



## AI-Driven Discovery of Abaucin: A Powerful Antibiotic

**For Prelims:** [Artificial Intelligence \(AI\)](#), [Antibiotic](#), Superbug, Acinetobacter baumannii, Abaucin

**For Mains:** Implications of antibiotic resistance on global health, Role of AI in accelerating drug discovery and its potential in addressing public health challenges

### Why in News?

Recently, Scientists from the United States and Canada have achieved a remarkable feat in the field of medicine by using [Artificial Intelligence \(AI\)](#) to discover a powerful [antibiotic](#) called **Abaucin** capable of fighting **Acinetobacter baumannii superbug**.

- This breakthrough holds immense promise in the fight against **drug-resistant bacteria**.

### What is Acinetobacter Baumannii?

- Acinetobacter baumannii is a **dangerous bacterium resistant to antibiotics**, as identified by the [World Health Organization \(WHO\)](#).
- It can cause severe infections like [pneumonia](#), [meningitis](#), and **wound infections, leading to fatalities**.
- Typically found in hospitals, Acinetobacter baumannii can **survive on surfaces for long periods, making it difficult to eradicate**.
- Due to its remarkable capacity to develop resistance to all currently available antibiotics, it was recognised as a "**red alert**" human pathogen.

### How does Antibiotic Resistance Occur?

- **Antibiotic resistance** occurs when bacteria adapt and become resistant to the effects of antibiotics, rendering treatments ineffective.
  - Antibiotics are medicines **used to prevent and treat bacterial infections**.
- **Overuse and misuse of antibiotics** have fueled the rise of drug-resistant bacteria, posing a global health concern.
- The WHO lists infections such as pneumonia, [tuberculosis](#), and **foodborne diseases** as becoming harder to treat with existing medication **due to increasing anti-bacterial resistance**.

### Note:

- Superbugs are bacteria that are **resistant to several types of antibiotics**.
- WHO's list of superbugs highlighted bacteria that have built-in abilities to find new ways to **resist treatment and can pass along genetic material** that **allows other bacteria to become drug resistant** as well. They **can also be fungi**.

## What is Abaucin?

- **About:**
  - Abaucin is a compound that shows useful activity as a **narrow-spectrum antibiotic**.
  - It is effective against *Acinetobacter baumannii*.
- **Discovery:**
  - Abaucin was discovered with the assistance of **AI using a machine-learning model approach**.
  - Network was trained with a dataset of ~7,500 molecules screened for inhibiting *Acinetobacter baumannii* growth.
  - The network predicted structurally different molecules with activity against *A. baumannii*, including abaucin.
  - Abaucin was experimentally validated and found to have potent antibacterial activity.
- **Mechanism of Action:**
  - Abaucin disrupts the **normal function of the CCR2 protein in bacteria**.
  - This disruption **hinders the movement of certain molecules** inside the bacteria, preventing them from **reaching the outer membrane**.
  - As a result, the **growth of *Acinetobacter baumannii* is inhibited, reducing its ability to cause infections**.

## UPSC Civil Services Examination, Previous Year Questions (PYQ)

### Prelims

**Q. Which of the following are the reasons for the occurrence of multi-drug resistance in microbial pathogens in India? (2019)**

1. Genetic predisposition of some people
2. Taking incorrect doses of antibiotics to cure diseases
3. Using antibiotics in livestock farming
4. Multiple chronic diseases in some people

**Select the correct answer using the code given below.**

- (a) 1 and 2
- (b) 2 and 3 only
- (c) 1, 3 and 4
- (d) 2, 3 and 4

**Ans: (b)**

### Mains

**Q. Can overuse and free availability of antibiotics without Doctor's prescription, be contributors to the emergence of drug-resistant diseases in India? What are the available mechanisms for monitoring and control? Critically discuss the various issues involved. (2014)**

[Source:IE](#)

