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Cell-Free DNA



Normal DNA vs. Cell Free DNA

Why in News?

- A notable advancement in medical science has emerged in recent years through the discovery of cell-free Deoxyribonucleic Acid (cfDNA),
 - Carrying significant implications for disease detection, diagnosis, and treatment.



Prokaryotic Cells 👀 Eukaryotic Cells





What is Cell-Free DNA

€ell-Free DNA refers to fragments of DNA that exist outside of cells, specifically in various body fluids.



- **CALC CONTRIBUTE CONTRIBUTE**
- Contain genetic information
 and can offer insights into a
 person's health status,
 potential diseases, and genetic
 variations.





Applications of Cell-free DNA

Non-Invasive Prenatal Testing (NIPT):

Cell-free DNA serves as a valuable tool for screening chromosomal abnormalities in developing fetuses, such as Down syndrome.

NIPT replaces invasive procedures such as amnio-centesis, minimizing risks for both expectant mothers and fetuses.

Analysis of cf-DNA in maternal blood provides crucial information about the foetus's genetic health. **Early Cancer Detection:**

- **Identifying cancers at their initial stages for prompt treatment.**
- Eg. The 'GEMINI' test utilizes cfDNA sequencing to detect lung cancer with high accuracy.

tumor



Figure 1. The Use of dd-cfDNA Assays to Assess Status of Acute Rejection and Allograft Injury.



Monitoring Organ Transplants:

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- Donor-derived cell free DNA offers a promising approach to monitor the health and acceptance of transplanted organs.
- Fluctuations in cfDNA levels can indicate organ rejection or acceptance before other markers become evident.
- Early detection of rejection allows for timely intervention and improved outcomes in organ transplantation.

Neurological Disorder Biomarkers:

• Aiding in the diagnosis and monitoring of conditions like Alzheimer's disease, neuronal tumors, and stroke.

Metabolic Disorder Insights:

Detection and management of conditions such as type-2 diabetes and non-alcoholic fatty liver disease.





Advancing Disease Research

The versatility of cfDNA applications contributes to a deeper understanding of complex diseases and their underlying genetic factors

