Magnetic Nanoparticles for Cancer Treatment

Prelims – *Science and Technology.*

Mains (GS III) - *Science and Technology - Developments and applications of science and technology and their effects on everyday life.*

Why in news?

Scientists from the Institute of Advanced Study in Science and Technology (IASST), Guwahati, in collaboration with NIT Nagaland, used magnetic nanoparticles to treat cancer.

- The magnetic system is developed with newly synthesized nanocrystalline cobalt chromite magnetic nanoparticles.
- It can treat cancer by increasing temperature of tumour cells through a procedure called ***magnetic hyperthermia***.

Magnetic Hyperthermia
• Magnetic hyperthermia is a *non-invasive technique* to treat cancer, where magnetic nanoparticles are introduced into the body and guided to the tumour site. • When subjected to an alternating magnetic field, these particles generate *localized heat*, raising the temperature of tumour cells to around 46°C, leading to *necrosis* (cell death) of cancerous cells without affecting nearby healthy tissue.

- **Material used -** Scientists developed *nanocrystalline cobalt chromite* magnetic nanoparticles using the chemical co-precipitation method.
- These nanoparticles are doped with *Gadolinium (Gd)* to enhance magnetic and heat-generating properties.
- They act as *nano-heaters* when introduced into the body in fluid form.
- Under an alternating magnetic field, they produce *localized self-heating*.
- This heating can raise the *tumour temperature to 46°C*, leading to cancer cell death (necrosis).
- **Advantages -** Targeted and localized treatment of cancer.
- External control through magnetic fields.
- Minimally invasive and potentially cost-effective therapy.
- Fewer side effects compared to chemotherapy and radiation.

Reference

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