



Oysters' Antimicrobial Properties

[Source: DTE](#)

Why in News?

According to new research, **antimicrobial proteins** isolated from [oyster](#) hemolymph (the equivalent of blood) can **kill** certain [drug resistant-bacteria](#).

- The proteins can also **improve** the efficacy of **conventional antibiotics** against resistant bacteria species.



What are the Key Facts Regarding Oysters' Antimicrobial Properties?

- **Role of Oysters:** Antimicrobial **proteins and peptides** from oyster hemolymph can:
 - **Kill** bacteria like ***Streptococcus spp.***, responsible for [pneumonia](#), **tonsillitis**, and **rheumatic fever**.
 - Inhibit and **penetrate biofilms** that protect bacteria from antibiotics and immune responses.
 - Enhance conventional antibiotics' efficacy by 2 to 32 times.
- **Immune Defenses of Oysters:** Oysters face many **microorganisms** in their marine environment, so they have **strong immune defenses**.

- Oyster hemolymph contains **antiviral and antibacterial proteins and peptides** effective against various human and marine pathogens.
- **New Antimicrobial Agents:** Over **90%** of antibiotics humans currently use are derived from **nature**. The same is true for **over 65%** of antibiotics **under recent development**.
- **Traditional Relevance:** It is used in **traditional Chinese medicine** for respiratory and inflammatory conditions.
 - It is integral to the health practices of **Indigenous Australians**.

Note: Globally, nearly **5 million people** die from **antimicrobial resistant infections** each year.

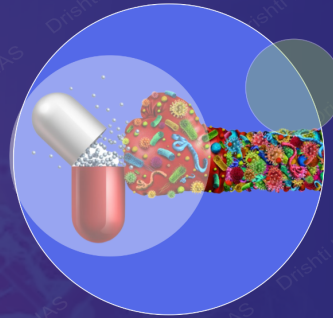
- The annual toll of antimicrobial resistant infections is expected to **rise by 70%**, with an estimated **40 million deaths** between 2025 and 2050.
- **Biofilms** are **bacterial communities** embedded in a **self-produced substance** that **sticks to surfaces, shielding** bacteria from the **immune system and antibiotics**.
 - They are involved in nearly **all bacterial infections**.

What are Oysters?

- **About:** Oysters belong to the **family *Ostreidae*** and are **classified as invertebrates**.
 - They are **omnivorous** and **live** in groups called **colonies, beds, or reefs**.
 - They are covered with **shells** that are **rough, rock-hard, and usually oval or pear-shaped**.
- **Habitat:** Oysters are found in **shallow ocean waters** worldwide and form colonies in beds or reefs.
 - Food oysters can occasionally produce pearls, though they are **not the same** as **pearl oysters**, which belong to a **different bivalve family**.
- **Ecological Role:**
 - **Keystone Species:** Oysters are considered a **keystone species** as Oyster beds and reefs provide **critical habitat** and protection for various marine organisms, including **sea anemones, barnacles, and mussels**.
 - **Keystone species** are organisms that have a **disproportionately large impact** on their ecosystems relative to their abundance. E.g., **Tigers, Sea Otters** etc.
 - **Water Filtration:** A single oyster can filter over **two gallons of water per hour**, amounting to up to 50 gallons per day.
 - Oysters **remove** pollutants like **nitrates, ammonia, phosphates, bacteria, and organic matter**, significantly improving water quality and clarity.
- **Diet and Behavior:** Oysters feed by **filtering algae and food particles** from water drawn over their **gills**.
 - All oysters **begin** life as **males** but typically **change permanently to females** after about a year. Also, oysters can **change gender multiple times** during their lifespan.
- **Role as Food:** They are high in **calcium, iron, and protein** and have been consumed raw or cooked by humans for thousands of years.

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 one of the following is a filter feeder? (2021)

- (a) Catfish
- (b) Octopus
- (c) Oyster
- (d) Pelican

Ans: (c)

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)

PDF Reference URL: <https://www.drishtiias.com/printpdf/oysters-antimicrobial-properties>

