

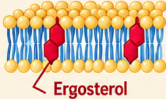
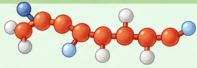
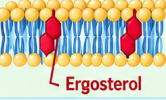
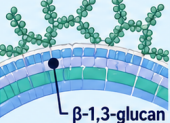
Rethinking the Chemical 'Arms Race' Against Fungi

Prelims: Current events of national and international importance | Science & Technology

Why in News?

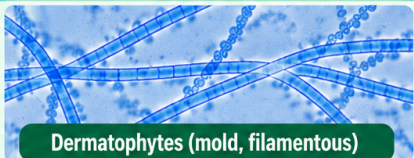
A Nature Communications study found Indian *Candida auris* isolates showing genetic mechanisms driving antifungal drug resistance.

- **Key finding** - Fungal pathogens can evade antifungals through **gene mutations, gene amplification and cellular compensatory mechanisms**, highlighting the growing challenge of **antifungal resistance**.

 SHANKAR IAS PARLIAMENT Major Antifungal Classes Targets and Resistance Mechanisms			
Antifungal class	Example	Main target	Resistance mechanism mentioned
Azoles 	Fluconazole	Ergosterol pathway / membrane 	Erg11 gene amplification 
Polyenes 	—	Ergosterol / cell membrane 	Resistance reported in some isolates
Echinocandins 	Caspofungin	Fungal cell wall 	Fks1 mutations, tolerance mechanisms

- **Candida auris (C. auris)** - It is an emerging yeast species that exhibits multidrug resistance.
- **First reported in - 2009, Japan.**
- This pathogen is capable of causing **invasive bloodstream infections**.
- C. auris poses a significant risk in hospital and intensive care unit (ICU) settings.
- Identification and treatment of C. auris can be challenging.
- Reported mortality rates among infected patients range from 30% to **40%**.
- In contrast to many superficial fungal infections, C. auris is capable of causing systemic or **invasive disease**.

- Fungi (singular fungus) are eukaryotic, non-phototrophic living organisms with rigid cell walls that belong to the fungi kingdom.
- Fungi are neither plants nor animals, and belong to their own distinct kingdom, the fungi kingdom.
- **3 main types of fungi**
- Fungi are divided into many different types, including molds, mushrooms, rusts, smuts, mildews and yeast. Of these, the three main types of fungi are **mushrooms, molds and yeasts.**

 Comparison: Dermatophytes vs <i>Candida auris</i> Different Fungi, Different Challenges 		
Feature	Dermatophytes	<i>Candida auris</i>
 Type	Molds	Yeast
 Common disease	Dermatophytosis	Invasive/systemic infection
 Typical location	Skin, hair, nails	Bloodstream, healthcare settings
 Major concern	Severe skin infection	Multidrug resistance
 Example	Ringworm-type infections	<i>C. auris</i>
 Microscopic appearance	 Dermatophytes (mold, filamentous)	 <i>Candida auris</i> (yeast, oval-shaped)
 Key Takeaway: Dermatophytes cause superficial skin infections, while <i>Candida auris</i> poses a serious threat due to its multidrug resistance and ability to cause invasive infections.		

yeasts.

- Fungi typically thrive in **warm and moist environments**; however, the human body temperature of **approximately 37°C** has historically provided protection against many fungal species.

Fungal infection-mammalian selection hypothesis

Global warming leads to the selection of heat-tolerant fungi, which subsequently develop an increased ability to survive at mammalian body temperatures, thereby raising the potential for human infection.

Conventional Approach: Evolutionary Arms Race

- The typical cycle involves a drug targeting the fungus, which then evolves resistance.
- This leads to the development of stronger drugs, followed by further resistance.
- This results in a continuous escalation that resembles an evolutionary arms race.

Proposed Alternative Strategy

- The proposed approach shifts the focus to less critical pathways rather than targeting essential survival molecules.
- **Aim** - To reduce fungal pathogenicity instead of eliminating the fungus entirely.

- **Advantage** - It applies lower selection pressure, which may slow the evolution of resistance.

Reference

[The Hindu | Rethinking the Chemical 'Arms Race' Against Fungi](#)

