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Portable Device to Detect Adulteration in Milk

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Why in News

Recently, researchers at the Indian Institute of Science (IISc), Bengaluru have developed a **low-cost device to detect the presence of melamine** (adulterate) in milk and dairy products.

Key Points

- The techniques currently used to detect the presence of melamine are time-taking and typically require expensive and sophisticated equipment and highly trained personnel.
- With the help of a newly developed **fluorometer device**
 - Researchers were able to **detect up to 0.1 parts per million (ppm)** of melamine in water and milk, which is much lower than the acceptable limit of 1 ppm.
 - The detection also took **just four minutes**.
- **Functioning:**
 - Copper nanoparticles are added to the specified DNA (double stranded) template of the milk and the sample is tested using the fluorometer.
 - Researchers observed that the **presence of melamine in the sample disrupted the synthesis of copper nanoparticles on double stranded DNA** and caused a **reduction in the intensity of fluorescence**, which was detected by the fluorometer.

These copper nanoparticles possess a **property called fluorescence** in which a material emits light of a different wavelength (colour) when a particular wavelength of light falls on it.

- **Fluorometer:**
 - It is a device used **to measure parameters of visible spectrum fluorescence** i.e. intensity and wavelength.
 - These parameters are used to identify the presence and the amount of specific molecules in a medium. E.g
 - The fluorometer can be used to detect **biomolecules and proteins** using the copper nanoparticles.
 - The device can also be modified to detect other substances such as **lead and mercury**.
 - Fluorometer can also be deployed as a **screening tool for environmental and food quality testing**.
- Earlier, **Food Safety and Standards Authority of India (FSSAI)** had imposed a **ban on all milk and milk products from China** in September 2008.
 - In April 2019, **FSSAI had recommended the extension of the ongoing ban** till labs at Indian ports are equipped for melamine testing.
- India is the **world's largest producer and consumer of milk**.

Melamine

- Melamine is an **organic base chemical** most commonly found in the form of **white crystals rich in nitrogen**.
- It is widely used in plastics, adhesives, countertops, dishware, whiteboards.
- **Used as adulterate:**
 - To increase milk volume, water is added, as a result of this dilution the milk has a lower protein concentration.
 - Companies normally check the protein level through a test measuring nitrogen content.
 - The addition of melamine increases the nitrogen content of the milk and therefore its apparent protein content.
- Melamine poisoning can lead to **kidney-related diseases and also kidney failure**.

Source: IE