



# Antibiotics Resistance

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## Why in News?

Widespread [antibiotic use](#) in healthcare has fueled [drug-resistant bacteria](#), with [antimicrobial resistance \(AMR\)](#) causing about **1.2 million deaths globally in 2021**.

- Indian hospitals report a **13% mortality rate** in infections caused by **drug-resistant bacteria**.

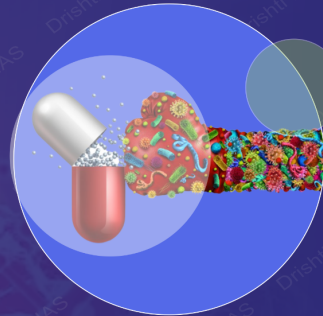
## What is Antibiotics Resistance?

- **About Antibiotics:** Antibiotics **treat bacterial infections** in humans and animals by **killing bacteria** or inhibiting their growth and multiplication.
  - They target bacterial **structures or processes**, ensuring minimal impact on human cells.
- **Working of Antibiotics:** Bacterial cells have a **protective cell wall** made of [peptidoglycan](#). Its two key components are **Glycans and Peptides**.
  - Antibiotics like [Penicillin](#) weakens bacterial cell walls by **disrupting peptide crosslinks**, leading to bacterial death.
- **Development of Antibiotics Resistance:** Antibiotic resistance occurs when bacteria **mutate or gain resistance genes**, making infections harder to treat.
  - Bacteria **evolve resistance** through various **mechanisms** like:
    - Producing enzymes like **penicillinase** against Penicillin, which break down antibiotic molecules.
    - **Modifying** their own structures to **evade the antibiotic's effects**.
- **New Survival Strategy:** A new study found that bacteria can **compensate for lost functions**, enhancing **resilience** and making **antibiotic resistance harder to combat**.

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# ANTIMICROBIAL RESISTANCE

The ability of microorganisms to resist the effects of antimicrobial drugs



## CAUSES OF ↑ AMR

- Poor infection control/sanitation
- Antibiotic overuse
- Genetic mutations of microbe
- Lack of investment in R&D of new antimicrobial drugs

Microbes that develop AMR are called 'Superbugs'

## IMPACTS OF AMR

- ↑ Risk of spreading infections
- Makes infections harder to treat; prolonged illness
- ↑ Healthcare costs

## EXAMPLE

- Carbapenem antibiotics stop responding due to AMR in *K. pneumoniae*
- AMR Mycobacterium tuberculosis causing Rifampicin-Resistant TB (RR-TB)
- Drug-resistant HIV (HIVDR) making antiretroviral (ARV) drugs ineffective

## RECOGNITION BY WHO

- Identified AMR as **one of the top 10 threats** to global health
- Launched **GLASS** (Global Antimicrobial Resistance and Use Surveillance System) in 2015

## INDIA'S INITIATIVES AGAINST AMR

- Surveillance of AMR in microbes causing **TB, Vector Borne diseases, AIDS etc.**
- **National Action Plan on AMR** (2017) with One Health approach
- **Antibiotic Stewardship Program** by ICMR

*New Delhi metallo-β-lactamase-1 (NDM-1) is a bacterial enzyme, emerged from India, that renders all current β-lactam antibiotics inactive*

## 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)**

**Q.What is the importance of using Pneumococcal Conjugate Vaccines in India? (2020)**

1. These vaccines are effective against pneumonia as well as meningitis and sepsis.
2. Dependence on antibiotics that are not effective against drug-resistant bacteria can be reduced.
3. These vaccines have no side effects and cause no allergic reactions.

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

**(a)** 1 only

**(b)** 1 and 2 only

**(c)** 3 only

**(d)** 1, 2 and 3

**Ans: (b)**

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