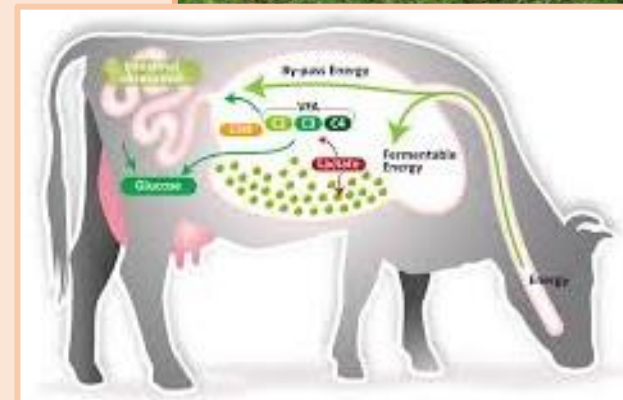


METABOLIC DISORDERS (Level 3)

Topic	Training & information Content
3.1	Estimating feeding value of fodder & feed on dairy farms
3.2	Sampling feeds & forages/analysis interpretation
3.3	Estimating Dry Matter intake for various breeds/age categories of dairy cattle in the tropics
3.4	Reviewing feed intake, rumen fill, Body Condition Scoring (BCS)
3.5	Life weight estimation of cows
3.6	Rumen fermentation
3.7	Mineral & vitamin requirement, guidelines
3.8	Manure scoring and evaluation
3.9	Guidelines for ration calculations for various breeds, heifers, lactation stage (Rumen8)
3.10	Use of Rumen8 software for ration calculation
3.11	Optimization of ration with Rumen8
3.12	Feeding management guidelines
3.13	Feeding management of dry cows/close-up
3.14	Feeding systems
3.15	Metabolic disorders
3.16	Scoring locomotion and hoof condition
3.17	Mycotoxin in dairy cattle nutrition
3.18	Heat stress in dairy cattle nutrition
3.19	Monitoring feeding management, using KPIs (based on Rumen8)



1. You will learn about (learning objectives):

- Types of metabolic disorders affecting cows.
- Causes of metabolic disorders.
- Prevention measures and management of metabolic disorders.



2. Introduction

- Metabolic disorders/problems are caused by too little or too much nutritional elements in a cow's body.
- There should be a balance of nutritional elements i.e. minerals.
- Metabolic disorders affects the normal functioning of the body and this affects animal productivity.
- Metabolic disorders can be easily evaded only through correct feed management practices.



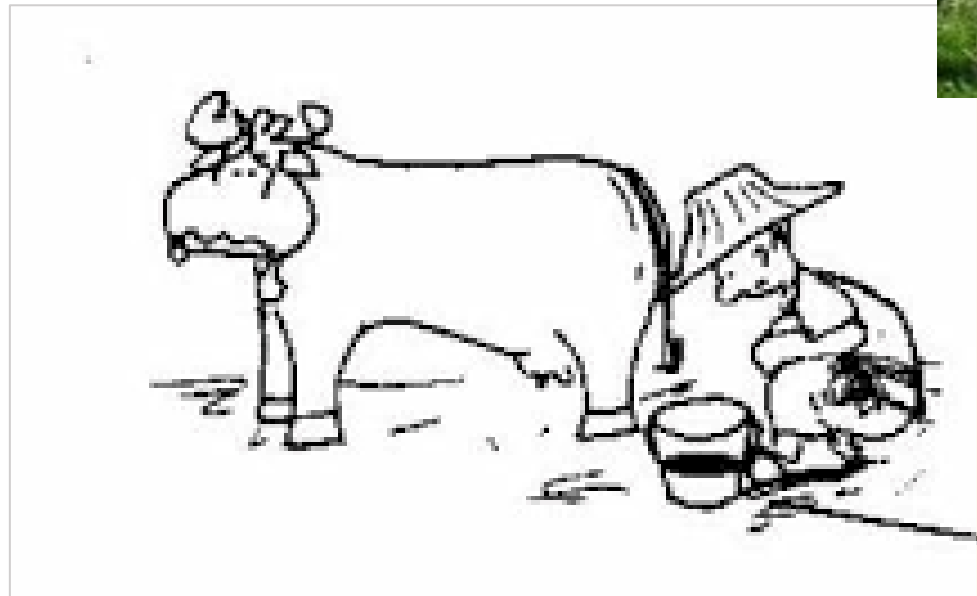
2.1 Introduction Cont'd...

- Metabolic disorders mostly affects animals undergoing internal changes.
- For example, cows that just calve down undergo changes within their bodies. These cows are in a transition stage.
- Metabolic disorders also affect cows in high stress situations such as harsh climatic conditions and poor feeding.



3. General effects of metabolic disorders

- Metabolic disorders can be an entry path way for other diseases.
- Recovery from metabolic disorders uses resources (time and money).
- Reduces feed intake in cows.
- Negatively affects milk production.
- Affects fertility of cows.
- Death can occur if not noticed on time or if prolonged.



4. Metabolic disorders

- Examples of nutritional/metabolic disorders include;
 1. Milk fever
 2. Rumen acidosis
 3. Ketosis
 4. Grass tetany
 5. Displaced abomasum
- Despite that bloat is not a metabolic disease, it will be mentioned and discussed later in the module.



5. Milk fever (hypocalcemia)

- Milk fever is caused by low blood calcium in the cow's body.
- It mostly affects milking cows after calving down.
- Milk fever can be contributed by nutritional factors such as vitamin D deficiency.
- Typically, milk is high in calcium (Ca) and this can lead to excessive drainage of calcium from the body. It is also influenced by alkaline digestive systems affecting Ca absorption.
- Older cows and Jersey breed and high producing cows are mostly affected. Older cows have weak brittle bones making it necessary to supply more calcium in their diet since they are unable to draw enough calcium from their bones.



6. Milk fever in lactating cows

- When cows calve down, calcium is needed in sufficient amounts for milk production and support muscle contraction.
- This causes cows to increase extraction of calcium from their body to enable milk (colostrum) production.
- Cows fed on high calcium diets during dry period obtain calcium from feeds; which discourage/lowers extraction of calcium from their bones when they calve down. This is the reason why cows get milk fever immediately after calving down or a few days later.



7. Symptoms of milk fever

- Difficulties in breathing due to weak heart rate.
- Cold ears and low body temperature (slightly below 38°C).
- Dry muzzle.
- Stiffness of hind legs causing inability of muscle coordination.
- Animal falls easily with reduced ability to stand up.
- Cows leaning their head & neck towards their chest.
- In severe conditions it can lead to death.



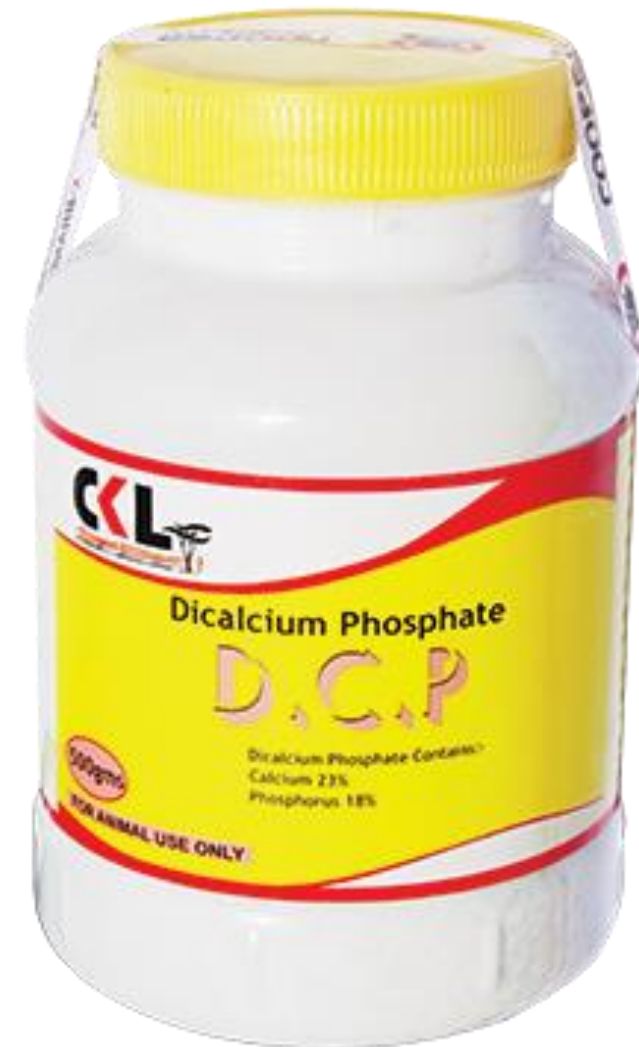
8. Management of milk fever

- Avoid excess feeding of calcium during dry period as it causes decrease in calcium mobilization from bones.
- At dry period feed low concentrates feed that are high in calcium (mixed with minerals) and high fiber that is low in calcium.
- Maintain dry cows at a body condition score (BCS) of 3-3.25 and after calving at a BCS of 2.5-3.
- Offer vitamin D to pregnant cows 3 days before calving to assist in efficient use of calcium in it's body. This should be in right amounts to avoid toxicity.



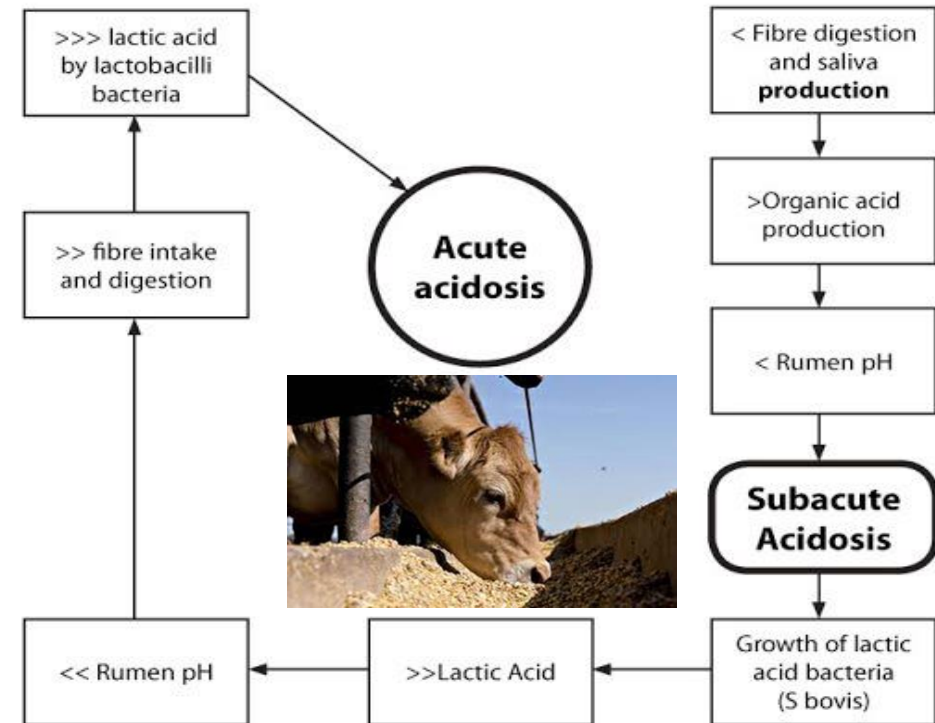
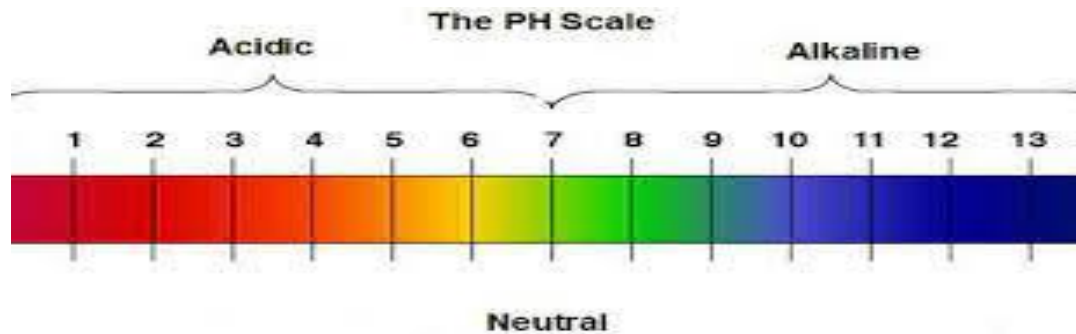
8.1 Management of milk fever Cont'd...

- Analyze forages to avoid feeding high potassium content (alkaline) as it increases blood pH, hence reducing absorption of calcium.
- Supply sufficient calcium in diet in relation to stage of production (early stage of lactation) to avoid calcium deficiencies.
- Feed Di-calcium phosphate (DCP) one table spoon to an individual cow after calving for at least two-three weeks.



9. Rumen acidosis

- Rumen acidosis happens in the rumen when the preferred pH levels drops.
- The optimum rumen pH ranges from 5.5-7. pH less than 5.6 is considered as acidosis.
- Cows are at risk of acidosis when they take in large amounts of concentrates.
- The risk of acidosis is further increased if forage: concentrate ratio is low 40:60. This leads to abnormal fermentation in the rumen that cause production of lactic acid, thus PH drops.



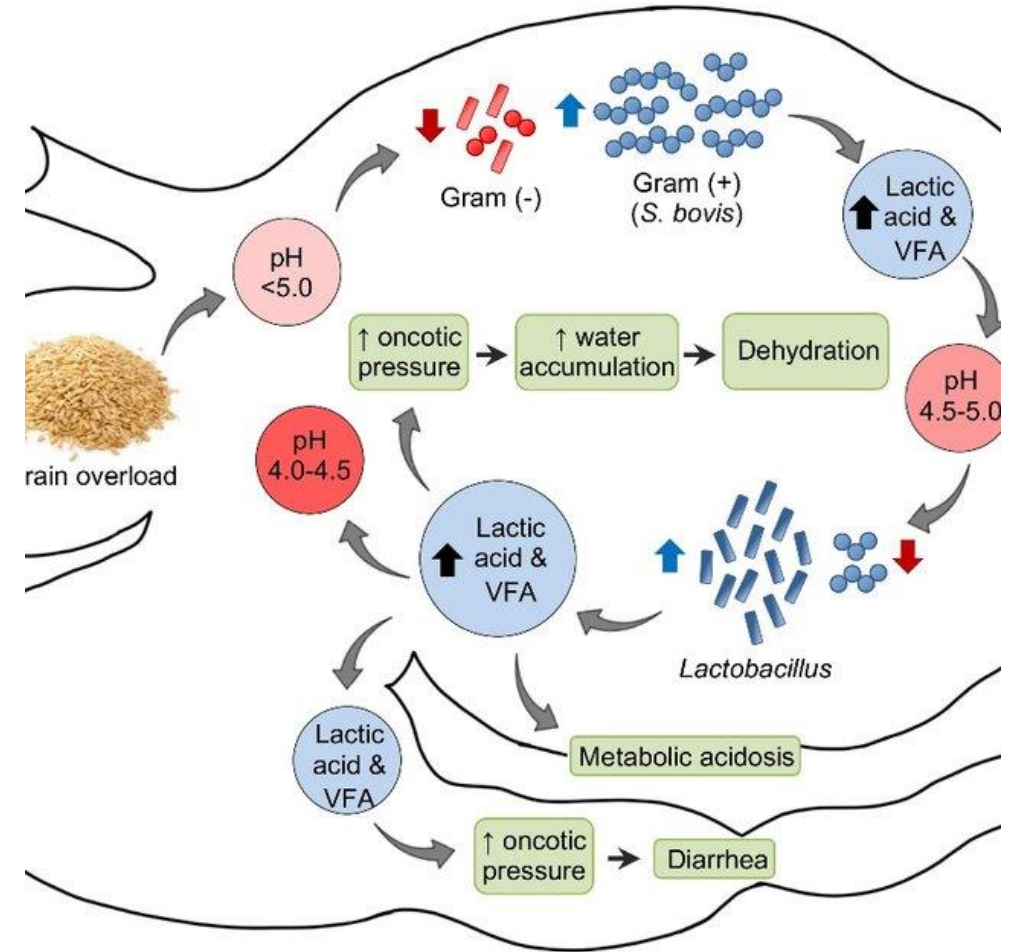
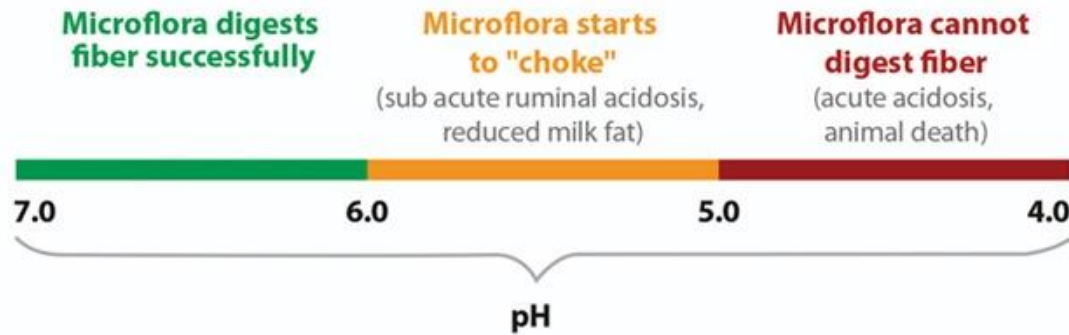
10. Sub-acute Rumen acidosis

- Rumen acidosis can either be acute or sub-acute.
- Sub-acute rumen acidosis occurs more than acute acidosis.
- Sub-acute rumen acidosis is mostly caused by feeding high grain content than forages and the pH in the rumen fall between 5-5.5.
- For example feeding highly fermentable carbohydrates e.g. starch sources from grains (barley).



11. Acute Rumen acidosis

- Sub-acute rumen acidosis contributes to acute rumen acidosis if highly fermentable carbohydrates (grain) are fed frequently and continuously, hence grain overload.
- This causes the rumen pH to drop sharply (to below 5) and remain low for long period due to continuous feeding.



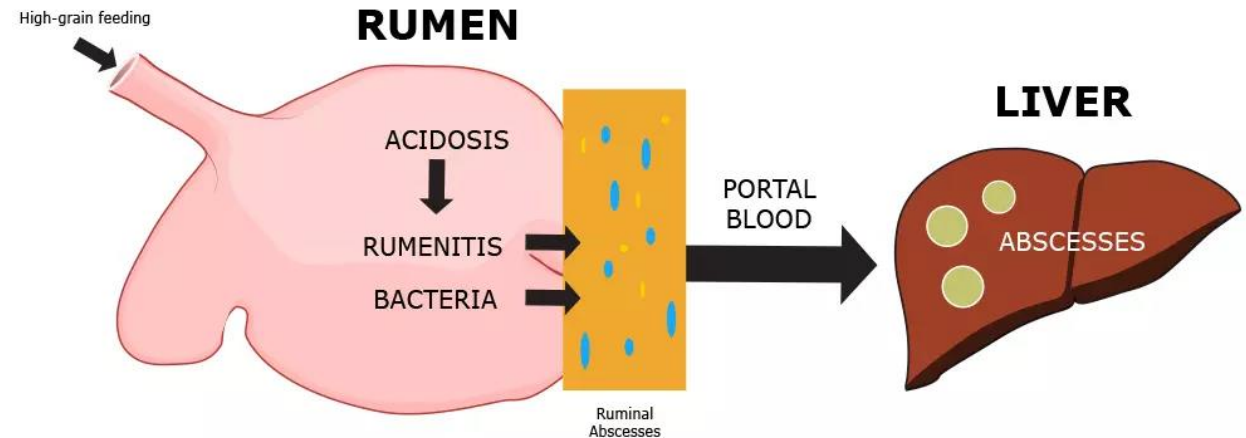
12. Signs of rumen acidosis

- Rumen pH dropping below 5 causes reduced appetite and affects the rumen flora.
- Consistency of manure changes eventually leading to diarrhea (manure score less than 2).
- Decreased rumination (chewing cud).
- Low skin temperature.
- Dehydration.
- Decreased urine pH.
- Hooves look abnormal (coronal band redden) and become tender.



13. Effects of rumen acidosis

- Acidosis is influenced by sudden shift to new rations especially that with highly fermentable carbohydrates.
- In the rumen flora, acid producing bacteria takes over, produce more acid. This damages the rumen wall linings and tissues.
- It exposes the rumen to damage by bacteria causing ruminitis, affecting absorption.
- Bacteria can get to bloodstream and cause liver problems and laminitis (acute acidosis).
- Acidosis reduces rumen contractions and fiber digestion.



Pathogenesis of liver abscesses in cattle fed a high grain diet.

Adapted from Nagaraja, T.G. and M. M. Chengappa, 1998

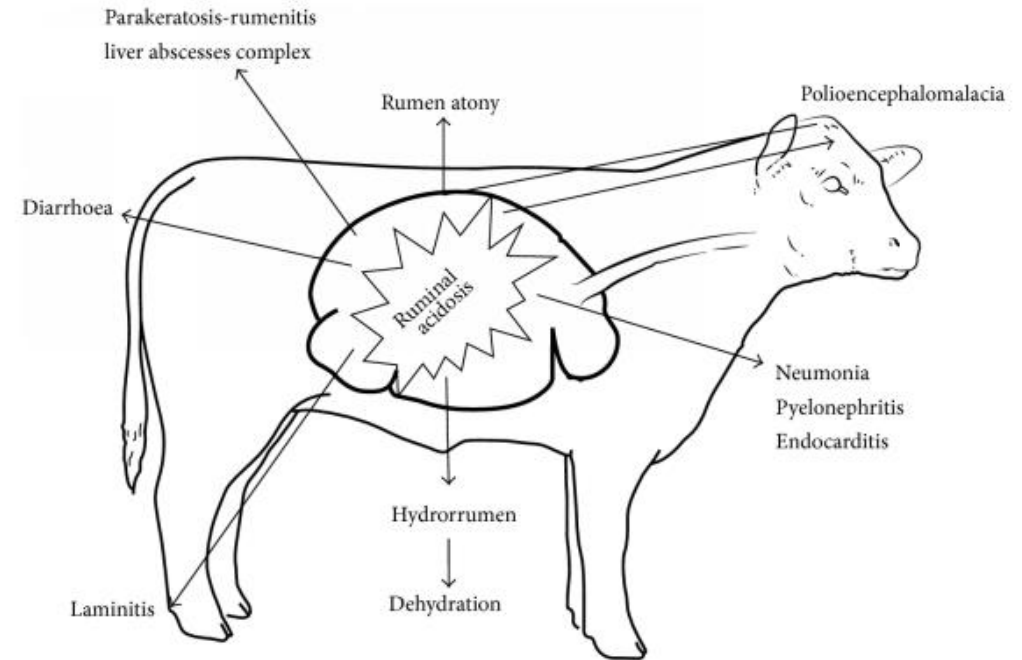
14. Prevention of rumen acidosis

- Include fiber rich ingredients in the ration, this encourages saliva production through rumination.
- Saliva has a buffering effect raising rumen pH.
- Pay attention to chopping size of fiber rich ingredient in the ration. Chop forage at a size of 1-3cm.
- Introduce highly fermentable carbohydrates gradually to cows and at recommended amounts.
- Avoid extended grazing/feeding on high quality forages especially maize with corn to minimize selective feeding on grains.



14.1 Prevention of rumen acidosis Cont'd...

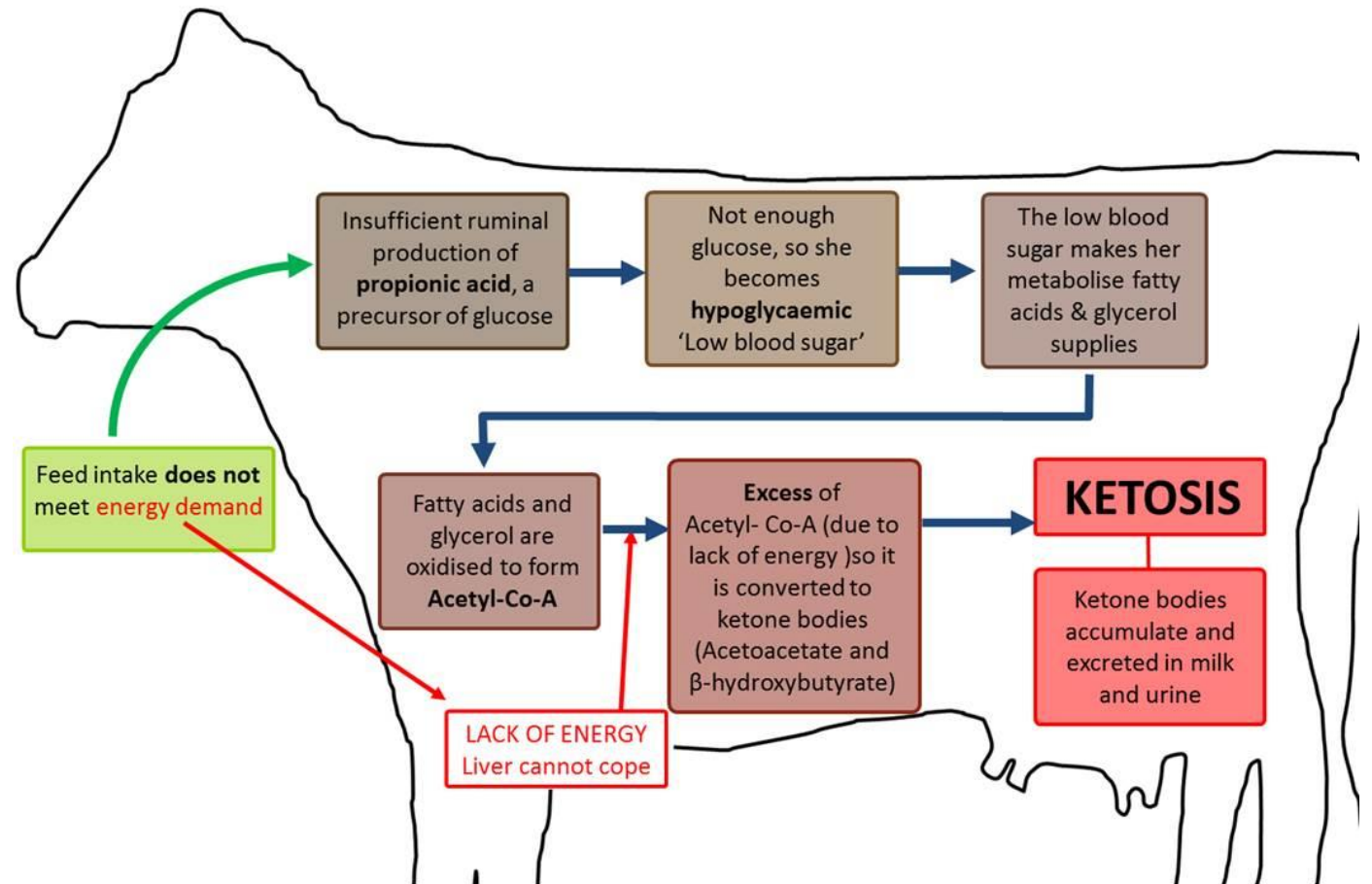
- Include recommended amount of grains in the ration throughout the day at recommended amount.
- Encourage continuous delivery of feed i.e., small and frequent feeding.
- Total mixed ration can be used to avoid selective feeding to bring right balance of forage and concentrates.
- Add buffers and/or modifiers to the ration for example limestone but under guidance of a nutritionist.



15. Ketosis

- Ketosis occurs when animals get less energy from feed intake than they require based on their nutritional needs, e.g. growth, milk production and maintenance.
- It is caused by reduced forage intake due to underfeeding.
- Mostly affects high yielding dairy cows in early lactation stage.
- At this stage they experience a negative energy balance.

Insufficient feed intake causes Ketosis



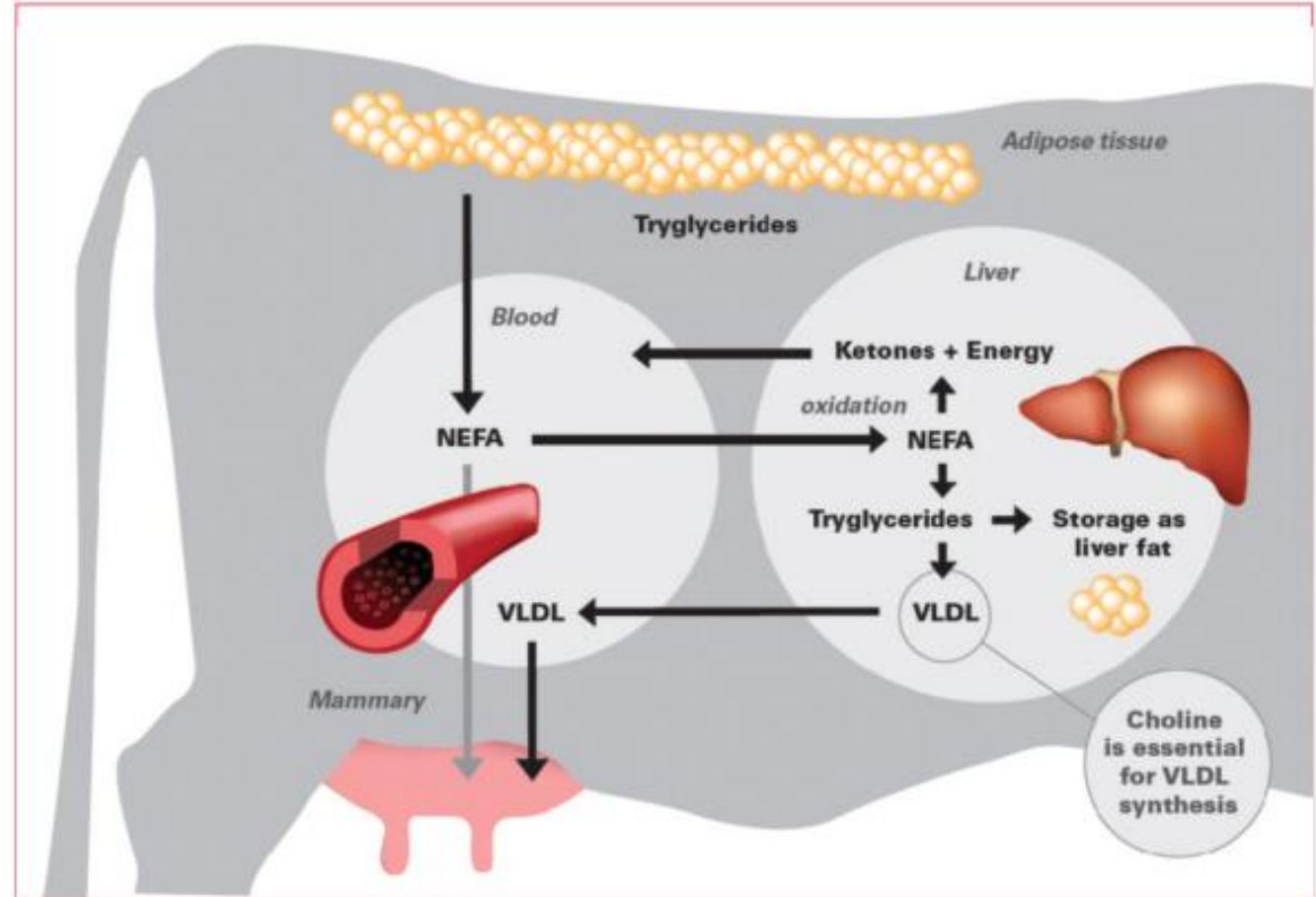
15.1 Ketosis Cont'd...

- After cows calve down they produce high volumes of milk and the amount of nutrients required are more than the feeds they take in.
- During this stage, feeding of low quality forages can cause Ketosis.
- Low quality forages e.g., silage that has undergone secondary fermentation can also contribute to Ketosis.
- Cows in other stages of lactation period can get ketosis due to low feed intake.
- Ketosis mostly affects dairy cows during dry season when pasture regeneration is low.



16. Ketone production

- Due to the energy gap felt by the body, the cow reacts by breaking down the body fat reserves it has (stored in the adipose tissues).
- Fat is broken down into smaller pieces into Non-esterified fatty acids (NEFA).
- NEFA is released to the bloodstream and transported to the liver.



16.1 Ketone production Cont'd...

- In the liver NEFA is oxidized into energy through the process of gluconeogenesis.
- However if NEFA is produced in large amounts, it causes the liver to be overworked. This causes a rise in ketone production.
- Ketones are then released to blood, milk and urine.
- Ketosis causes low blood glucose (sugar) and rise in blood ketone level.



17. Signs of Ketosis

- Cow looks dull and inactive.
- Reduced feed intake.
- Reduced weight.
- Reduced milk yield.
- Sudden increase in milk fat content.
- Reduced rumen movements.
- Breath, milk and urine smells like acetone.



Weight loss in due to Ketosis

18. Prevention of Ketosis

- Feeding quality feeds that meets the cow's energy requirement at all stages.
- The use of Total mixed ration to avoid selective feeding.
- Avoid overfeeding or over conditioning cows at calving periods.



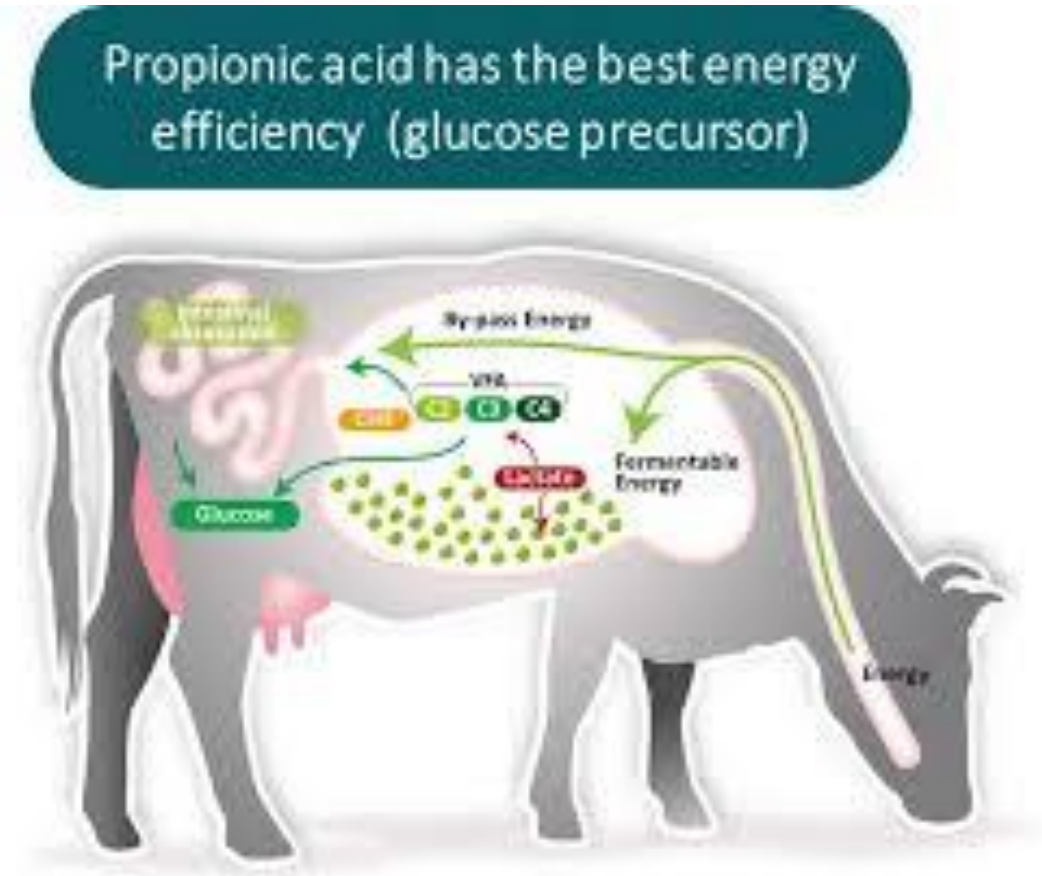
19. Effects of Ketosis

- Liver damage, production of ketone by cows body indicates that the liver is overworked.
- Ketosis affects milk production, reproduction and performance of the cow.
- Ketosis causes reduced immunity which means cows may be prone to other diseases/initiates other health problems i.e. displaced abomasum, metritis and mastitis.
- In extreme conditions cows may be unable to stand up.



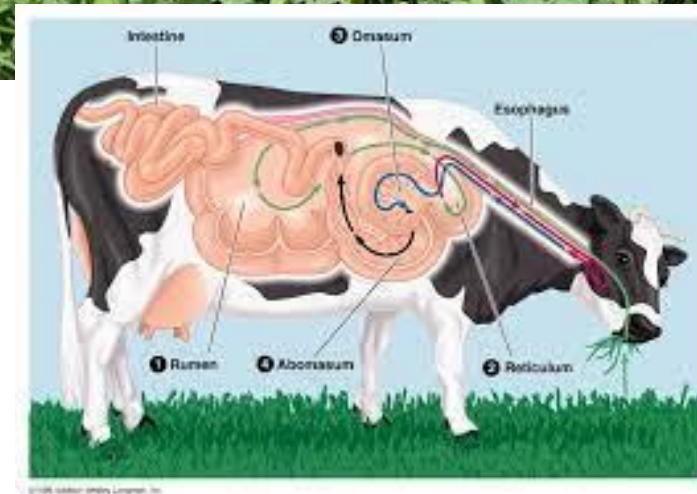
20. Management of Ketosis

- Oral administration to give glucose precursors.
- Glucose precursor is a substance used as a supplement that produce glucose. This is done to restore glucose in the body of dairy cow.
- Intravenous injection to increase blood sugar level (e.g. Ca, P & Mg) and provision of multivitamins injection.
- Drenching using propylene glycol after calving helps prevent ketosis in high milk producing cows.



21. Grass tetany

- Grass tetany is caused by low blood magnesium in the cow's body.
- It is common in lactating cows feeding on fresh and flourishing pastures that are heavily fertilized.
- Heavily fertilized pastures have high potassium which limits magnesium absorption.
- High potassium, low sodium and phosphorus affect magnesium absorption in the rumen.
- Feeding legume forage high in magnesium helps.
- Feed cows with sources of magnesium during high risk seasons.



22. Signs of Grass tetany

- Loss of appetite.
- Convulsions.
- Staggering/stiff movements.
- Frequent urination.

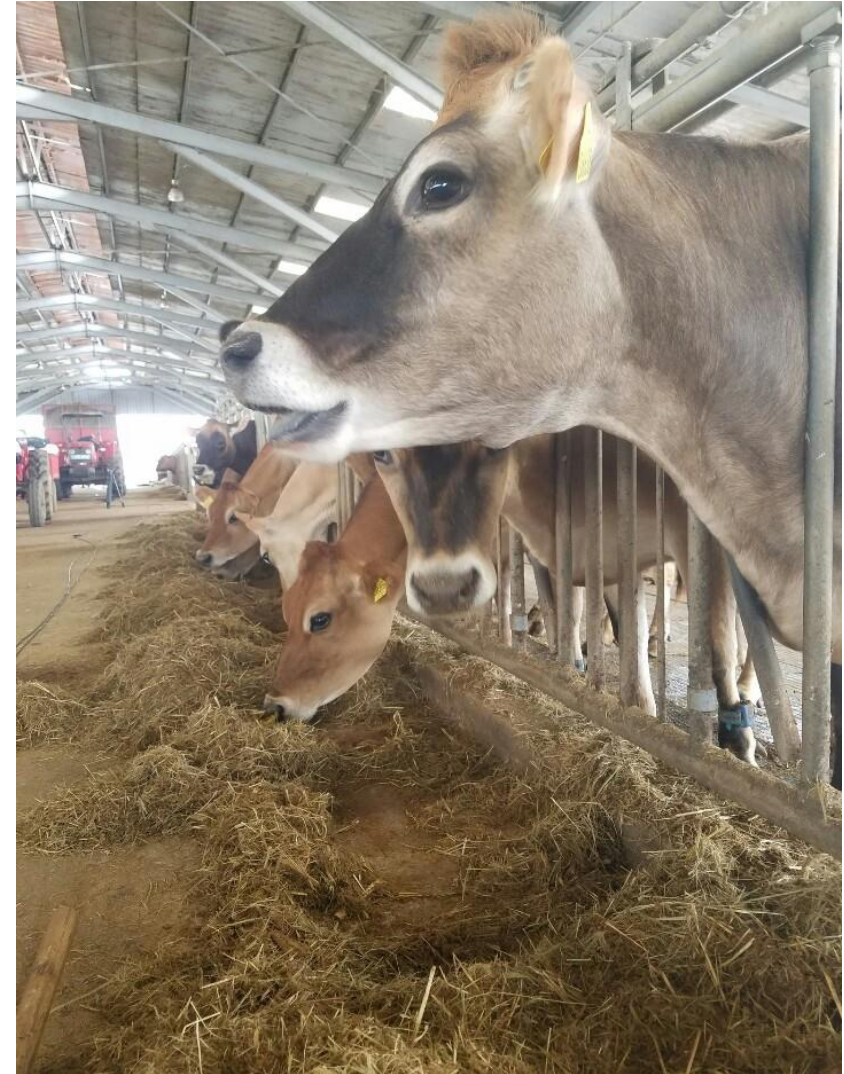


23. Management of Grass tetany

- For grazing cows supply hay before or during grazing.
- Feed cows on wilted forages after cutting fresh forage. Wilt under a shade.

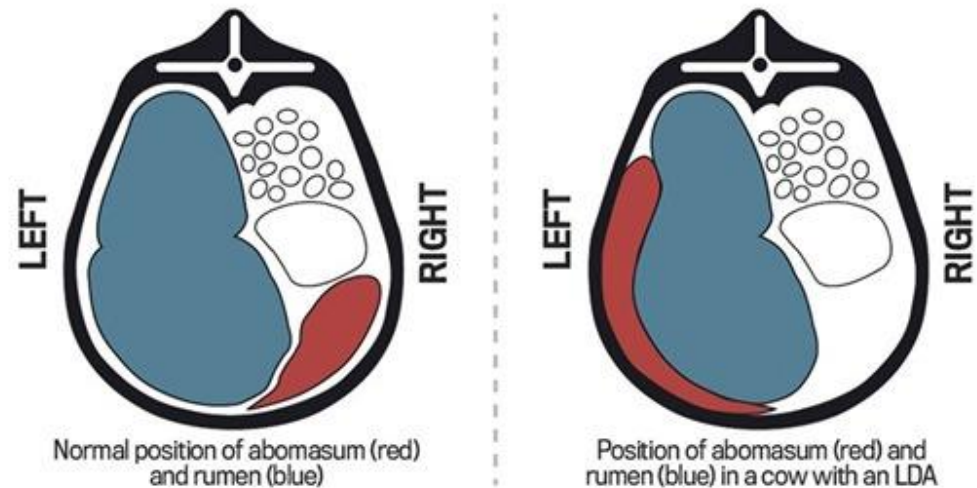
Treatment of of grass tetany

- Inject magnesium sulphate under the skin.



24. Displaced abomasum

- When the abomasum moves to the left or right side of the abdominal cavity, it is known as displaced abomasum.
- Displacement of the abomasum is commonly to the left side.
- Occurs mostly during the first months of lactation. This is common after birth because of the displacement caused by the calf.
- It is important to gradually introduce grain rations and ensure adequate fiber in the diet.



25. Signs of displaced abomasum

- Reduced feeding hence dry matter intake drops.
- Decrease in milk production.
- Discomfort and pain.
- When hitting the right rib cage a high echoing ping sound can be heard instead of a deep thud.



26. Treatment of displaced abomasum

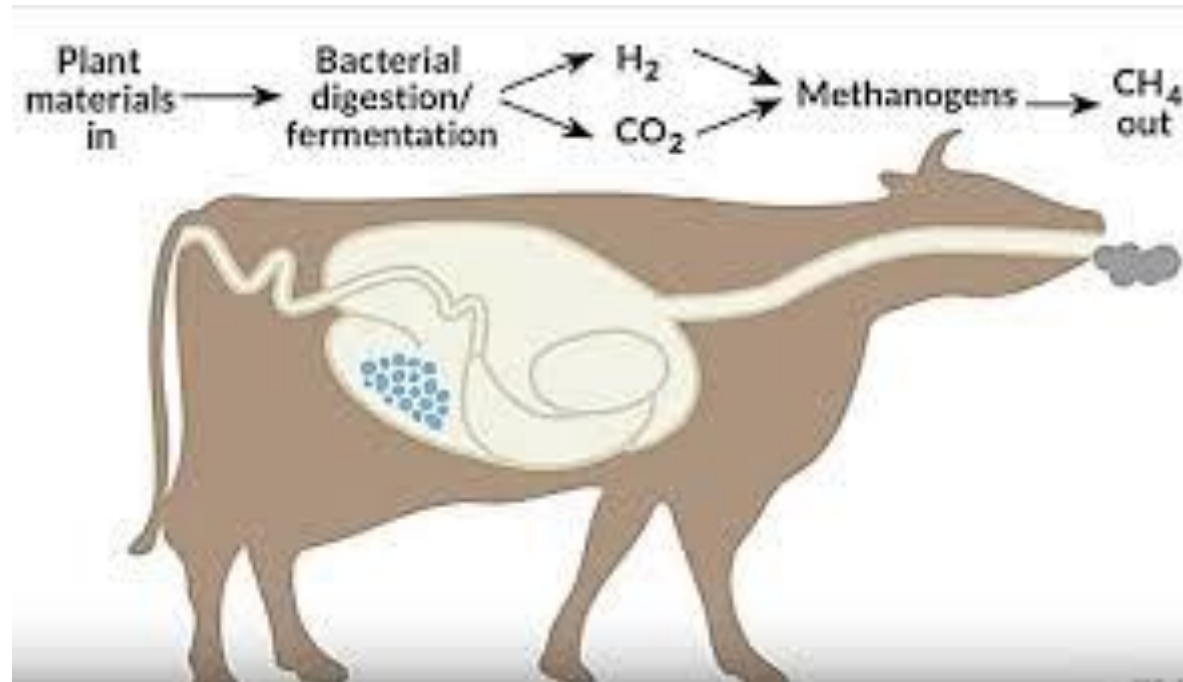
- Make the cow walk as a form of exercise.
- Try rolling the cow to make the abomasum to go to its right position.
- Surgery may be needed to correct the problem in worse cases especially in right displaced abomasum.

Seek veterinary advice!



27. Bloat

- Bloat occurs when a cow produces gas in the rumen and expelling the gas becomes impossible.
- Gases are produced in the rumen when digestive processes takes place.
- Belching removes these gases produced.
- Bloated animals however usually have difficulties belching (erasticating), interrupting gas expulsion.



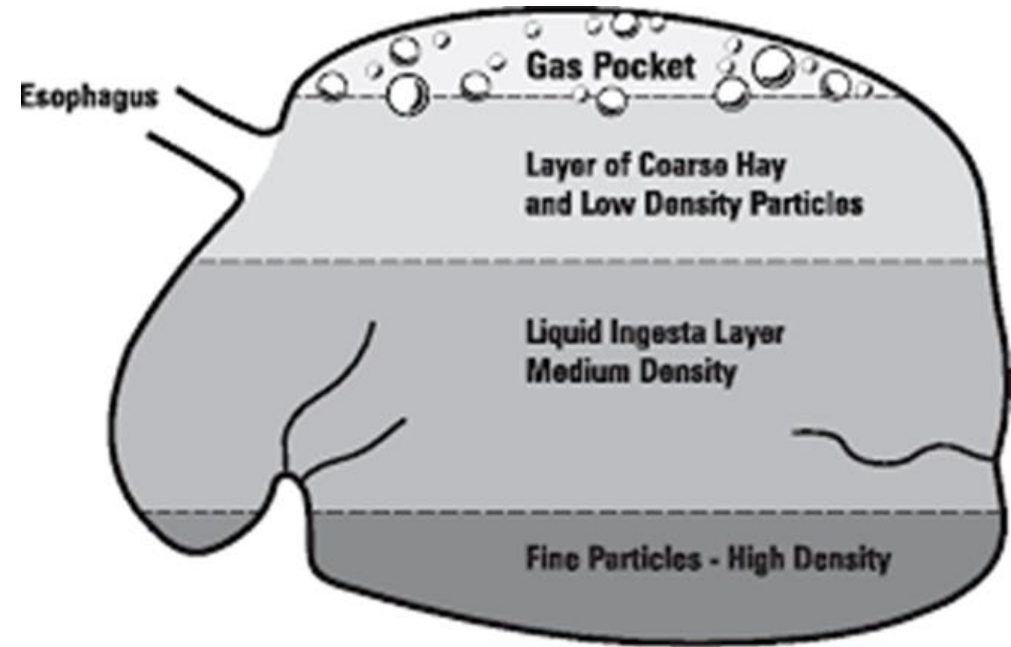
28. Types of bloat

- There are two types of bloat experienced by dairy cows;
 - i. Frothy/primary bloat
 - ii. Free gas/secondary bloat

i. Frothy/primary bloat

- This is the most common type of bloat.
- Occurs when cows feed on fresh forages.
- Fermentation of forages especially legumes causes froth (foam) to be formed that blocks gases from being released.

Note: Walking the cow can help breakdown the foam/froth.

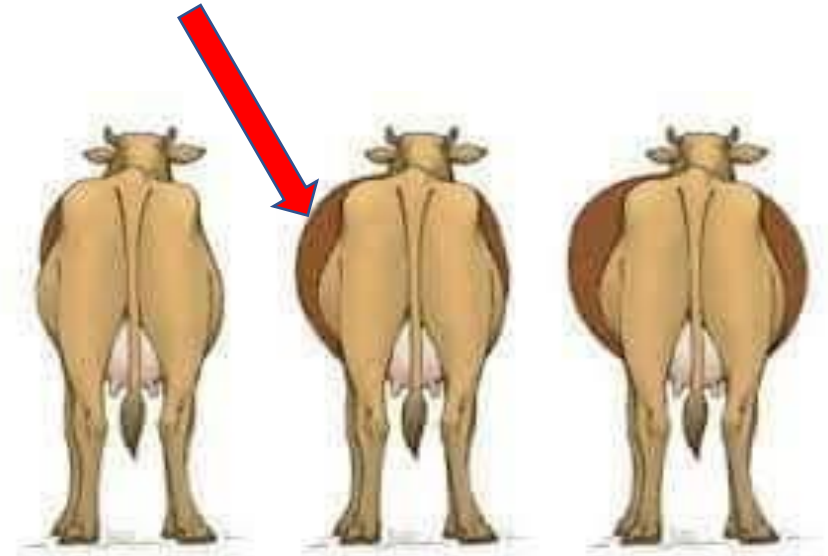


ii. Free gas/secondary bloat

- This is bloat caused when there is an obstruction especially in the oesophagus.
- This makes it difficult to eliminate gases formed during fermentation.

29. Signs of bloat

- To confirm bloat symptoms in a cow;
 - Area between the ribs and hip bone (left side-where the rumen is located) sticks out.
 - When protruding area is touched cow shows sign of pain (rumen & abdomen).
 - Discomfort will also be noticed and labored breathing.
 - Cow's can also collapse when bloat is extreme.



Mild

Moderate

Severe



30. Prevention of bloat

- Feed total mixed ration.
- Ensure cows have feed 24 hrs.
- Introduce new diets gradually to cows to allow time for adaptation to change.
- Never graze cows on fresh vegetative grass or mixed (grass and legumes) sward or legume on an empty rumen. This is because when cows are hungry they feed to their fill especially in the beginning of rainy seasons.
- Feed dry hay to cows who have been in a night boma without any feeds before feeding fresh grass or grazing on legume rich pastures.

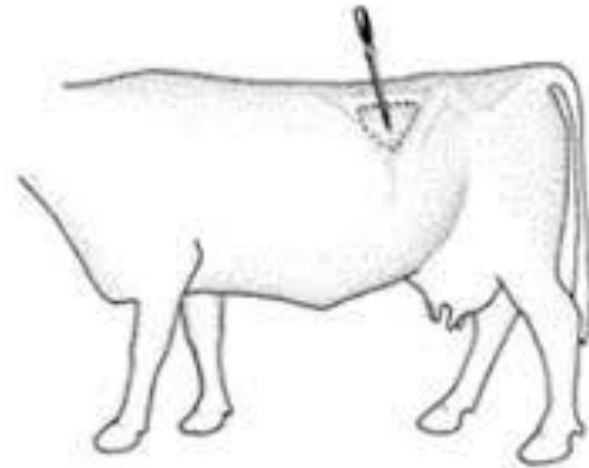
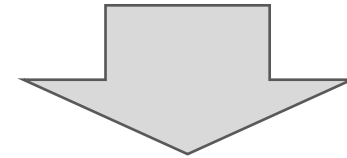


31. Treatment of bloat

- Inserting a stomach tube to the rumen through the mouth to enable gas expulsion can be considered (frothy bloat).
- Give the cow an anti foaming agent e.g. Teepol, anti bloat.
- To release gases in cows stomach trocar and cannula can be used by poking the cows stomach to expel the gas.



Anti bloat drug



32. Take home messages/Summary

- Ration formulation for cows should aim to balance forages and concentrates (grains).
- Minimum forage content in the ration is 40% and concentrates not be more than 60%.
- Feeding a total mixed ration (TMR) provided all its particles are of approximately the same size can help avoid selective feeding by cows.
- Observation is key in managing metabolic disorders to identify symptoms (problems) before they go out of hand.

