



## Nano-Robots

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### Why in News

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Recently, a group of scientists has found a way to **tackle issues pertaining to root canal treatments (dental procedures)** using nanosized robots.

Root canal treatment is **designed to eliminate bacteria from the infected root canal**, prevent reinfection of the tooth and save the natural tooth.

### Key Points

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- **About the Research:**
  - A **significant percentage of root canal treatments fail**, because the **procedure leaves out some bacteria** that are located deep within the dentinal tubules.
  - In the research the scientist has found a way to **tackle this using nanosized robots** that will travel through the tubules and target the bacteria.
  - Under this method, **spiral silica nanobots** with a bit of iron embedded in them are injected in the central canal of the tooth. Then a **rotating magnetic field** is applied. This causes the **nanorobot to move - like screws move into a wall**.
  - Once the bacterial colony is reached, the **nanorobot can deploy various antibacterial strategies** one of which is localised heating.
- **Nanorobots:**
  - Nanorobotics describes the **technology of producing machines or robots at the nanoscale**.
    - **'Nanobot'** is an informal term to refer to engineered nano machines.
  - Nanobots are robots that carry out a very specific function and are **~50–100 nm wide**.
  - They can be used **very effectively for drug delivery**.
    - Normally, drugs work through the entire body before they reach the disease-affected area.
    - Using nanotechnology, the drug can be **targeted to a precise location** which would make the **drug much more effective and reduce the chances of possible side effects**.

- **Uses of Nanotechnology in Health Care:**
  - **Nanotech detectors** for heart attack.
  - **Nanocarriers** for eye surgery, chemotherapy etc.
  - **Diabetic pads** for regulating blood sugar levels.
  - **Nanosponges** are polymer nanoparticles coated with a red blood cell membrane, and can be used for absorbing toxins and removing them from the bloodstream.
  - **NanoFlares** are used for detection of cancer cells in the bloodstream.
  - **Nanopores** are used in making DNA sequencing more efficient.
- **Governmental Initiatives to Promote Nanotechnology:**
  - **Nano Science and Technology Mission (NSTM):**
    - **NSTM**, launched in 2007, is an umbrella programme that aims to promote research and development in nanotechnology.
    - The objectives include the promotion of research, infrastructure development to support the research, development of nanotechnology, human resources, and international collaborations.
  - **Nano Science and Technology Initiative (NSTI):**
    - It was set up by the Department of Science and Technology (DST) in 2001.
    - It aims to focus on issues related to infrastructure development, research and application programmes related to nanomaterials including drugs, drug delivery, gene targeting and DNA chips.

Source: TH