to do all we can to stay one step ahead”.

- **Critic:**

- After the Covid-19 pandemic, more concerns are raised on carrying out such kinds of research.
- This may cause the extinction of the living things or may change their genetic makeup forever.

Way Forward

- The **World Health Organization (WHO)** should lead activities on DURC.
- There should be **responsible use** of life sciences research, focusing on mitigation and prevention of bio-risks and associated ethical issues.
- Develop a **Global Guidance Framework for** countries to follow.
- There is a need to ensure greater transparency about such research.

Source:TH