



Neurovascular Tissues/Organoids

[Source: PIB](#)

Why in News?

Recently, researchers at the Post Graduate Institute of Medical Education & Research (PGIMER) in Chandigarh, have developed a groundbreaking prototype model for **generating neurovascular organoids (NVOEs) from autologous blood**, representing a novel approach to generating **neurovascular tissues**.

- These innovative NVOEs hold the key to transforming our understanding of brain function and neurological diseases.

What are the Key Highlights of the Research?

- **Addressing Challenges in Neural Organoid Development:**
 - Traditional neural organoids **lack vascularization**, limiting their utility in modelling brain activity and investigating neurological diseases.
 - Vascularization is the process of **growing blood vessels into a tissue** to improve oxygen and nutrient supply.
 - Previous approaches, such as **co-culturing blood vessel organoids with cerebral organoids**, proved ineffective due to the absence of **active blood flow** and are labour-intensive and not cost-effective.
- **Neurovascular Tissues/Organoids:**
 - PGIMER researchers have introduced a prototype for establishing **self-organizing NVOEs entirely from autologous blood**, without genetic manipulation or morphogen supplementation.
 - Autologous blood is a blood donation that an individual gives for their own use, for example, before surgery.
 - This approach produces **functional vascularized embryoids** on their own and **doesn't need any special culture conditions**, making it cost-efficient and accessible.
 - The researchers verified that these **neurovascular organoids have working blood vessels** by detecting signals from haemoglobin using a method called **BOLD (Blood-Oxygen-Level-Dependent) imaging**.
 - BOLD imaging is a technique that uses magnetic resonance imaging (MRI) to **measure brain activity**.
- **Implications for Neuroscience:**
 - These organoids have broad implications for studying **neurological diseases**, [regenerating nerves](#), and developing treatments for [tumours](#) and **autoimmune conditions**.
 - These models help researchers understand the **genetic causes of hearing loss and language challenges in children** with early-onset Sensorineural Hearing Loss (SNHL).
 - They study children with additional conditions like [autism or intellectual disability](#), aiming to improve communication outcomes. By studying NVOEs, researchers can investigate how **altered brain activity affects sensory processing**.
 - Although functional MRI (fMRI) is a useful tool for monitoring brain activity, it's not suitable for these children due to their cochlear implants or hyperactivity.

▪ **Future Applications:**

- The prototype holds the potential for **developing patient-specific embryoid models** for congenital neurosensory, neurodevelopmental, and neurodegenerative diseases.
- It can aid in **deciphering genetics and neural circuits**, testing drugs, and identifying novel biomarkers for **early neurological diseases**, ushering in a new era of personalised medicine in neuroscience.

Neural Organoids

- Neural organoids, also known as **cerebral organoids**, are **human pluripotent stem cells (hPSCs)-derived 3D in vitro culture systems** that recapitulate the developmental processes and organisation of the **developing human brain**.
 - These provide a physiologically relevant in vitro 3D brain model for the study of **neurological development and disease processes** that are unique to the human nervous system.
- They have important applications in studying human brain development and neurological disorders such as [schizophrenia](#).

Kala Azar

[Source: IE](#)

Why in News?

India achieved significant progress in eliminating [Kala Azar \(KA\)](#), reporting **less than one case per 10,000 population in 2023**, compared to previous years.

- Data from the [National Vector Borne Disease Control Programme](#) revealed a decline in Kala Azar cases, with 595 cases and four deaths reported in 2023 compared to 891 cases and three deaths in 2022.

Note:

- India has not yet eliminated KA but has made substantial progress towards its elimination goal.
 - India's initial target year for Kala Azar elimination was 2010, which was later extended to 2015, 2017, and then 2020.
- The [WHO](#) defines elimination for KA as having **fewer than one case per 10,000 people at the sub-district (block Primary Health Centres) level** in India. Once achieved, the elimination is to be sustained for 3 years for KA elimination certification.
 - India will need to sustain this momentum over the **next three years to receive WHO certification**, considering that India has missed at least four deadlines for Kala Azar elimination.
- In Oct 2023, **Bangladesh became the first country, globally**, to be officially validated by the WHO for eliminating Kala Azar as a public health problem.

What are the Key Facts About Kala Azar?

▪ **About:**

- Kala-azar (**visceral leishmaniasis**), also known as **Black Fever** is a fatal disease caused

by a protozoan parasite ***Leishmania donovani***.

- **Symptoms:**
 - It is characterised by irregular bouts of fever, weight loss, enlargement of the spleen and liver, and anaemia.
- **Prevalence:**
 - Most cases occur in Brazil, east Africa and India. An estimated 50,000 to 90 000 new cases of VL occur worldwide annually, with only 25-45% reported to WHO. It has an outbreak and mortality potential.
- **Transmission:**
 - Leishmania parasites spread through bites of infected female sandflies, feeding on blood for egg production. Over 70 animal species, **including humans, can carry these parasites.**
- **Major Risk Factors:**
 - Poverty, poor housing, and sanitation.
 - Diets lacking essential nutrients.
 - Movement into high-transmission areas.
 - Urbanisation, deforestation, climate change.
- **Diagnosis and Treatment:**
 - Suspected visceral leishmaniasis cases require immediate medical attention. Diagnosis involves clinical signs combined with parasitological or serological tests.
 - Left untreated, it can be **fatal in 95% of cases.**
- **Prevention and Control:**
 - **Early diagnosis and prompt treatment** are crucial in reducing disease prevalence, and preventing disabilities, and death.
 - **Vector control, such as insecticide spray** and the use of insecticide-treated nets, helps reduce transmission by decreasing the number of sandflies.
 - **Effective disease surveillance** is important for monitoring and acting during epidemics and high case fatality rates.
 - **Social mobilization and strengthening partnerships**, including community education and collaboration with stakeholders, are critical for effective control.
- **India's Efforts to Control Kala Azar:**
 - The Government of India launched a **centrally sponsored Kala-azar control program in 1990-91**, which was later revised in 2015.
 - The program aimed to eliminate **Kala-azar by 2023**, aligning with the WHO [neglected tropical diseases \(NTDs\) Roadmap goal of 2030](#).
 - The **National Vector Borne Disease Control Programme (NVBDCP), 2003** is an umbrella programme for prevention and **control of vector borne diseases** viz., malaria, lymphatic filariasis, **kala azar**, and chikungunya.
 - **Recent Efforts:**
 - Rigorous indoor residual spraying effort aimed at curtailing sandfly breeding sites; application of a **special soil to seal crevices in mud walls**, preventing sandflies from nesting.
 - Pucca houses in KA-affected villages have been constructed under PMAY-G - A total of 25,955 houses in 2017-18 (1371 houses in Bihar & 24584 in Jharkhand).
 - Mobilisation of the [ASHA \(Accredited Social Health Activist\) network](#) to ensure completion of treatment for PKDL patients, who require a 12-week course of Miltefosine (an antileishmanial agent).

Post-kala-azar Dermal Leishmaniasis (PKDL)

- PKDL is a skin condition that **follows visceral leishmaniasis**, causing rashes on the face, arms, and trunk.
 - It affects mainly Sudan and the Indian subcontinent, with 5-10% of kala-azar patients developing it.
 - PKDL may occur 6 months to a year after kala-azar treatment, potentially spreading Leishmania.
-

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims:

Q. Consider the following diseases: (2014)

1. Diphtheria
2. Chickenpox
3. Smallpox

Which of the above diseases has/have been eradicated in India?

- (a) 1 and 2 only
(b) 3 only
(c) 1, 2 and 3
(d) None

Ans: (b)

India's First Ammunition-Missile Manufacturing Complex in UP

Source: IE

Recently, Adani Group has inaugurated **South Asia's largest ammunition and missile complex** in Kanpur, Uttar Pradesh spanning 500 acres.

- This facility is poised to become one of the region's most extensive integrated ammunition manufacturing complexes, producing **high-quality small, medium, and large-caliber ammunition** for the armed forces, paramilitary forces, and police.
- The complex has commenced production of **small-caliber ammunition**, with an initial batch of 150 million rounds, which accounts for approximately 25% of India's annual requirement.
- This unveiling coincides with the 5th anniversary of the **Balakot airstrike**, also known as 'Operation Bandar,' a landmark operation by the **Indian Air Force** that showcased India's strategic assertiveness in countering external threats.

Read more: [RFID of Ammunition Stock](#)

PM Unveils Three Space Facilities and Presents Astronaut Wings

Source: PIB

Recently, the Prime Minister of India inaugurated three significant **space infrastructure projects: SLV Integration Facility (PIF)** at Satish Dhawan Space Centre, Sriharikota, **Semi-cryogenics Integrated Engine and Stage Test (SIEST) facility** at ISRO Propulsion Complex, Mahendragiri and **Trisonic Wind Tunnel** at Vikram Sarabhai Space Center, Thiruvananthapuram.

- They will enhance India's technical capabilities in the space sector and support its vision for space

exploration.

- The PIF will ramp up [PSLV launches](#) **from 6 to 15 annually** and support [SSLV](#) and other small launch vehicles.
 - The SIEST facility will develop **semi-cryogenic engines**, enhancing payload capacity, with capabilities to test engines up to 200 tons of thrust.
 - The Trisonic Wind Tunnel marks a milestone in **aerodynamic testing** for rockets and aircraft.
- These facilities are also crucial for the **Gaganyaan Mission**.
- Also, the Prime Minister announced the names of four pilots chosen for Gaganyaan mission and presented '**Astronaut Wings**' to them.
 - The designated pilots for the Gaganyaan mission are **Group Captain P Balakrishnan Nair, Group Captain Ajit Krishnan, Group Captain Angad Pratap, and Wing Commander S Shukla**.

Read more: [Gaganyaan Mission](#)

PDF Reference URL: <https://www.drishtiias.com/current-affairs-news-analysis-editorials/news-analysis/28-02-2024/print>

