



## Maximise your herd's potential

### Rumen Development

The pre-ruminant stomach is made up of the same four compartments as the adult ruminant stomach. At birth, the abomasum is the functioning structure while the rumen is basically non-functional. The abomasum is very similar to our stomach, in that it has an enzyme based digestive system. Milk is channeled into the abomasum via the oesophageal groove, thus bypassing the rumen. Solid food and water, however, enter the rumen and these help it to gradually increase in size and digestive function. The functioning rumen is just a big fermentation sack with digestion being effected by microbes (bacteria, protozoa, etc) rather than enzymes.

Proper development of the rumen allows calves to be weaned without a check in growth; a calf can not be successfully weaned unless it has sufficient rumen development to enable it to function as a ruminant rather than a monogastric. Functioning as a ruminant means that a calf is able to efficiently use grains and forages to derive sufficient protein and energy for the optimal rate of growth.

Calves can appear to be thriving in the first few weeks of life but if rumen development is not being fostered, the calf will be severely set back at weaning and may develop stress related diseases such as pneumonia or ringworm. Calves without adequate rumen function are likely to have restricted growth for a month or more after weaning while the rumen develops.

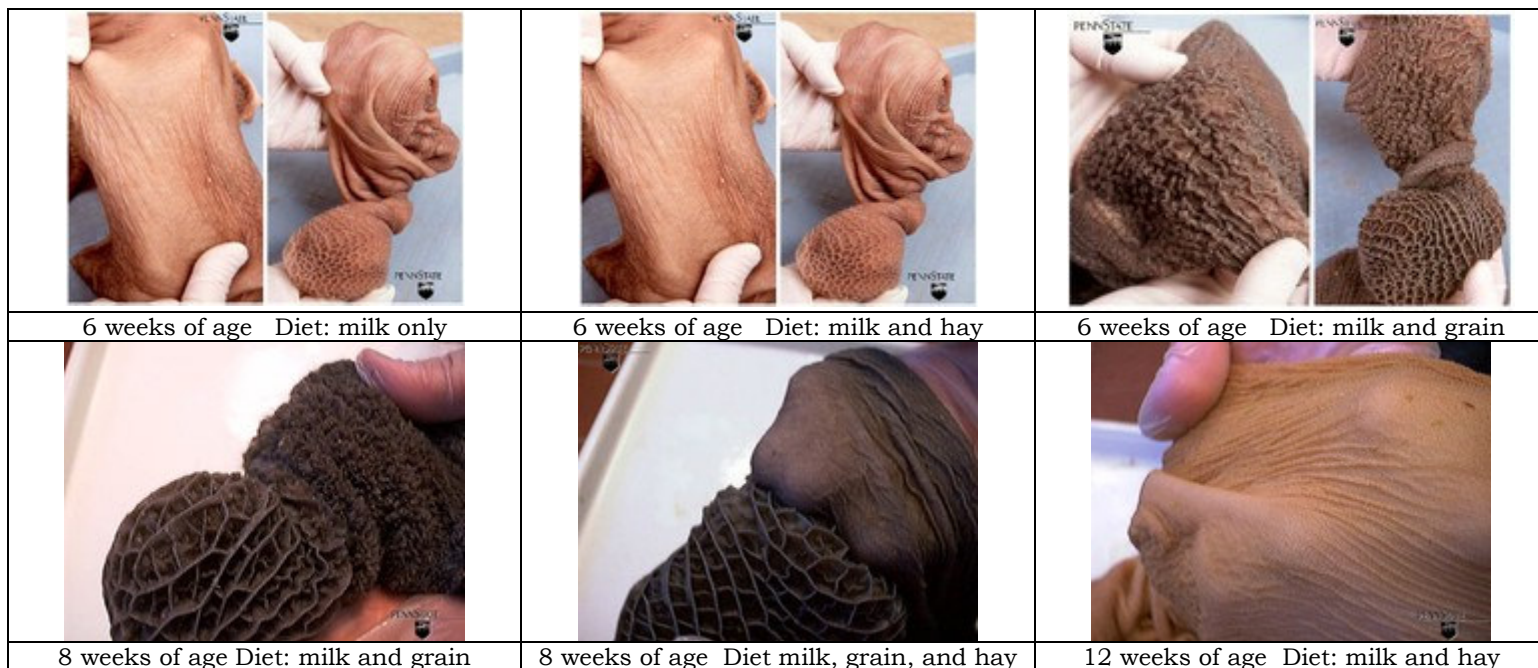
At birth, the abomasum accounts for about 70% of the volume of the entire stomach. Gradually over several weeks, if the calf is encouraged to eat grain, the rumen will begin to function & by eight weeks of age, the rumen has increased in size and function to the point where the abomasum provides about 50% of the total stomach volume. By the time the animal reaches maturity, the abomasum accounts for less than 10% of the total volume, while the rumen, reticulum and omasum make up the remainder.

The cross-section of the rumen wall consists of three main layers:

- a mucosal layer, which is the layer on the inside, and which is illustrated in the photos below.
- a muscle layer, which helps to churn the contents of the rumen. This necessary to keep food particles in suspension, to expel gasses produced during digestion and to move digested material into the abomasum.
- a tough, fibrous exterior layer to protect the whole organ.

Changing the rumen from a small inactive organ to one which functions efficiently enough to supply the calf with the nutrients for maintenance and growth involves many changes. The rumen must enlarge, the walls must thicken and the papillae, which are the tiny finger-like projections which become part of the mucosal layer, must form, develop and elongate. Research done in the 1980s suggests that the stimulus for these changes is the presence of butyric acid. This volatile fatty acid is an end product of the digestion of grain by micro-organisms in the rumen. It is not produced by the digestion of forages such as straw or hay, which are commonly fed to young calves in the mistaken belief that they stimulate rumen development. This development turns the inside of the rumen from a smooth pale surface to a convoluted, dark coloured surface with greatly increased surface area (papillae) and rich blood supply. This increases the ability of the rumen to absorb nutrients.

***Illustrations of development of the rumen in response to different diets.***



Source: Penn State University

**Forage**

The above photos are powerful illustrations that forage – hay or straw, is not helpful in the early stage of rumen development. In the pre-weaning phase grain alone is necessary to initiate the development process. After weaning, when the calf is able to digest enough grain to survive and grow on, forage is necessary to develop the musculature of the rumen and to assist its functioning.

Calves have a high energy requirement relative to their ability to consume dry feed. If calves consume significant amounts of hay, their intake of grain or pellets will be limited and growth and rumen development will be slowed down.

**Water**

Water is essential for development of the rumen. Milk does not help rumen development at all, as it does not normally enter the rumen.

Calves should have fresh clean water available at all times; this means cleaned out regularly and frequently. A 90 kg heifer will drink about 12-15ℓ on a 25°C day. This will increase significantly in very hot weather. The rumen cannot function without a supply of fresh water.