



Insect-Based Livestock Feed

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Why in News?

India is promoting **insect-based livestock feed** as a sustainable and climate-friendly alternative to **conventional animal feed**, aiming to combat **antimicrobial resistance (AMR)** and reduce the **environmental footprint** of animal farming.

- It has been initiated by **ICAR** in partnership with research institutes like **Central Institute of Brackishwater Aquaculture (CIBA)** & **Central Marine Fisheries Research Institute**.

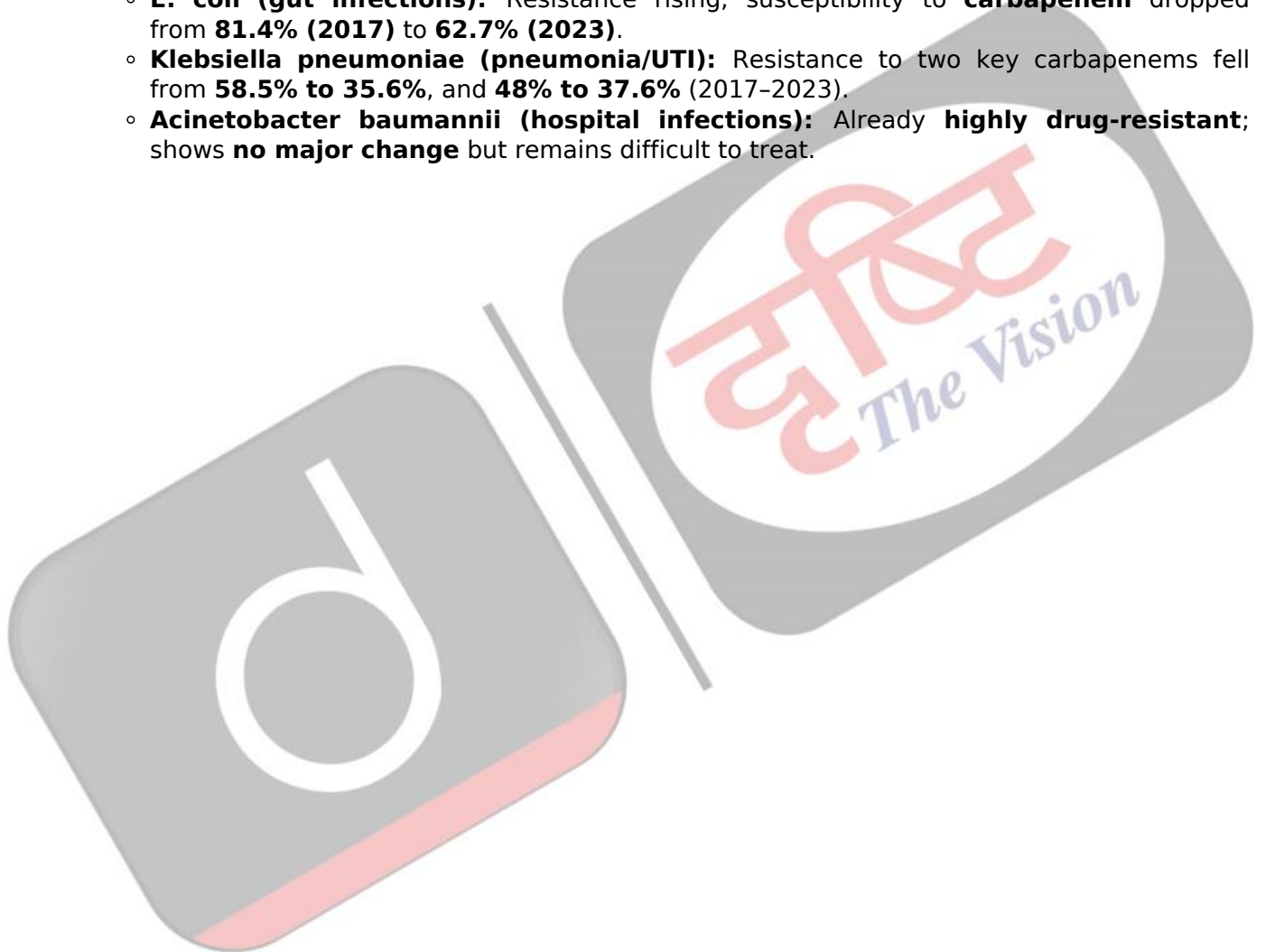
What is Insect-Based Feed?

- **About:** Insect-based livestock feed is a **protein-rich alternative** derived from insects such as **black soldier flies** (*Hermetia illucens*), **crickets**, small mealworms (*Alphitobius*) and Jamaican field crickets (*Gryllus assimilis*).
 - It is used in **livestock and aquaculture** as a **sustainable and circular** source of nutrition.
- **Working Principle:** Insects such as black soldier fly larvae rapidly convert agro and food waste into high-protein biomass (up to 75% protein) within 12-15 days, enabling quick and cost-effective feed production.
 - The resulting proteins **enhance gut health in animals**, reducing the need for antibiotics and helping combat [antimicrobial resistance \(AMR\)](#).
 - The leftover **frass** serves as an **organic fertiliser**, supporting **closed-loop, sustainable farming**.
- **Significance:**
 - **Nutritional and Economic Value:** Insect-based feed is rich in **up to 75% protein**, along with **essential fats, zinc, calcium, iron, and fibre**.
 - It offers **better digestibility** than soy or fishmeal, while being **cost-effective** and suitable for **large-scale livestock and aquaculture** due to **lower land, water, and input requirements**.
 - **Supports Food Security and Fights AMR:** With **meat production expected to double by 2050**, insect-based feed aligns with **FAO's projection of a 70% rise in global food demand**. Its gut-health benefits **reduce dependence on antibiotics**, helping to tackle **antimicrobial resistance (AMR)** in animal farming.
 - **Promotes Environmental Sustainability:** Insect farming results in **lower [greenhouse gas \(GHG\)](#) emissions**, **reduces land degradation**, and has a **smaller environmental footprint** compared to conventional feed sources.
 - It supports **climate-smart agriculture** and helps conserve natural resources.
 - **Drives Circular Economy:** Insects are reared on **organic waste** (e.g., agro and food waste), converting it into **high-quality protein and fats**.
 - The leftover **frass** serves as an **organic fertiliser**, enabling a **closed-loop, zero-waste production model**.
 - **Global Acceptance and Indian Push:** Insect-based feed is already **approved in over 40 countries** for use in **poultry, aquaculture, and livestock**.

- In India, **ICAR** and startups like **Loopworm** and **Ultra Nutri India** are piloting it for **shrimp, seabass, poultry, and cattle**, reflecting growing **domestic scalability and adoption**.

What is Antimicrobial Resistance (AMR)?

- **About AMR:** AMR occurs when **bacteria, viruses, fungi and parasites** no longer respond to **antimicrobial medicines**.
 - This makes **antibiotics and other treatments ineffective**, leading to infections that are harder to treat, and increasing the risk of **severe illness, disability, and death**.
- **Prevalence of AMR:** AMR is among the **top global health and development threats**. In 2019, bacterial AMR caused **1.27 million deaths** and contributed to **4.95 million deaths** globally.
 - According to the **WHO**, AMR may result in an **additional USD 1 trillion** in healthcare costs by 2050, and cause **USD 1-3.4 trillion in annual GDP losses** by 2030.
- **Common Drug-Resistant Pathogens in India:**
 - **E. coli (gut infections):** Resistance rising; susceptibility to **carbapenem** dropped from **81.4% (2017)** to **62.7% (2023)**.
 - **Klebsiella pneumoniae (pneumonia/UTI):** Resistance to two key carbapenems fell from **58.5% to 35.6%**, and **48% to 37.6%** (2017-2023).
 - **Acinetobacter baumannii (hospital infections):** Already **highly drug-resistant**; shows **no major change** but remains difficult to treat.



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. 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)

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. Widespread resistance of malarial parasite to drugs like chloroquine has prompted attempts to develop a malarial vaccine to combat malaria. Why is it difficult to develop an effective malaria vaccine?(2010)

- (a) Malaria is caused by several species of Plasmodium
- (b) Man does not develop immunity to malaria during natural infection
- (c) Vaccines can be developed only against bacteria
- (d) Man is only an intermediate host and not the definitive host

Ans: (b)