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CURRENT AFFAIRS

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TECHNIQUES OF BONE GRAFTING

THIS ARTICLE COVERS 'DAILY CURRENT AFFAIRS' AND THE TOPIC DETAILS OF "TECHNIQUES OF BONE GRAFTING". THIS TOPIC IS RELEVANT IN THE "SCIENCE AND TECHNOLOGY" SECTION OF THE UPSC CSE EXAM.

WHY IN THE NEWS?

Recently, the Indian Institute of Technology (IIT) Kanpur entered into an agreement with a biotechnology company based in Canada, Conlis Global, through a Memorandum of Understanding (MoU). This agreement involves the licensing of a pioneering technology developed domestically by IIT Kanpur known as "Nano Hydroxyapatite-Based Porous Polymer Composite Scaffold for Bioactive Molecule Delivery in Musculoskeletal Regeneration".

ABOUT NANO HYDROXYAPATITE-BASED POROUS POLYMER COMPOSITE SCAFFOLD

Nano hydroxyapatite-based porous composite scaffolds are a new generation of biomaterial with immense potential in bone repair. Here's a closer look at their properties and applications:

PROPERTIES

- **Biodegradable:** These scaffolds naturally break down over time within the body, eliminating the need for additional surgery.
- **Bone Regeneration:** They possess both osteoinductive and osteopromotive properties, meaning they can stimulate bone growth and formation.
- **Biocompatible:** The material is highly compatible with living tissues, promoting good interaction with osteoblast cells, which are crucial for bone formation.
- **Strong and Stable:** These scaffolds exhibit high mechanical strength, providing a sturdy support structure for bone regrowth.

APPLICATIONS

- **Orthopaedics and Dentistry:** They are finding use in various orthopaedic and dental implants, including bone graft substitutes, coatings for prosthetic devices, and tissue engineering scaffolds.
- **Large Bone Defects:** Functionalized versions of these scaffolds can be used as fillers for large bone defects. Their porous structure ensures proper blood circulation and oxygen supply, which is vital for bone healing.

- **Enhanced Healing:** By promoting tissue formation and mineralisation, these scaffolds can accelerate bone defect repair.

ABOUT BONE GRAFTING

Bone grafting is a surgical technique to address missing bone or heal complex fractures. It essentially involves transplanting bone tissue to promote bone growth and regeneration. This procedure is employed in various fields like orthopaedics, dentistry, and maxillofacial surgery.

TYPES OF GRAFT MATERIALS

- **Autografts:** The patient's own bone, often taken from the hip, ribs, or other suitable sites. This offers the best compatibility but requires additional surgery for harvesting.
- **Allografts:** Bone from a deceased donor, processed to minimise rejection risks.
- **Xenografts:** Animal bone, typically from cows or pigs, specially treated for biocompatibility.
- **Alloplastic Grafts:** Synthetic materials like ceramics, polymers, or biocompatible metals that mimic bone structure and stimulate new bone growth.

COMMON REASONS FOR BONE GRAFTING

- **Fracture Healing:** To promote healing in complex fractures, non-unions (fractures that haven't healed on their own), or bone defects.
- **Filling Bone Defects:** Bone loss due to trauma, tumours, infections, or birth defects can be addressed with grafts.
- **Spinal Fusion:** For stabilising the spine, treating disc problems, or correcting spinal deformities in orthopaedic and neurosurgical procedures.
- **Dental Implants:** To increase jawbone volume for successful placement of dental implants.
- **Maxillofacial Reconstruction:** Restoring facial bone structure and function after trauma, birth defects, or tumour removal.

BONE GRAFTING PROCESS & TECHNIQUES

- **Harvesting Bone Grafts:** Techniques for obtaining autografts can involve traditional open surgery or minimally invasive procedures.
- **Preparing the Graft:** Allografts and xenografts undergo processing to remove cellular components while preserving the bone structure and growth factors.
- **Graft Placement:** The graft material is surgically inserted into the defect site and often secured with fixation devices like screws, plates, or meshes.
- **Bone Graft Substitutes:** Synthetic materials or biological agents can be used to stimulate bone formation and regeneration in some cases.

PRELIMS PRACTISE QUESTIONS

Q1. Consider the following diseases:

1. Hepatitis B
2. HIV-AIDS

How many of the diseases above can be transmitted from one person to another through tattooing?

- (a) Only one
- (b) Only two
- (c) All three
- (d) None

Answer: B

MAINS PRACTISE QUESTIONS

Q1. What are the potential applications of nanotechnology, such as nanobots, in the healthcare sector? Discuss how these nanotechnologies could revolutionise medical treatment, diagnosis, and drug delivery methods.

Himanshu Mishra

CLIMATE CHANGE AND THE NEED FOR WATER CONSERVATION AND PROMOTION

SOURCE – THE HINDU AND PIB.

GENERAL STUDIES – WATER CONSERVATION, WATER CRISIS AND CITIZENS LIFE IN INDIA, SUSTAINABLE DEVELOPMENT, WORLD WATER DAY 2024, RAIN WATER CONSERVATION, MANAGEMENT AND PROMOTION, CATCH THE RAIN CAMPAIGN

WHY IN THE NEWS ?



- According to the latest report released recently by the Central Water Commission, only 23 percent of the total water holding capacity is available in all the reservoirs of South India. This is nine

percentage points less than the recurring decadal average, indicating the magnitude of the water crisis in India.

- Even before the latest report released by the Central Water Commission, South India had to face a water crisis in summer 2017. This year the water crisis is set to be different and worse due to some other reasons.
- 223 of Karnataka's 236 taluks are affected by drought, including Mandya and Mysore districts, which are Bengaluru's water sources.
- As summer heats up in India, around 7,082 villages across Karnataka are at risk of drinking water crisis in the coming months.
- India's monsoon is affected by various factors. One of the major factors of which is El Nino which has made the Indian monsoon more irregular.
- El Nino – occurred in the year 2014-16, but this phenomenon was so significant that it is one of the five strongest phenomena in the contemporary history of India.
- Due to the effect of El Nino in India, irregularities occur in the Indian monsoon.
- Due to climate change, after the record heat in the year 2023, the current heat situation is expected to get worse in 2024 also.
- Record-breaking heat could occur by 2026, the United Kingdom's Meteorological Office reports.
- Due to climate change, India's agricultural system, which is dependent on monsoon, will have to face more devastating effects. Therefore, the Government of India also needs to bring positive changes in the implementation of its sustainable development policies.
- Recently, 'World Water Day' was celebrated all over the world on 22 March 2024.
- World Water Day, held annually on 22 March since 1993, is an annual day of the United Nations. The main objective of which is to focus on the importance of freshwater.
- The main objective of World Water Day is to raise awareness about people living without access to safe water.
- Main topic or theme of World Water Day 2024 is "**Leveraging Water for Peace**".
- Recently, India's Jal Shakti Ministry launched a program for rainwater harvesting and other sustainable water management systems by starting '**Jal Shakti Abhiyan: Catch the Rain – 2024 Campaign**'.
- This program in India '**Water power through women power**' was based on a theme. It was organized at the Convention Center of New Delhi Municipal Council, as part of the fifth edition of the campaign of the Ministry of Jal Shakti.
- The campaign '**Water power through women power**' seeks to establish a strong link between women empowerment and sustainable management of water resources in India.
- In this program which was organized in India '**Jal Shakti Abhiyaan 2019 to 2023 – A public-led movement towards water security**' screening of a documentary titled and two books –**Talks by champions and women water warriors of 'Jal Shakti Abhiyan: 2019 to 2023'** and '**101 Jal Jeevan Mission**' was also unveiled.

HISTORY OF WORLD WATER DAY :

- A proposal was passed on the topic of celebrating the festival and availability of clean water in the Environment and Development Conference held in Brazil in 1992 '**World Water Day**'.
- The United Nations General Assembly (UNGA) adopted this resolution in 1992 and every year at the global level '**World Water Day**' on **22 March** announced to be celebrated.

- Therefore, 'World Water Day' was celebrated for the first time in the year 1993.
- The UN recognized the right to safe, clean drinking water and sanitation as a human right in 2010,.
- The main objective of recognizing the right to safe, clean drinking water and sanitation as a human right is to focus people's attention on the global water crisis.

IMPORTANCE OF WORLD WATER DAY :

- The main goal of World Water Day is to support the achievement of Sustainable Development Goal (SDG) 6.
- The main goal of celebrating World Water Day is to provide clean water and sanitation to all by 2030 at the global level.

WHY IS THERE A NEED FOR WATER CONSERVATION IN THE PRESENT TIMES?

- According to the United Nations, 1.4 million people die every year from diseases caused by lack of sanitation, hygiene and clean water. About 25% of the world's population lacks access to clean water and almost half the global population lacks clean toilets. The global water scarcity is projected to increase by 55% by the year 2050.
- Water is extremely essential for everyday activities in human life. Proper use of water plays an important role in the management of freshwater reserves.
- On an average, a person wastes 45 liters of water a day through his daily activities. Therefore, making a few changes in daily water usage can save a considerable amount of water for future use.
- More than 3 billion people around the world migrate to other countries due to water dependence.
- Only 24 countries worldwide have signed cooperation agreements for shared water use.

CHALLENGES FOR WATER MANAGEMENT IN INDIA :

The following challenges exist before water management in India –

- To reduce the gap between demand and supply of water.
- Providing sufficient water for food production and balancing use among competing demands.
- To meet the growing demands of metros and other big cities.
- Treatment of wastewater.
- Sharing of water among neighboring countries as well as among the states.

WAY FORWARD :

- India is home to 18 percent of the world's population, but only about 4 percent of the people have access to adequate water resources.
- Nearly 90 million people in India do not have access to safe water. The normal annual rainfall of India is 1100 mm which is more than the world average rainfall of 700 mm.



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- According to data released by the India Meteorological Department, the south-west monsoon has been below normal in 42 percent of the districts during June to August 2023. In August 2023, rainfall in the country was 32 percent below normal and 62 percent below normal in the southern states.
- India received the least rainfall in August last year after 1901 i.e. in the last 122 years.
- Less rainfall in India will not only have a serious impact on Indian agriculture, but it can also lead to severe water shortage in various areas of the country.
- The net quantity of water that can be used in a year in India is estimated at 1,121 billion cubic meters (BCM).
- Data published by the Water Resources Ministry shows that the total water demand will be 1,093 BCM in 2025 and 1,447 BCM in 2050. As a result, there is a possibility of a huge reduction in water availability in the next 10 years.
- India exploits groundwater the most in the world. This quantity is more than the combined exploitation of the world's second and third largest groundwater exploiters (China and the United States).
- According to the Falkenmark Water Index, about 76 percent of the people in India are already facing water shortage.
- According to a NITI Aayog report, by the year 2030 the country's water demand will double compared to the current available supply.
- Water consumption can be measured and limited using modern technologies like Artificial Intelligence, Remote Sensing etc.
- Expanding water sources, improving water efficiency, and protecting water resources can improve water availability and quality in India.
- Technological measures like buried clay pot plantation irrigation can also be used to overcome water crisis in India and for water conservation, thereby saving water and improving crop productivity.
- To overcome the water crisis in India and for water conservation, it is extremely important to improve policies at the government level to conserve water resources and expand micro irrigation techniques to ensure accurate and correct consumption of water. Can go.
- Watershed management can prove to be a good option for water conservation and groundwater recharge in India.
- The main objective of development of water harvesting in India is to conserve every drop of rain water, control soil erosion, increase soil moisture and recharge, water harvesting per unit area and per unit water despite adversities of weather. Productivity has to be maximized.
- Special emphasis should also be given to the traditional system of water conservation in India.
- In order for the rivers flowing in different areas of India to remain perennial, it is very important to make policies at the government level and make efforts for water conservation.
- It is extremely important to establish a water bank in each area along with creating a clear framework for water budgeting and water auditing in rural areas of India.
- In water conservation, symposiums and seminars should be organized from time to time with groundwater scientists to create awareness about water conservation in the society. In the present situation, for a permanent solution to this problem, everyone will have to make collective efforts for water conservation and promotion.

- Bureaucratic, non-transparent and non-participatory approach still persists in the functioning of water governance institutions in India. Therefore, it cannot be denied that there is a need for improvement in the water administration of the country.
- It is necessary that reliable information and related data about natural disasters like drought and flood are available to us as soon as possible so that they can be dealt with in time and possible damage can be reduced. Therefore, important decisions regarding increasing the groundwater level and regulating groundwater use in India need to be taken urgently.
- The condition of rivers in the country is pathetic. Therefore, the condition of rivers can be seriously considered.
- There are policies related to water management or conservation in India, but the problem lies at the level of implementation of those policies. The laxity in the implementation of water conservation policies in India should be removed and better implementation should be ensured so that the biggest problem of water mismanagement in the country can be tackled.
- In low and middle income countries like India Climate change will have a more lethal impact by creating multiple crises simultaneously. While this process will change the way weather events co-evolve, it will also affect their frequency such that two events will be more likely to occur simultaneously than before – for example, drought and disease. outbreak, which will further worsen the socio-economic conditions of marginalized groups.
- Governments and policy makers need to keep in mind that other future crises may not just be due to climate change but will be connected to water.

PRACTICE QUESTIONS FOR PRELIMINARY EXAM :

Q.1 Consider the following statements regarding water conservation management and promotion in India in relation to climate change.

1. India's monsoon is also affected by external factors like El Nino.
2. Watershed management is a good option for water conservation and groundwater recharge in India.
3. The main theme of World Water Day 2024 is 'Leveraging Water for Peace'.
4. The main theme of World Water Day 2024 in India was Water Power through Women Power.

Which of the above statement /statements is/are correct ?

- A. Only 1, 2 and 3.
- B. Only 2, 3 and 4.
- C. None of these.
- D. All of the above .

Answer – D

PRACTICE QUESTIONS FOR MAIN EXAM :

Q.1. Underlining the various threats arising from climate change, Discuss in detail the challenges and their solutions to water conservation, management and promotion in India.

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