Kala-azar Disease

Recently, a team of researchers from the National Centre for Cell Science (NCCS), Pune have found new biomolecules to fight drug resistance in Kala-azar (visceral leishmaniasis). NCCS is an autonomous organisation under the Department of Biotechnology, Government of India. It was established to facilitate cell biology research in the country.

Leishmaniasis

- It is a neglected tropical disease affecting almost 100 countries including India.
- Neglected tropical diseases are a diverse group of communicable diseases that prevail in tropical and subtropical conditions in 149 countries.
- It is caused by a parasite called Leishmania, which is transmitted through the bite of sand flies.

There are three types of leishmaniasis:

- **Visceral leishmaniasis**, which affects multiple organs and is the most serious form of the disease.
- **Cutaneous leishmaniasis**, which causes skin sores and is the most common form.
- **Mucocutaneous leishmaniasis**, which causes skin and mucosal lesions.

Visceral leishmaniasis, which is commonly known as Kala-azar in India, is fatal in over 95% of the cases, if left untreated.

Resistance to Drug: The only drug available against leishmaniasis, miltefosine, is rapidly losing its effectiveness because of emerging resistance to this drug due to a decrease in its accumulation inside the parasite.

Responsible Proteins: A protein called ‘P4ATPase-CDC50’, is responsible for intake of the drug by the parasite, and another protein, called ‘P-glycoprotein’, is responsible for throwing this drug out from within the parasite’s body.

A decrease in the activity of the former protein, and an increase in the activity of the latter results in less accumulation of miltefosine inside the parasite’s body, thus causing it to become resistant to the drug.

While exploring ways to tackle miltefosine resistance, the researchers worked with
one of the species of Leishmania that causes infection, called Leishmania major.

They tried to manipulate these transporter proteins in the species in a manner that would result in increased uptake of the drug and decrease in its being thrown out of the parasite’s body.

They used computational methods to design small molecules, called peptides, that could very specifically interact with the transporter proteins of Leishmania major alone, and not interfere with human proteins in any way.

A peptide is a short chain of amino acids. Amino acids are organic compounds that combine to form proteins.