



Meet the Tiny Pacemaker: As Small as a Grain of Rice!

Description

Researchers announced on Wednesday that they have successfully engineered the world's smallest pacemaker—a miniaturized heartbeat regulator, surpassing the dimensions of a grain of rice, which can be injected and manipulated via light before ultimately dissolving within the body.

Although human trials remain several years away, this wireless device has been lauded as a "transformative breakthrough" with the potential to catalyze significant advancements across various medical fields.

Currently, millions globally rely on permanent pacemakers, which administer electrical impulses to ensure proper heart rhythm.

The US-led team of scientists behind this innovation was driven by the desire to assist the approximately one percent of newborns afflicted with congenital heart defects who require temporary pacemakers during their recovery from surgery.

This novel pacemaker could also aid adults in achieving a regular heartbeat during their post-operative recuperation.

Presently, temporary pacemakers necessitate surgical procedures to attach electrodes to the heart muscle, with wires connecting to a powered device externally worn on the patient's chest.

Once the pacemaker is deemed unnecessary, medical personnel remove the wires, a process that can occasionally lead to tissue damage.

Notably, Neil Armstrong, the first human to set foot on the Moon, succumbed to internal bleeding following the removal of his temporary pacemaker in 2012.

In contrast, the newly devised pacemaker operates wirelessly and, measuring merely one millimeter in thickness and 3.5 millimeters in length, can be accommodated within a syringe's tip.

Designed to dissolve when no longer needed, it spares patients the invasiveness of traditional surgical interventions.

A Significant Leap Forward

The pacemaker interacts with a soft patch affixed to the patient's chest, as outlined in a study published in the journal [Nature](#). This patch detects irregular heartbeats and emits light signals, instructing the pacemaker to regulate the rhythm.

Powered by a galvanic cell, the device harnesses the body's fluids to convert chemical energy into electrical impulses for cardiac stimulation. Laboratory tests have demonstrated its efficacy across various animal models, including mice, rats, pigs, and dogs, as well as in human heart tissue samples.

According to John Rogers, the principal investigator from Northwestern University, human testing may



commence within two to three years. His lab has established a startup aimed at achieving this goal.

Looking ahead, Rogers noted that the underlying technology could yield innovative solutions to pressing challenges in human health.

Bozhi Tian, a researcher from the University of Chicago who has also explored light-activated pacemakers, characterized this advancement as a "significant leap forward," emphasizing its transformative potential in medical technology.

"It represents a paradigm shift in both temporary pacing and bioelectronic medicine, paving the way for applications beyond cardiology, including nerve regeneration, wound healing, and the advent of integrated smart implants," he stated.

Heart disease remains the foremost global cause of mortality, according to the World Health Organization.

Vocabulary List:

1. **Miniaturized** /'mɪn.i.ə.tʃə.r.aɪzɪd/ (adjective): Reduced in size; made smaller in scale.
2. **Transformative** /træns'fɔ:rm.ɪ.tɪv/ (adjective): Causing a marked change in someone or something.
3. **Recuperation** /rɪ,kʊ:.pə'reɪ.fən/ (noun): The process of recovering health and strength after illness or injury.
4. **Afflicted** /ə'flɪk.tɪd/ (verb): To cause pain or suffering to; to trouble.
5. **Catalyze** /'kæt.əl.aɪz/ (verb): To bring about or initiate a reaction or change.
6. **Voltage** /'vɒl.tɪdʒ/ (noun): An electromotive force or potential difference expressed in volts.

Comprehension Questions

Multiple Choice

1. What is the size of the world's smallest pacemaker?
Option: Size of a grain of rice
Option: 1 millimeter in thickness and 3.5 millimeters in length
Option: 5 centimeters in length
Option: 10 millimeters in thickness
2. How is the novel pacemaker administered within the body?
Option: Through surgery
Option: Via light manipulation
Option: Through oral ingestion



Option: Injection

3. What did Neil Armstrong succumb to following the removal of his temporary pacemaker in 2012?

Option: Heart attack

Option: Internal bleeding

Option: Infection

Option: Heart failure

4. Which researcher characterized the advancement in pacemaker technology as a

Option: John Rogers

Option: Bozhi Tian

Option: Neil Armstrong

Option: Ratan Naval Tata

5. What is the power source of the novel pacemaker?

Option: Battery

Option: Electricity

Option: Galvanic cell

Option: Solar energy

6. According to the text, what organization deems heart disease as the foremost global cause of mortality?

Option: Tata Group

Option: National Aeronautics and Space Administration (NASA)

Option: World Health Organization

Option: Agence France-Presse

True-False

7. The new pacemaker dissolves within the body once it is no longer needed.

8. The temporary pacemakers currently in use require no surgical procedures for attachment.

9. The US-led team of scientists behind the innovation aimed to assist newborns with congenital heart defects.

10. Wireless operation is a key feature of the newly devised pacemaker.

11. John Rogers is the lead researcher from the University of Chicago.



12. Bozhi Tian suggested that the technology could have applications beyond cardiology.

Gap-Fill

13. The size of the newly devised pacemaker is one millimeter in thickness and _____ millimeters in length.

14. According to John Rogers, human testing of the new pacemaker may commence within _____ years.

15. Bozhi Tian predicted that the technology could yield solutions for challenges in human health beyond _____ applications.

16. The new pacemaker operates wirelessly and can be accommodated within a syringe's _____.

17. Currently, millions worldwide rely on permanent pacemakers to ensure proper heart _____.

18. The pacemaker is designed to _____ when it is no longer needed, sparing patients from traditional surgical interventions.

Answer

Multiple Choice: 1. 1 millimeter in thickness and 3.5 millimeters in length 2. Injection 3. Internal bleeding 4. Bozhi Tian 5. Galvanic cell 6. World Health Organization

True-False: 7. True 8. False 9. True 10. True 11. False 12. True

Gap-Fill: 13. 3.5 14. two to three 15. cardiology 16. tip 17. rhythm 18. dissolve

CATEGORY

1. Sci/Tech - LEVEL5

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