3. Monoclonal Antibodies - Science & Technology

ICMR invites EoI to develop monoclonal antibodies against Nipah virus in India. The ICMR is inviting Indian companies to develop and produce monoclonal antibodies (mAbs) to create a domestic stockpile against the highly fatal Nipah virus. This initiative aims to ensure self-reliance for therapy and post-exposure prophylaxis during recurring outbreaks, as India currently lacks an approved vaccine or antiviral and has completed successful animal trials for indigenous mAbs.

ICMR Call for Action on Nipah Virus

Core Announcement - The Indian Council of Medical Research (ICMR) has invited Expressions of Interest (EoI).

Target Audience - The EoI is aimed at Indian organisations, companies, and manufacturers.

Objective - The goal is the development and production of monoclonal antibodies (mAbs) specifically designed to counter the Nipah virus (NiV).

Monoclonal Antibodies (mAbs)

Definition - Monoclonal antibodies are laboratory-produced molecules. Their primary function is to mimic the immune system's natural ability to fight off harmful pathogens, such as viruses and bacteria.

Origin of the Name ("Monoclonal") - They are termed "monoclonal" because they are produced by identical immune cells (clones). These clones are all derived from a single parent cell. As a result, every antibody produced is identical and is designed to recognize and bind to one specific target (antigen).

Working Mechanism

Binding - They attach to a specific antigen (a target molecule, usually a protein) located on the pathogen or cell.

Neutralizing Actions - This binding can trigger several defensive outcomes -

1. Neutralize toxins released by the pathogen.
2. Block receptors that the virus would use to enter a healthy cell.
3. Mark the pathogen or infected cell for destruction by other components of the immune system.

Production (The Hybridoma Technique) - This process uses a method called the hybridoma technique.

Step 1 - A specific B-cell (a type of white blood cell, also known as a B lymphocyte) that naturally produces the desired antibody is isolated.

Step 2 - This B-cell is fused with a myeloma cell (a type of immortal cancer cell).

Result - This fusion creates a new cell called a hybridoma.

Function - The hybridoma is a "super cell" that possesses two key traits - it can divide indefinitely (like the myeloma cell) and it can produce large quantities of the *same* antibody (like the B-cell).

Applications

Medical Treatment

1. **Cancer Therapy -** (e.g., Rituximab, Trastuzumab).
2. **Autoimmune Diseases -** (e.g., Adalimumab).
3. **Viral Infections -** (e.g., therapies developed for COVID-19).

Diagnosis - Used in rapid antigen tests. Utilized in various other laboratory diagnostics.

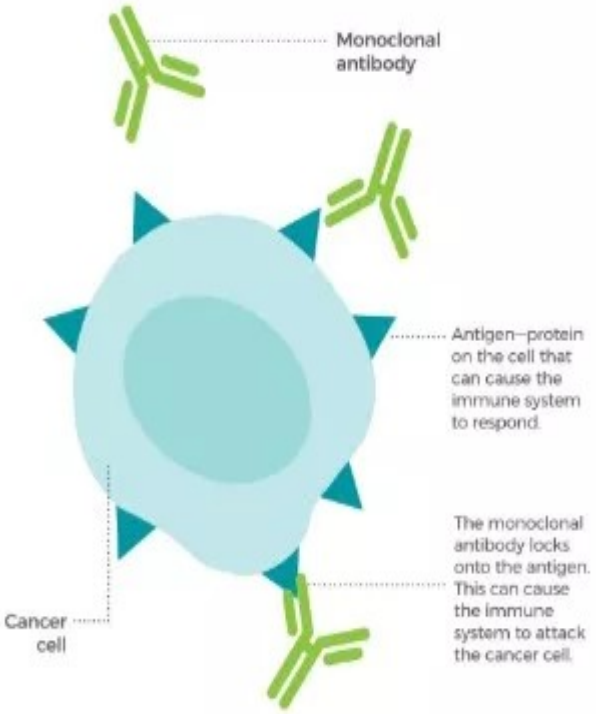
Research - Used as a tool to identify or isolate specific molecules within cells and tissues.

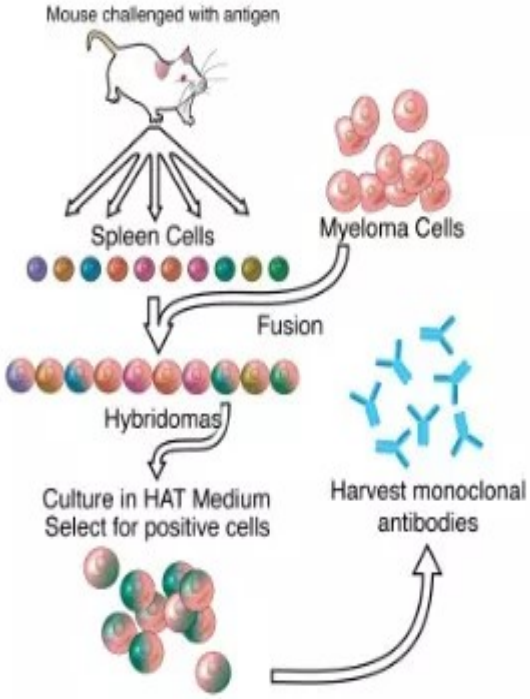
Advantages

1. They offer highly specific and targeted action against a pathogen.
2. This specificity can reduce side effects when compared to broad-spectrum drugs.
3. They are particularly useful when vaccines or antivirals are unavailable or prove to be ineffective.

Limitations

1. They are expensive to produce and to store (often require a stringent cold chain).
2. In some cases, they may trigger immune reactions in the patient.
3. Their effectiveness is limited if the target antigen mutates, which can happen with certain viral strains.





Specific Application in Nipah Control

Post-exposure prophylaxis (PEP) - Intended for individuals at high risk after a known exposure. This includes healthcare workers, family members of patients, and laboratory personnel who were exposed without adequate protection.

Therapeutic Use - When administered early in the infection, mAbs can -

1. Reduce the viral load in the patient.
2. Limit the progression of the disease.
3. Improve survival outcomes.

About the ICMR Initiative

Core Objective - To develop, produce, and stockpile indigenous monoclonal antibodies against the Nipah virus. This stockpile is intended for both therapeutic (treating the sick) and prophylactic (preventing infection in the exposed) use during outbreaks.

Implementing Agencies - The initiative is led by the ICMR in partnership with the ICMR–National Institute of Virology (NIV), Pune.

Role - These bodies will provide technical guidance, research support, and oversight at all phases of the project.

Collaboration Model - ICMR plans to partner with Indian industry and biotech firms. The ultimate goal is to create a domestic monoclonal antibody platform that allows for scalable production.

Current Status - Animal trials using indigenously developed mAbs have already been successfully completed. The ICMR–NIV in Pune has initiated advanced Research & Development (R&D) in this specific domain.

Rationale (Why this is necessary)

High Fatality Rate - Nipah has a fatality rate ranging between 40% and 75%, which varies based on clinical management and the speed of the outbreak response.

Recurring Outbreaks in India - The virus has caused repeated outbreaks since 2001, with frequent spillovers in Kerala (specifically in 2018, 2021, 2023, 2024, and 2025).

Current Gaps - There is currently no approved vaccine or antiviral therapy for Nipah. During past outbreaks, India's reliance on imported or experimental antibody stocks caused significant deployment delays.

Strategic Need - Building domestic mAb capacity is crucial for India's self-reliance. A domestic supply ensures rapid deployment during future public health emergencies.

About Nipah Virus (NiV)

Nature of the Virus - Nipah is a zoonotic virus, meaning it is transmitted from animals to humans. It can also be transmitted through contaminated food or directly from person to person.

Symptoms - It causes severe respiratory illness and encephalitis (inflammation of the brain) in humans.

Classification - It is classified as a highly pathogenic virus due to its high fatality rate and significant epidemic potential.

Origin & History

First Identified - The virus was first recognized in Malaysia during 1998–99 among pig farmers.

Name - It is named after the village of Sungai Nipah in Malaysia, where the virus was first detected.

Reservoir Host - The natural host and reservoir for the virus are fruit bats of the genus *Pteropus*, also known as flying foxes.

Transmission Routes

Animal to Human - Direct contact with infected animals (bats or pigs). Consumption of raw date palm sap that has been contaminated by the saliva or urine of infected bats.

Human to Human - Through respiratory droplets from an infected person. Contact with the body fluids of an infected person. Contact with contaminated surfaces, which makes transmission in healthcare settings a major risk.

Fatality Rate - As mentioned, the rate is high at 40–75%, depending on the outbreak response and access to healthcare.

Strain in India - The variant prevalent in India is the Bangladesh clade (NiV-B).

Key Characteristics - This strain is known for - More frequent person-to-person transmission. A higher mortality rate compared to the Malaysian strain (NiV-M).

Source - https - //www.thehindu.com/news/national/icmr-invites-eoi-to-develop-monoclonal-antibodies-against-nipah-virus-in-india/article70232755.ece