

**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-2)**

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## **2. Probiotics**

- **Probiotic is defined as a live microbial food supplement that beneficially affects the host animal by improving the intestinal microbial balance.**
- **Beneficial microbes produce enzymes that complement the digestive ability of the host & their presence provides a barrier against invading pathogens.**

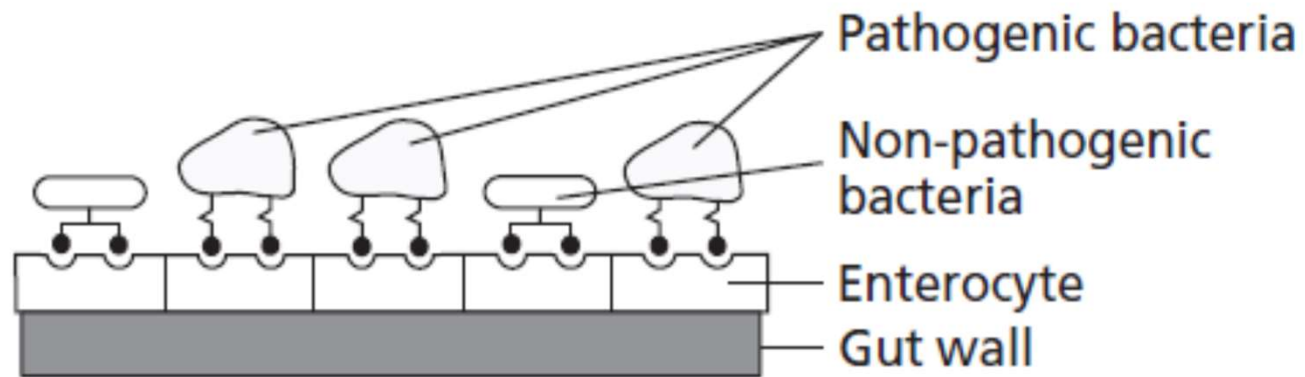
**Desirable bacteria exert their effects in different ways;**

- ✓ **Adhesion to the digestive tract wall to prevent colonisation by pathogenic microorganisms:**
- **E. coli, need to become attached to the gut wall to exert their harmful effects.**

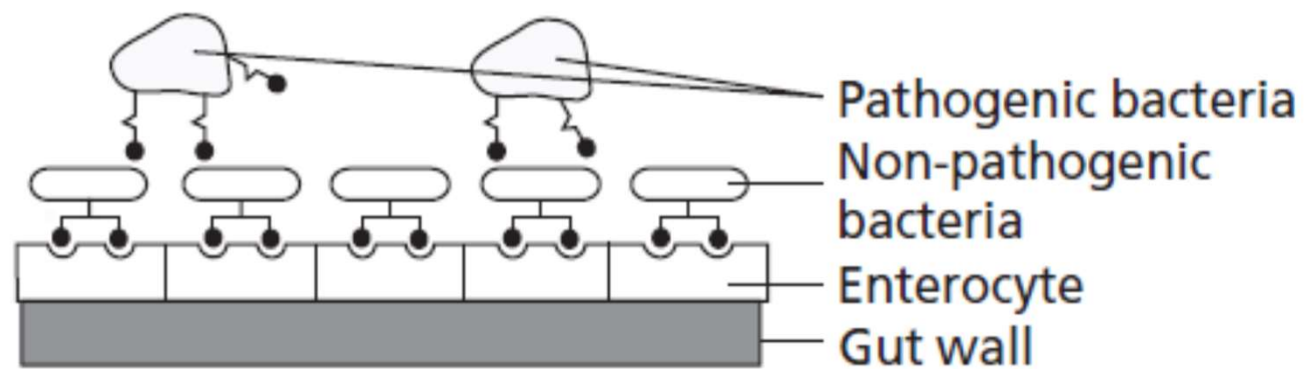
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- **Attachment is achieved by means of hair like structures on the bacterial surface, called fimbriae.**
  - **Fimbriae are made up of proteins k/a lectins, which recognize & selectively combine with specific oligosaccharide receptor sites on the gut wall.**
  - **Lactobacilli successfully compete for these attachment sites.**
- ✓ **Neutralization of enterotoxins produced by pathogenic bacteria that cause fluid loss:**
- **Live probiotic bacteria can neutralize toxins, but the active substance has not been identified.**

Cont.....



(a)



(b)

Cont.....

✓ **Bactericidal activity:**

- Lactobacilli ferment lactose to lactic acid, thereby reducing the pH to a level that harmful bacteria cannot tolerate.
- Hydrogen peroxide is also produced, which inhibits the growth of Gram-negative bacteria.
- Lactic acid producing bacteria of the **Streptococcus and Lactobacillus** species may produce antibiotics.

✓ **Prevention of amine synthesis:**

- Coliform bacteria, decarboxylate amino acids to produce amines, cause gut irritation, leads to diarrhoea.
- If desirable bacteria prevent the coliforms proliferating, then amine production will also be prevented.

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✓ **Enhanced immune competence:**

- **Oral inoculation of Lactobacilli can elevated serum protein & WBC.**
- **Aids immune system development by stimulation of the production of antibodies and increased phagocytic activity.**

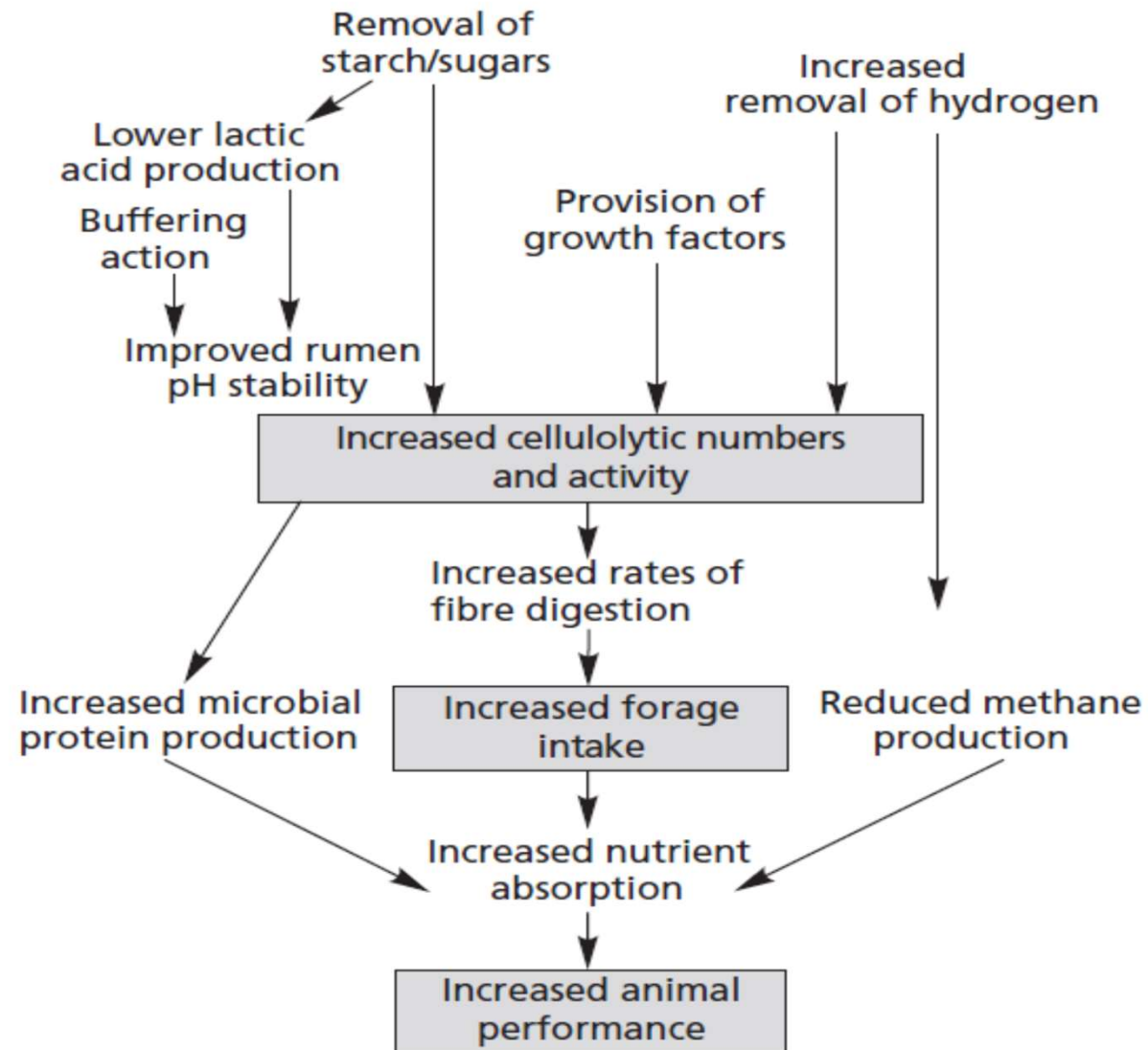
✓ **Other postulated effects include:**

- **Beneficial interaction with bile salts,**
- **Increased digestive enzyme production,**
- **More efficient absorption of nutrients &**
- **Greater vitamin production**

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- In monogastric, strains of **Lactobacilli, Bacillus subtilis & Streptococci** have been used as probiotics.
- In ruminant, **yeast (*Saccharomyces cerevisiae*)** in the form of live culture, or dead cells with culture extracts, has proved successful.
- Metabolites of dead & live yeast cells (B vitamins, BCFA, amino acids & peptides) stimulate the growth of the bacterial species ***Megasphaera elsdenii***.
- This utilizes the lactic acid produced from the rapid fermentation of starch & sugars associated with high-concentrate diets.
- Also live yeasts ferment sugars derived from the degradation of starch, thus **competing with the lactic-acid-producing bacteria & thereby stabilize rumen pH & reduce the risk of acidosis.**

Cont.....





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- Live yeast cultures also **scavenge oxygen in the rumen**, helps to maintain anaerobic conditions & favouring the growth of cellulolytic bacteria.
- **Increase forage intake, result in improved liveweight gain, milk yield & milk fat content.**
- **Addition of yeast to intensive beef diets has increased daily live weight gain and food conversion efficiency.**
- **Improved fibre digestion** has also been reported **in horses** when yeast cultures have been given.

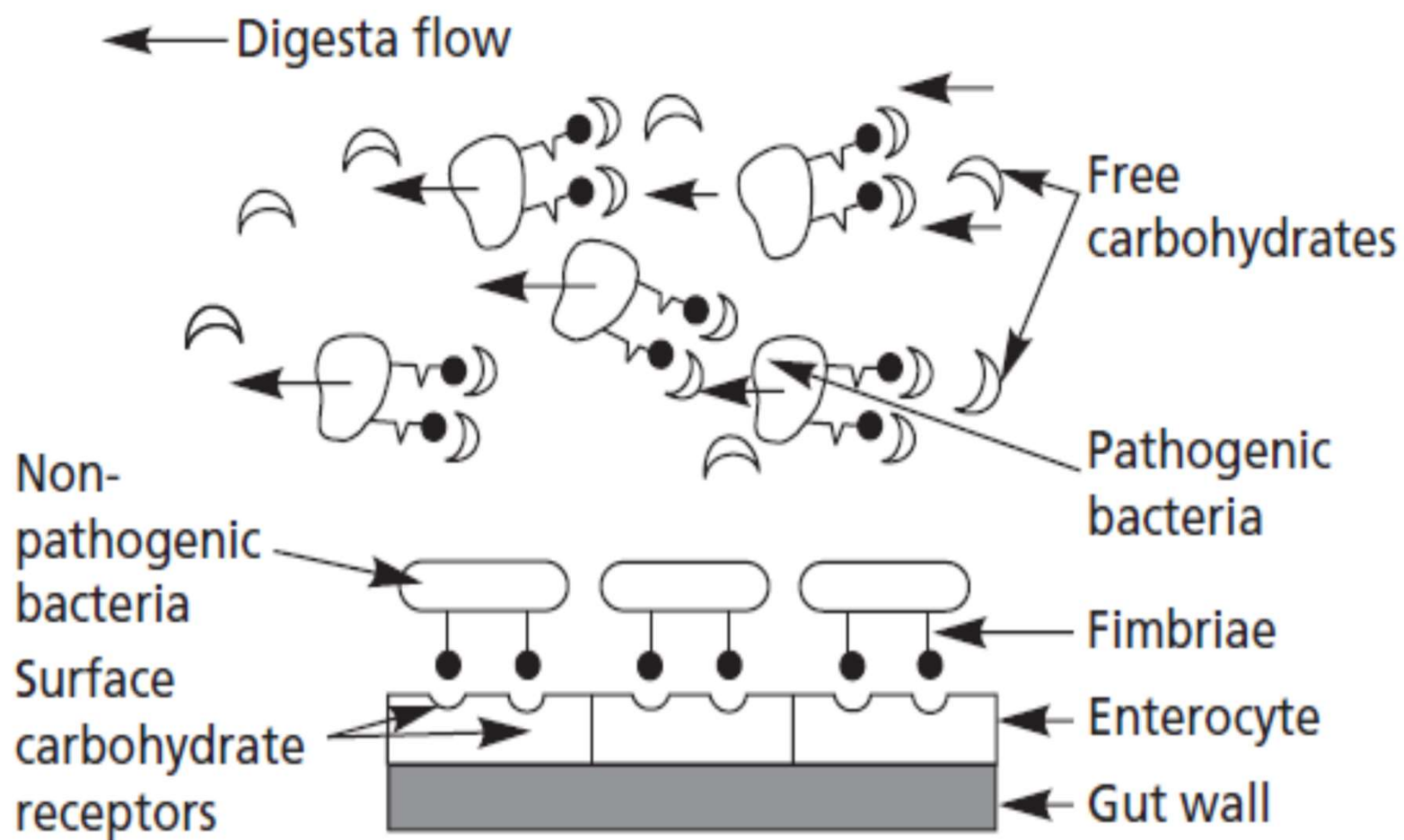
### **3. Prebiotics:**

- ✓ **Defined as compounds other than dietary nutrients that modify the balance of the microflora population by promoting the growth of beneficial bacteria & thereby provide a healthier intestinal environment.**

#### **Oligosaccharides occur naturally in foods such as;**

- ✓ **Soya bean meal, rapeseed meal & legumes contain alfa-galactooligosaccharides (GOS);**
- ✓ **Cereals contain fructo-oligosaccharides (FOS);**
- ✓ **Milk products have trans-galactooligosaccharides (TOS);**
- ✓ **Yeast cell walls contain mannan-oligosaccharides (MOS).**
- ✓ **They are also produced commercially.**

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- Pathogenic bacterial cells have surface compounds called **lectins** that recognise these carbohydrates & by which they attach to the gut cells.
- **Lectin**–carbohydrate combination is specific to a particular organism.
- Salmonella & E. coli have a mannose-specific lectin that binds to mannose residues on the gut mucosal surface.
- However, if the same carbohydrate (oligosaccharide) is provided in the diet, harmful bacteria can be encouraged to attach to these &
- They do not adhere to the gut wall but are excreted without producing toxins.

**Discussions.....**

**Questions, if any.....??**

**THANKS**