

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;

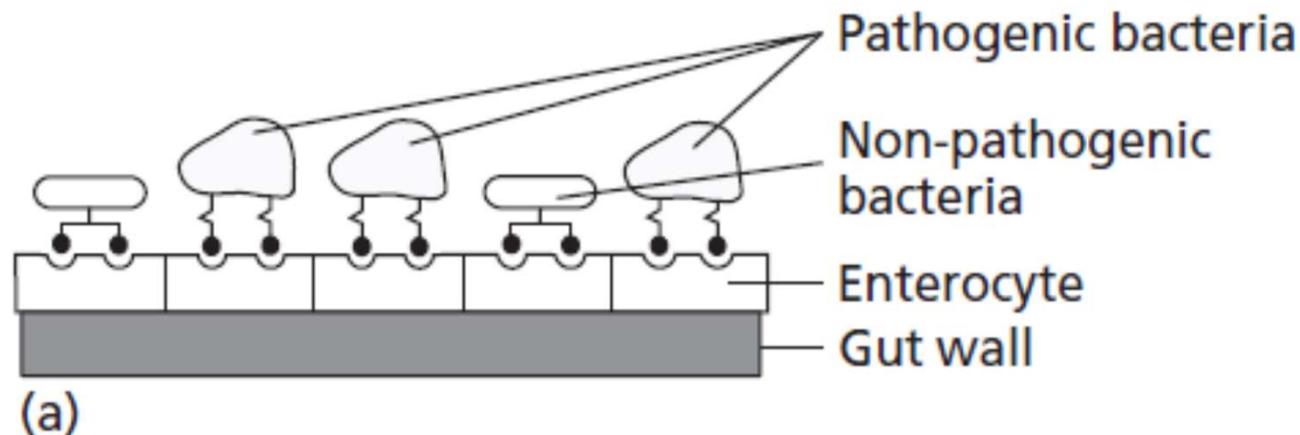
✓ Adhesion to the digestive tract wall to prevent colonisation by pathogenic microorganisms:

➤ E. coli, need to become attached to the gut wall to exert their harmful effects.

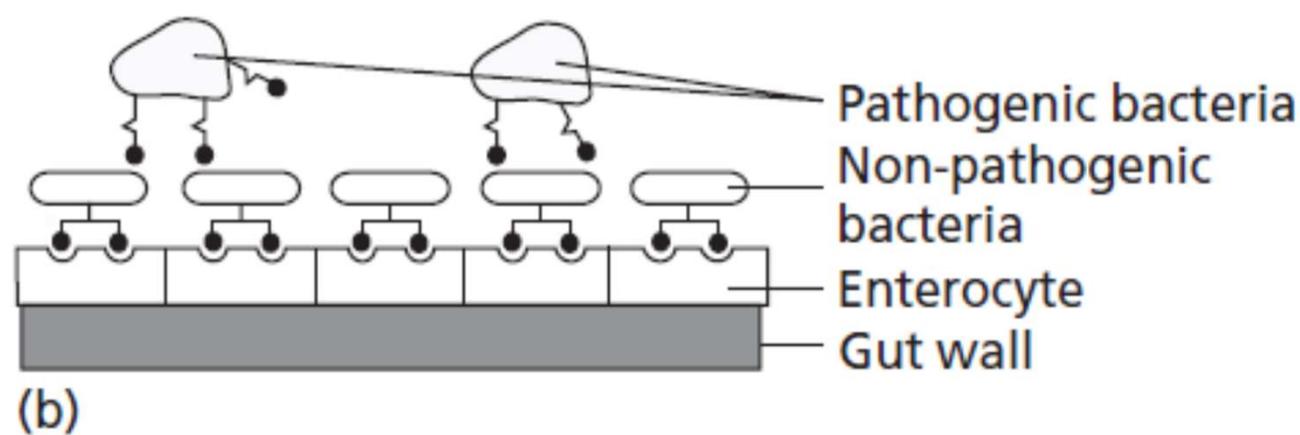
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- Attachment is achieved by means of hair like structures on the bacterial surface, called fimbriae.
 - Fimbriae are made up of proteins k/a lectins, which recognize & selectively combine with specific oligosaccharide receptor sites on the gut wall.
 - Lactobacilli successfully compete for these attachment sites.
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- ✓ 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.

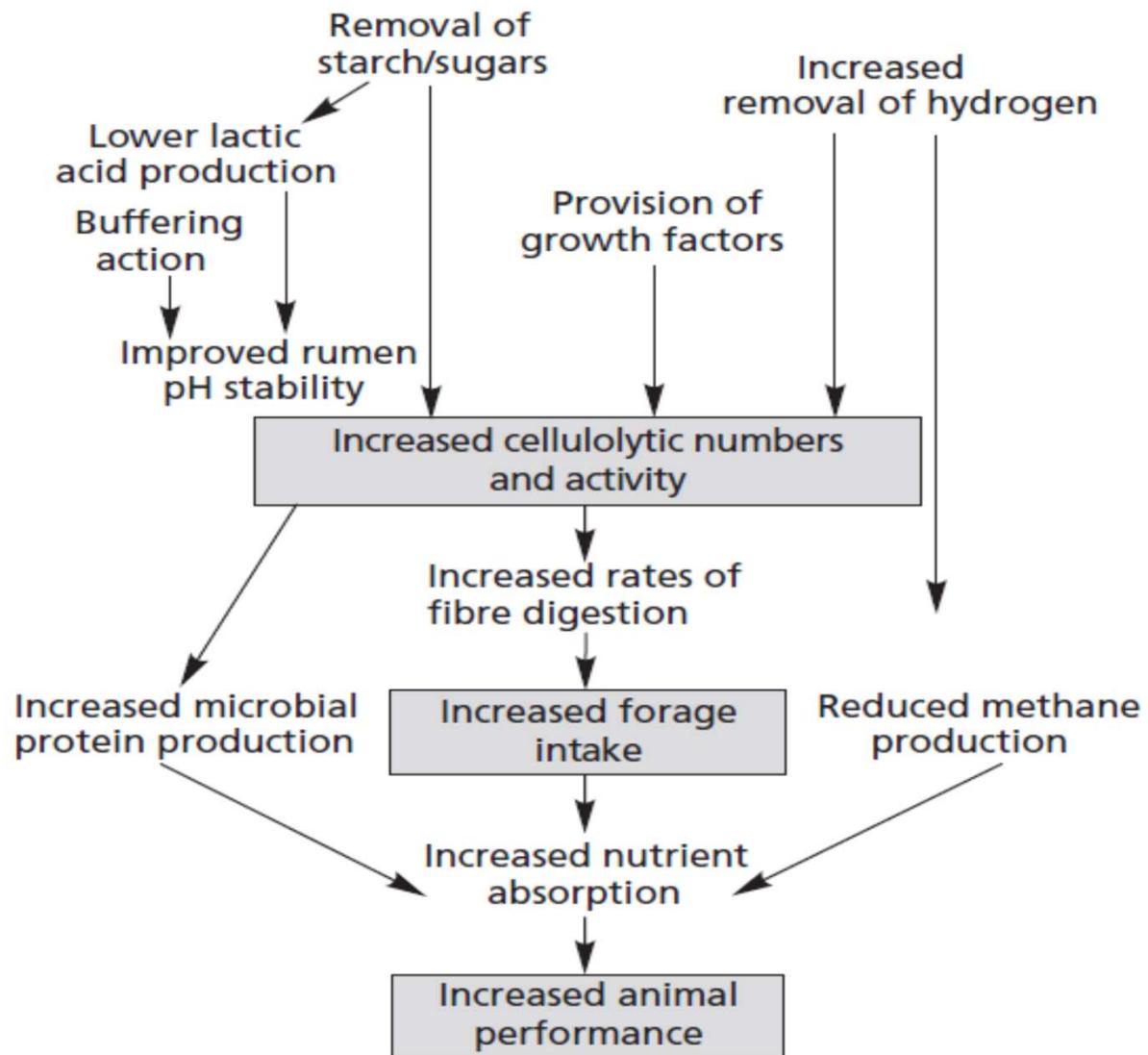
✓ Other postulated effects include:

- 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.**

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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.**

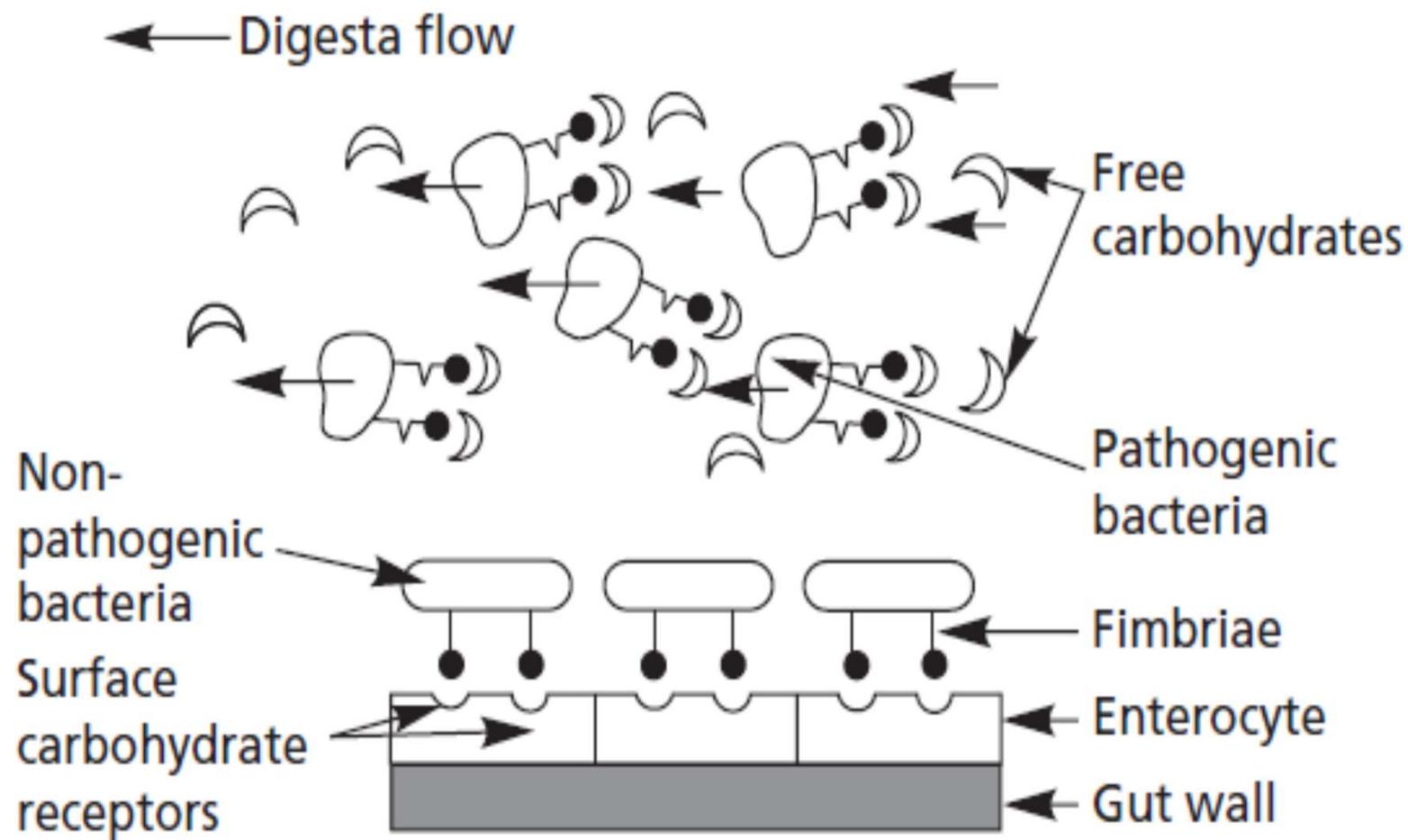
3. Prebiotics:

- ✓ 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