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1. How the world's first brain implant to control epileptic seizures works

Why in News?

A UK-based teenager, Oran Knowlson, has become the first person in the world to be fitted with a brain implant to help bring his epileptic seizures under control. The deep brain stimulation (DBS) device, which sends electrical signals deep into the brain, has reduced Knowlson's daytime seizures by 80%.

What is epilepsy?

Epilepsy, a condition that leads to recurring seizures, sees a person experience jerking of arms and legs, temporary confusion, staring spells, or stiff muscles. It is caused by abnormal electrical activity in the brain.

The disease has no identifiable cause in nearly 50% of the cases. However, head trauma, tumours in the brain, some infections like meningitis, or even genetics can lead to epilepsy. It can increase the risk of accidents, drownings, and falling.

In India, according to estimates between 3 and 11.9 per 1,000 people suffer from epilepsy. Although several anti-seizure medicines are available in the market, 30% of the patients remain resistant to treatment.

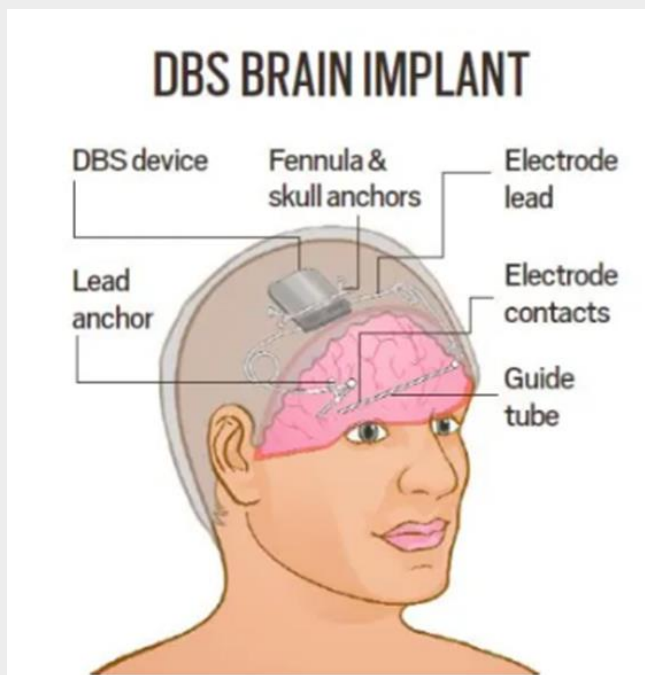
How does the device work?

The neurostimulator delivers constant electrical impulses to the brain to disrupt or block abnormal seizure-causing signals.

A 3.5 cm square, 0.6 cm in thickness, the device was surgically implanted in Knowlson's skull and anchored using screws. The doctor then inserted two electrodes deep into his brain until they reached the thalamus — a relay station for all the motor and sensory information. The ends of the electrodes were connected to the neurostimulator.

The device was switched on after Knowlson recovered from his surgery. It can be recharged by a wireless headphone.

What is DBS?



The device uses DBS, which is also utilised for movement disorders associated with Parkinson's, and other neurological conditions. Although DBS has been tried before for childhood epilepsy, until now neurostimulators were placed in the chest (instead of the brain), with wires running up to the brain where the leads were placed on the affected region.

Other Treatment Options

It is not the first line of treatment for epilepsy. Doctors first use anti-seizure medicines and a ketogenic diet, which is high in fats and low in carbohydrates. Although the reasons are not well understood, a ketogenic diet is known to reduce seizures, even in children with

treatment-resistant epilepsy. If that does not work, doctors can carry out brain surgery to remove a portion of the brain where the seizures originate.

Another surgery called corpus callosotomy may be suggested in some children. In this, doctors remove a part that connects both halves of the brain, which does not allow abnormal electrical signals to travel from one half of the brain to another.

Surgery is still preferable to implanting a DBS device. Currently, the DBS devices available in the market reduce seizures by around 40%. In comparison, seizures drop by nearly 90% if the patient undergoes surgery.

Relevance: GS Prelims; Science & Technology

Source: Indian Express

2. How urban expansion makes Delhi susceptible to flooding

Why in News?

Unchecked and ill-thought-out urban expansion is the principal reason behind chronic urban flooding in Delhi, and the larger National Capital Region (NCR).

Last week, a spell of heavy rain brought parts of Delhi to a standstill. Streets across the city and in the larger NCR were inundated, leading to hours-long traffic snarls in some places. Water-logging also led to lengthy power cuts, property damage, and loss of life, with at least 11 people dying due to structural collapses and electrocution.

While the rainfall last week was unprecedented — the India Meteorological Department (IMD) recorded 228.1 mm rainfall in its Safdarjung station over a 24-hour period from June 27-28, an 88-year high — flooding and water-logging have now become a part and parcel of Delhi's


monsoons. Factors such as inadequate desilting of drains by civic authorities also play a part, but at the heart of it, Delhi is ailed by a more fundamental problem.

A rapidly growing city


Delhi is undergoing one of the world's fastest urban expansions. According to data from NASA's Earth Observatory, the geographic size of Delhi almost doubled from 1991 to 2011. Most of this expansion has occurred on the peripheries of New Delhi, with erstwhile rural areas becoming engulfed in the capital's urban sprawl. Cities outside Delhi, but a part of the NCR — Bahadurgarh, Ghaziabad, Faridabad, Noida, and Gurugram — have also witnessed rapid urbanisation.

According to the United Nations' The World's Cities in 2018 data booklet, Delhi will overtake Tokyo as the world's most populous city by 2030, with an estimated population of nearly 39 million, roughly two and a half times its population in 2000.

Low-lying areas around the Yamuna are flood prone



Areas on both sides of the Yamuna River are prone to flooding during the monsoon season.



Water-logging under the Minto Bridge in New Delhi on June 28. *Praveen Khanna*

MANY CITIES, SAME PROBLEM

BENGALURU <i>13 cm of rainfall in Bengaluru's Rainbow Drive Layout in 2022; one of the worst floods in 15 years</i> "We must not overlook the critical role of the storm water drain network in replenishing these (Bengaluru's lakes) water bodies. It is a network which is crucial to the health of the city and its lakes." NARESH V NARASIMHAN, ARCHITECT, URBAN PLANNER	MUMBAI <i>94.4 cm rain on July 26, 2005; wettest 24 hours ever; city stopped entirely; more than 1,000 dead</i> "We need to make an assessment of our storm water drains and see if they are capable of handling excessive rain... We need to then improve early warning systems... An evacuation strategy is important." SUBIMAL GHOSH, HEAD OF CLIMATE STUDIES, IIT BOMBAY	KOCHI & OTHER KERALA CITIES <i>Worst ever floods in mid-Aug 2018; 4 districts of Kerala submerged; Kochi inundated for days</i> "We need strong legal systems in place to ensure future structures follow the lay of the land, allow water to percolate, and don't narrow down streams." MANOJ KINI, MD, KERALA TOURISM INFRASTRUCTURE LTD.	SHIMLA & OTHER HILL TOWNS <i>Catastrophic rainfall in July-Aug 2023 wreaked havoc in Mandi, Kullu, Manali, Shimla</i> "There should be new paradigms of the architecture of governance. Communities should be made custodians and some kind of insurance model should be developed." TIKENDER PANWAR, URBAN SPECIALIST
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(The experts spoke to The Indian Express in 2023)

Topography and drainage

This urban expansion, however, has paid little heed to Delhi's natural topography. Topography determines drainage patterns. If one looks at Delhi's historic cities — from Tughlakabad, Mehrauli, and Shahjahanabad to Civil Lines, New Delhi, and the Cantonment area — all were

carefully selected, and built on higher ground. In Delhi's villages too, the centre of the village would always be five to six metres higher than the village periphery.

This allowed rainwater to drain out. But as the city has expanded, not enough thought has gone behind building with regards to the land's drainage capacities.

Thus, with high-intensity rain there is significant run-off (unconfined flow of water, which occurs when there is more water on the land's surface than it can absorb), and existing drainage systems have been inadequate.

Relevance: GS Prelims & Mains Paper III; Disaster Management

Source: Indian Express

3. What is Project Nexus that RBI has signed up for?

Why in News?

The Reserve Bank of India (RBI) has joined Project Nexus, a multilateral international initiative to enable instant cross-border retail payments by interlinking domestic Fast Payments Systems (FPSs). India's Unified Payments Interface (UPI) and FPSs of Malaysia, the Philippines, Singapore and Thailand will be interlinked through Nexus. Going ahead, the platform can be extended to more countries.



What is Project Nexus?

Project Nexus is conceptualised by the Innovation Hub of the Bank for International Settlements (BIS). It seeks to enhance cross-border payments by connecting multiple domestic instant payment systems (IPS) globally. It is the first BIS Innovation Hub project in the payments area to move towards live implementation.

The Reserve Bank of India has been collaborating bilaterally with various countries to link India's Fast Payments System (FPS) – UPI, with their respective FPSs for cross-border Person to

Person (P2P) and Person to Merchant (P2M) payments. While India and its partner countries can continue to benefit through such bilateral connectivity of FPS, a multilateral approach will provide further impetus to the RBI's efforts in expanding the international reach of Indian payment systems.

In over 70 countries today domestic payments reach their destination in seconds at near-zero cost to the sender or recipient. This is thanks to the growing availability of instant payment systems. Connecting these IPS to each other can enable cross-border payments from sender to recipient within 60 seconds (in most cases), according to the BIS.

What are the benefits of the platform?

Project Nexus is designed to standardise the way IPS connect to each other. Rather than a payment system operator building custom connections for every new country that it connects to, the operator can make one connection to the Nexus platform. This single connection allows a fast payments system to reach all other countries on the network. Nexus could significantly accelerate the growth of instant cross-border payments.

Which countries have joined the platform?

Project Nexus aims to connect the FPSs of four Association of Southeast Asian Nations (ASEAN) — Malaysia, Philippines, Singapore, and Thailand; and India, who would be the founding members and first mover countries of this platform.

An agreement on this was signed by the BIS and the central banks of the founding countries i.e., Bank Negara Malaysia (BNM), Bank of Thailand (BOT), Bangko Sentral ng Pilipinas (BSP), Monetary Authority of Singapore (MAS), and Reserve Bank of India on June 30, 2024, in Basel, Switzerland. Indonesia will also join the platform in future.

Relevance: GS Prelims & Mains Paper III; Economics

Source: Indian express