



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](#)

