

BIHAR ANIMAL SCIENCES UNIVERSITY

Bihar Veterinary College, Patna

Department of Animal Nutrition

UG Lecture on (UNIT-I)

**Feed Additives in the Rations of Livestock and Poultry
(Part-1)**

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Point to be discuss.....

- **Feed additives**
- **Types of feed additives**
- **Antibiotics**
- **Probiotics**
- **Prebiotics**
- **Enzymes**
- **Hormones**
- **Organic acids**
- **Other growth stimulants etc.**
- **Advantages of feed additives**
- **Limitations of additives in livestock and poultry.**

Feed Additives

- Feed additives are materials that are administered to the animal to enhance the effectiveness of nutrients and exert their effects in the gut or on the gut wall cells.

1. Antibiotics:

- Chemical compounds produced by other microorganisms (e.g. fungi, and are also synthesized in the laboratory) that, when given in small amounts, halt the growth of bacteria.
- They are used at therapeutic levels to treat diseases caused by bacteria.
- In subtherapeutic levels added to the feed/food to enhance the rate of growth.

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- **Various groups of antibiotics act in different ways to reduce the numbers of specific bacteria in the GIT, and increase the efficiency of nutrient utilization by;**
 - **Reduction or elimination of the activity of pathogenic bacteria.**
 - **Allowing the host to achieve production levels closer to their potential.**
 - **Stimulation of growth of microbes that synthesizes unidentified nutrients.**
 - **Reduction of the growth of microorganisms that compete with the host animal.**
 - **Increased absorptive capacity of the small intestine by decrease thickness of intestinal wall.**

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- These effects may be coupled with a reduced turnover of mucosal cells as well as **reduced mucous secretion**.
- Large proportion of the energy & protein required to maintain an animals &
- Any reduction in the mass of the gut & cell turnover will release nutrients for other purposes such as **growth & production**.
- **AGPs used mainly in pig & poultry feeds @20–40 mg/kg**
- **Improvements of 4–16 percent in growth rate & 2–7 percent FCR.**
- **Response is greatest in young animals & consuming diets containing vegetable protein rather than animal protein.**
- **Effect is less in healthy herds and flocks.**
- **Young pre-ruminant calves also respond to AGPs in the same manner as non-ruminants.**

Modes of action of antibiotics

- Antibiotics halt the growth of bacteria by interfering with their cellular metabolism. There are four groups;
 - i. Interfere with the synthesis of bacterial cell wall & cause the cell to burst:
 - ✓ These are high-molecular-weight (>1200) compounds that act on Gram positive bacteria.
 - ✓ They are poorly absorbed by the host and thus are non-toxic
 - ✓ Leave no detectable residues and have no withdrawal period (i.e. a period of time during which the compound must be removed from the food/body before the animal is slaughtered).
 - ✓ Examples of this type of antibiotics are **Avoparcin & Flavomycin**.

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ii. Inhibitors of bacterial protein synthesis:

- ✓ Primarily active against Gram-positive bacteria & have a medium MW (>500).
- ✓ Absorbed to a greater extent than the higher-molecular-weight compounds, they **do not have a withdrawal period**.
- ✓ Examples- **Tylosin & Virginiamycin**.

iii. Inhibitors of bacterial DNA synthesis:

- ✓ These can have a broad spectrum of activity, have a low MW (about 250) & **require withdrawal periods**.
- ✓ Examples- **Nitrofurans & Quinoxaline-N-oxides**.

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iv. Ionophore antibiotics:

- ✓ **Interfere with the electrolyte balance (Na/K) of bacterial cell by transporting potassium into the cell, which then requires energy to pump it out.**
- ✓ **Ion pump fails to operate efficiently & potassium accumulates inside the cell.**
- ✓ **Water enters by osmosis & the cell becomes rupture.**
- ✓ **Example- Monensin sodium**

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- Ruminants depend primarily on rumen microbes for their nutrient supply & use of antibiotics might be disadvantageous.
- However, certain AGP of ionophore type (e.g. **monensin sodium**) found effective with low-roughage : high-concentrate diets.
- Reduced methane production & increased propionic acid proportions, which improve productivity.
- **Monensin sodium @20–30 mg/kg feed, improves the feed efficiency.**
- Amino acid degradation is decreased & spare amino acid may use for gluconeogenesis & enhanced propionic acid production.
- Recently, due to development of antibiotic resistance, AGPs has been curtailed by several countries.

Discussions.....

Questions, if any.....??

THANKS