



New Drug for Amoebiasis

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Why in News

Recently, researchers from the **Jawaharlal Nehru University (JNU)** have developed new drug molecules against the **protozoa '*Entamoeba histolytica*'** that causes **amoebiasis**.

Key Points

- **The Protozoa and High Oxygen Level:**
 - The protozoa is **anaerobic or microaerophilic** in nature such that it **cannot survive high concentrations of oxygen**.
 - Anaerobic organisms are those who exist in the absence of free oxygen.
 - A **microaerophilic** atmosphere is ideal for a **microorganism** that can grow under **reduced oxygen** and increased carbon dioxide levels.
 - However, during infection, **it faces a high surge of oxygen** inside the human body. The organism synthesizes large amounts of cysteine to **counter oxidative stress**.
- **Synthesis of Cysteine:**

This **pathogen** deploys **cysteine** as one of the essential molecules in its defence mechanism against **high oxygen levels**. It **expresses two crucial enzymes** for **synthesizing cysteine**.

 - Cysteines are enzymes that degrade proteins in the body.
 - Cysteine biosynthesis is crucial for the survival of *E. histolytica* and for similar protozoan parasites.
- **JNU Research:**
 - Researchers have characterized and determined the molecular structures of both the crucial enzymes.
 - They have also successfully screened for potent inhibitors for one of the enzymes, **O-acetyl L-serine sulfhydrylase (OASS)**.
 - Some of these inhibitors can **check the growth of this organism with high efficacy** by targeting their pathways.
 - The identified molecules can lead to the **development of drug molecules**.

Protozoa

- Protozoans are the **single-celled eukaryotes, either free-living or parasitic**, which feed on organic matter such as other microorganisms or organic tissues and debris.
 - **Eukaryotes** are organisms whose cells have a nucleus enclosed within membranes, unlike prokaryotes, which have no membrane-bound organelles.
 - A **parasite is an organism** that lives on or in a host and gets its food from or at the expense of its host. E.g. plasmodium parasite which causes malaria.
- **Habitat:** Mostly they are **aerobic** (with oxygen) but some are **anaerobic** (without oxygen) and present in the rumen or human intestine.
- **Size and Shape:** The size and shape of Protozoa vary greatly, from microbial ($1\mu\text{m}$) to large enough and can be seen by the naked eye.
- **Nutrition:** Protozoans are **heterotrophs** and have **holozoic nutrition**.
Holozoic nutrition can be defined as a method of nutrition which **involves the ingestion of some complex organic substances** (such as parts of a plant or animal) that may be in the solid or the liquid form.

Entamoeba histolytica

- According to the **World Health Organization (WHO)**, **Entamoeba histolytica** is the **third-leading cause of morbidity and mortality due to parasitic disease in humans**.
 - Predominantly infecting humans and other primates, *E. histolytica* is estimated to infect about **35-50 million people** worldwide.
 - A **parasitic disease** is an infectious disease caused or transmitted by a parasite. E.g. Malaria.
- It causes **amoebiasis or amoebic dysentery**, which is highly prevalent in developing countries.

Amoebiasis

- It is a disease caused by the parasite **Entamoeba histolytica**.
- Amoebiasis infection is most common **in tropical areas** with untreated water. E.g. India.
- It **spreads through drinking or eating uncooked food**, such as fruit, that may have been washed in contaminated local water.
- If symptoms occur, they may be mild and include cramping and diarrhoea.
- It can be treated through antibiotics.

Source: PIB