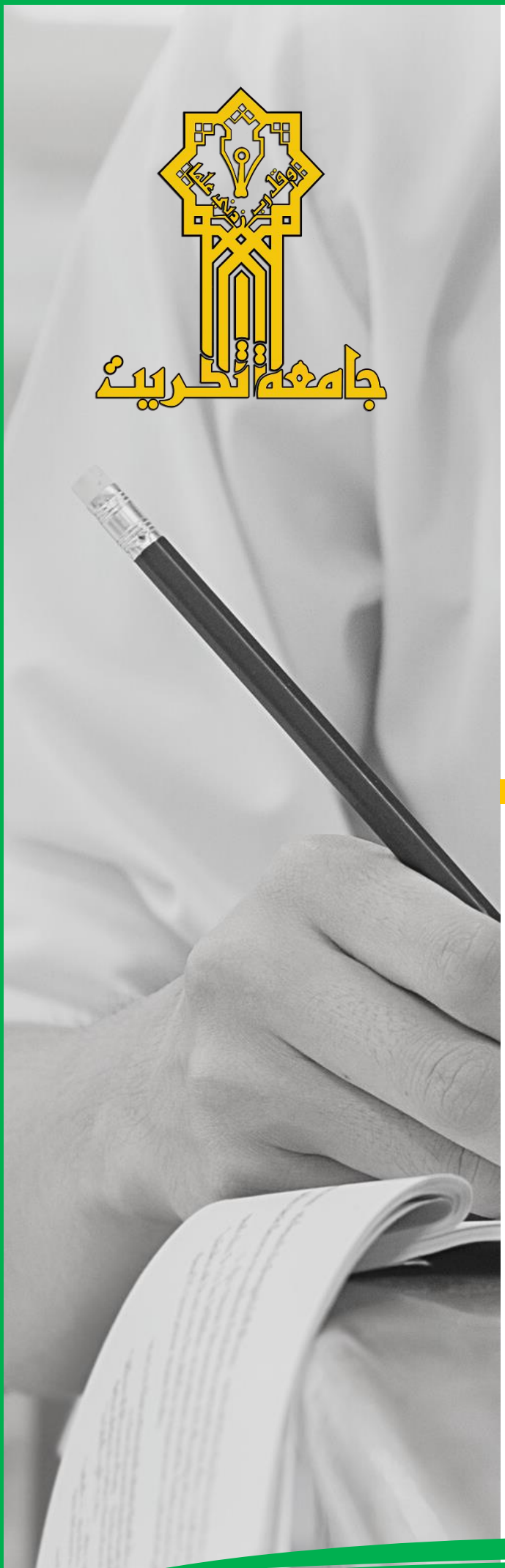

Tikrit University
College of Veterinary Medicine

Lec no. 7.

Rumination.

Subject name: animal management.

Subject year: 2025.

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SCAN ME
Lecturers link

bologna process 2024 – 2025.

1st class ، 1st semester.

Animal management.

Lec no. 7.

Rumination process:

In order to have a clear understanding of the rumination process, it is necessary to quickly understand the processes that take place on fodder materials (the process of feeding).

The feeding process begins with transferring the ingested feed materials to the mouth, followed by mastication, then swallowing, then rumination, which is a special process only for ruminants, and then re-swallowing the feed materials that were regurgitated.

Rumination:

It is a process specific to some types of animals called ruminants, including (livestock, which are cows, buffalo, sheep, goats, giraffe, bison, deer, llamas, wildebeest, and antelope), which possess a large digestive system consisting of 4 chambers (rumen, reticulum, omasum, abomasum).

It is simply the process of returning part or some of the ingested feed materials that were not chewed well, such as rough feed (hay, alfalfa and grasses with a high fiber content) to be returned to the mouth to be chewed again and swallowed again.

The mechanism of rumination.

The ruminant animal consumes feed materials quickly during certain hours of the day and stores it in the rumen incompletely (i.e. they were not chewed well

and not fully digested as well) and then spends part of the time (8 hours out of a total of 24 hours) in to ruminate on these feed materials, the rumination process or rumination cycle takes about 1 minute.

Stages of rumination.

1- Return the feed to the mouth.

It begins with reflexive contractions within the rumen, followed by contractions from the reticulum. These contractions push large particles towards the cardiac region, which is (the connection between the oesophagus and the stomach opening), through the negative pressure that is generated within the respiratory system due to the closure of the epiglottis. As a result, the muscles of the oesophagus expand and the flexor cardia muscle expands so the Feed go towards the mouth.

2- Re-chewing and 3- Mixing with saliva.

Once the food reaches the mouth, it is chewed again and mixed with saliva at a slower rate than the first chew (55 chews/minute compared to about 90 chews/minute when eating feed) in order to allow the opportunity to grind and mix the feed with saliva. The amount of saliva secreted in a mature cow is estimated at about 100-150 liters/day. This large amount of saliva essentially works to provide an aqueous medium for microbial fermentation as well as to neutralize acidity due to it containing a high concentration of basic bicarbonate.

4- Re-swallowing.

An automatic process that takes place after the chewing process is completed and the feed particles are softened, as the morsel moves directly to the bottom of the rumen due to its high density.

Digestion.

It is a process that includes all the mechanical, enzymatic and fermentative processes that take place on food materials ingested in the digestive tract. There are many differences in digestion processes between different animals, and this depends on the differences between them from a physiological and anatomical standpoint, depending on the nature of each animal.

Digestion in ruminants:

The microorganisms present in the rumen play the main role in the digestion process in this part of the digestive canal. The rumen can be likened to a large vessel for fermentation under anaerobic conditions, and this fermentation takes place through very large and diverse numbers of bacteria and protozoa.

The benefits that microorganisms obtain from the rumen.

1- Flora microorganisms can obtain the nutrients necessary to perform their work through the foods that animals eat.

2- The rumen provides the temperature necessary for the activity of these organisms, which is around 38-40 degrees Celsius.

3- The final products obtained from microbial decomposition continue to disappear from the fermentation area and head towards the small intestine for absorption, because the collection of these final products inhibits their activity.

4- The rumen provides the appropriate pH for the growth and activity of these organisms, which ranges between 6.2 - 7.0, and this degree is regulated by basal saliva, which is rich in bicarbonate.

The role of microorganisms in digestion.

1- It is known that cellulose is not digestible by the digestive enzymes secreted by the organs attached to the digestive system (liver, pancreas), but it can be digested by the cellulase enzyme secreted by cellulolytic bacteria, where it is transformed into All of them turn into monosaccharides, which in turn ferment, producing volatile fatty acids (VFA), which are acids (propionic, butyric, acetic), which are absorbed by (the rumen, the reticulum, and the omasum), but the greatest part of absorption is through the rumen.

   The important difference in carbohydrate digestion between ruminant and non-ruminant animals can be summarized in several points:

   A- Ruminants benefit from cellulose, while non-ruminants cannot.

   B- Digestion in ruminants is carried out mainly by microorganisms, while in non-ruminant animal's digestion is enzymatic.

   C- The final products of carbohydrate digestion in ruminants are (VFA), while the final products of digestion in non-ruminants are glucose.

   D- Digestion in ruminants is fermentation, in non-ruminants it is enzymatic, and in other animals it is a mixture of fermentation and enzymatic.

2- The protein ingested by ruminants is attacked by microorganisms in the rumen and is analysed into (ammonia, amino acids). At the same time, the microorganisms present in the rumen make protein in their cells from the protein ingested by the animal. (So, the fate of the microorganisms is to turn into microbial protein and be absorbed by the animal's digestive system. This means that the breeder aims to increase the number of microorganisms because in the end they will turn into protein.

3- The presence of the vitamin group (B-complex) is considered essential in the diets of non-ruminant animals, while in ruminant animals we see that this group of vitamins can be manufactured by the microorganisms present in the rumen.

Digestion in non-ruminant animals.

1- The digestive canal of non-ruminant animals with simple stomachs, such as (carnivorous animals such as humans, dogs, etc.) has a thick, small stomach.

2- As for animals that eat both meat and plants, which are called omnivorous, such as pigs, we find that the cecum and colon are large in size.

3- As for animals that feed on only herbivorous plants and are non-ruminant, significant development and enlargement of the colon and cecum occurs, such as rabbits and horses.

Eructation:

The process of microbial fermentation that takes place inside the anterior stomach produces large quantities of gases estimated at about 30 liters per hour in cows and 5 liters per hour in sheep. The accumulation of these huge quantities of gases requires the necessity of expelling them from the stomach in a process called eructation. The process of eructation occurs in conjunction with reticulum contractions (which are under the direct control of the nervous system) in order to get rid of the gases formed through the mouth. The accumulation of gases and failure to get rid of them leads to bloat, which may end in the death of the animal if rapid and proper intervention is not done.

The stomach of ruminant new-borns.

New-borns of ruminant animals are considered monogastric animals due to the incomplete development and maturation of the anterior stomach. The size of the anterior stomach at this stage constitutes about 20% (meaning the anterior stomach is the rumen) of the total volume, while the rennet constitutes about 80%. After the animal or new-born advances in age, this percentage will be reversed, as the percentage of the rumen will be 80% and the rennet will be 20%, and then the new-born will turn from a single-stomach animal to a ruminant animal. During the early stage of life (the first weeks after birth), the new-born has what is called the oesophageal groove, which is an open groove or channel that extends from the oesophagus and ends with the opening, in order to transport the milk directly to the enzyme area of the rennet so that the renin enzyme can ferment this milk. To benefit from it in the rest of the digestive tract. The importance of this groove fades as the animal begins to depend on obtaining its food from alternative sources of milk, such as rough feed that contains a percentage of fiber, and this usually occurs within 3-4 weeks after birth.