

# Metabolic Disorders in Livestock



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# Introduction:

- .Disturbance of one or more metabolic processes related to regulation of certain metabolite in body fluids.
- Affects energy production or damages tissue.
- May be inherited or acquired(more common).
- **The cascade of metabolic disorders occurs in a predictable fashion.**

# Metabolic diseases Vs Nutritional diseases

- Is bit difficult to differentiate.
- Nutritional disease-long term ,steady state,corrected by **only supplementation of diet**,not fatal  
whereas
- Metabolic disease-acute state , responds dramatically to the **systemic administration** of needed metabolites,potentially fatal.

# Metabolic disorders in ruminants:

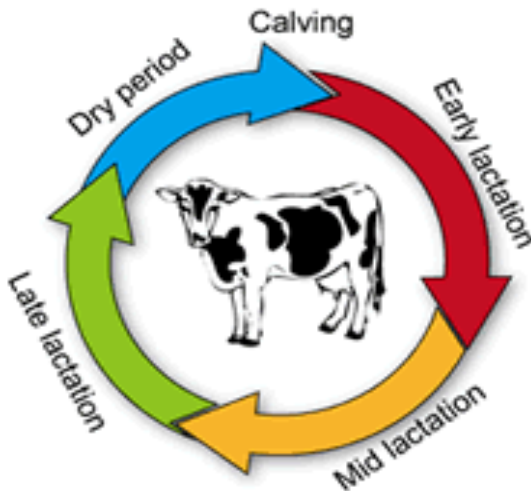
In ruminants, the metabolic disorders are generally encountered during **“TRANSITION PHASE”**



About three weeks before and after parturition

Can be divided into-

- Late lactation
- Dry period
- Parturition
- Early lactation



# FACTORS WHICH PREDISPOSES AN ANIMAL TO METABOLIC DISORDER-

Hormonal  
changes around  
parturition

Abrupt  
change of  
diet

Negative  
energy  
balance

Non lactating to  
lactating stage

Drainage of  
minerals

# Some common metabolic disorders

- Milk fever
- Ketosis
- Grass tetany
- Ruminant acidosis
- Downer cow syndrome
- Fatty liver syndrome
- Bloat
- Retained placenta
- Laminitis
- Displaced abomasum

# MILK FEVER

- **Synonym**-Parturient paresis, hypocalcemia
- Afebrile metabolic disorder of high yielders or mature dairy cattle and buffaloes.
- Heifers-rarely affected; older cows increase in susceptibility upto fifth or sixth calving.
- Risk of milk fever increases by approximately by 9% per lactation.
- **Etiology**-hypocalcemia due to sudden increase in Ca requirement for colostrum and milk production.

# Predisposing factors-

- Increased estrogen level around parturition-inhibits Ca mobilisation
- Older cows are unable to mobilize Ca from bones.
- Feeding of high K/Na diet-leads to metabolic alkalosis-inhibits Ca resorption.
- Increased Ca intake during dry periods-reduces parathyroid activity.
- Low magnesium diets(Mg necessary for appropriate PTH secretion).



Characteristic symptom-cows appear in recumbent state with it's head on flank(S-shaped).

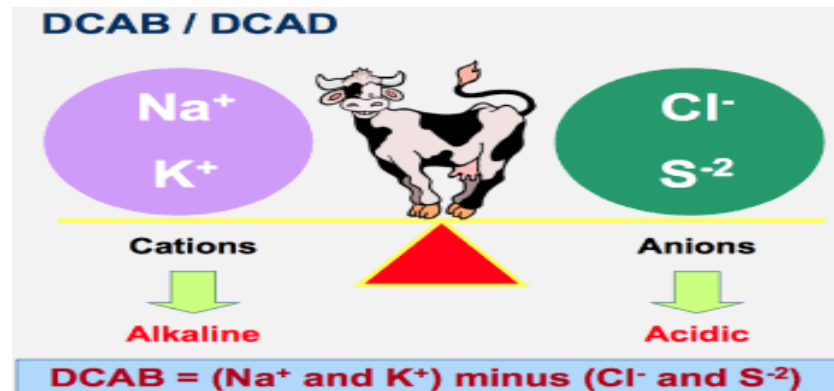


Figure 1. Cow in sternal recumbency.

Source: Kimura et al. 2006

# Preventive measures

1. Feeding low Ca diet around calving-increases parathyroid activity and synthesis of 1,25-dihydroxy vitamin D<sub>3</sub>.
2. Feeding acidifying rations.
3. Oral drenching around calving with Ca supplementation like CaCl<sub>2</sub>.
4. Vitamin D<sub>3</sub> administration 2-8 days before calving.
5. Feeding diet low in potassium(corn silage,distiller's grain).



# Treatment:



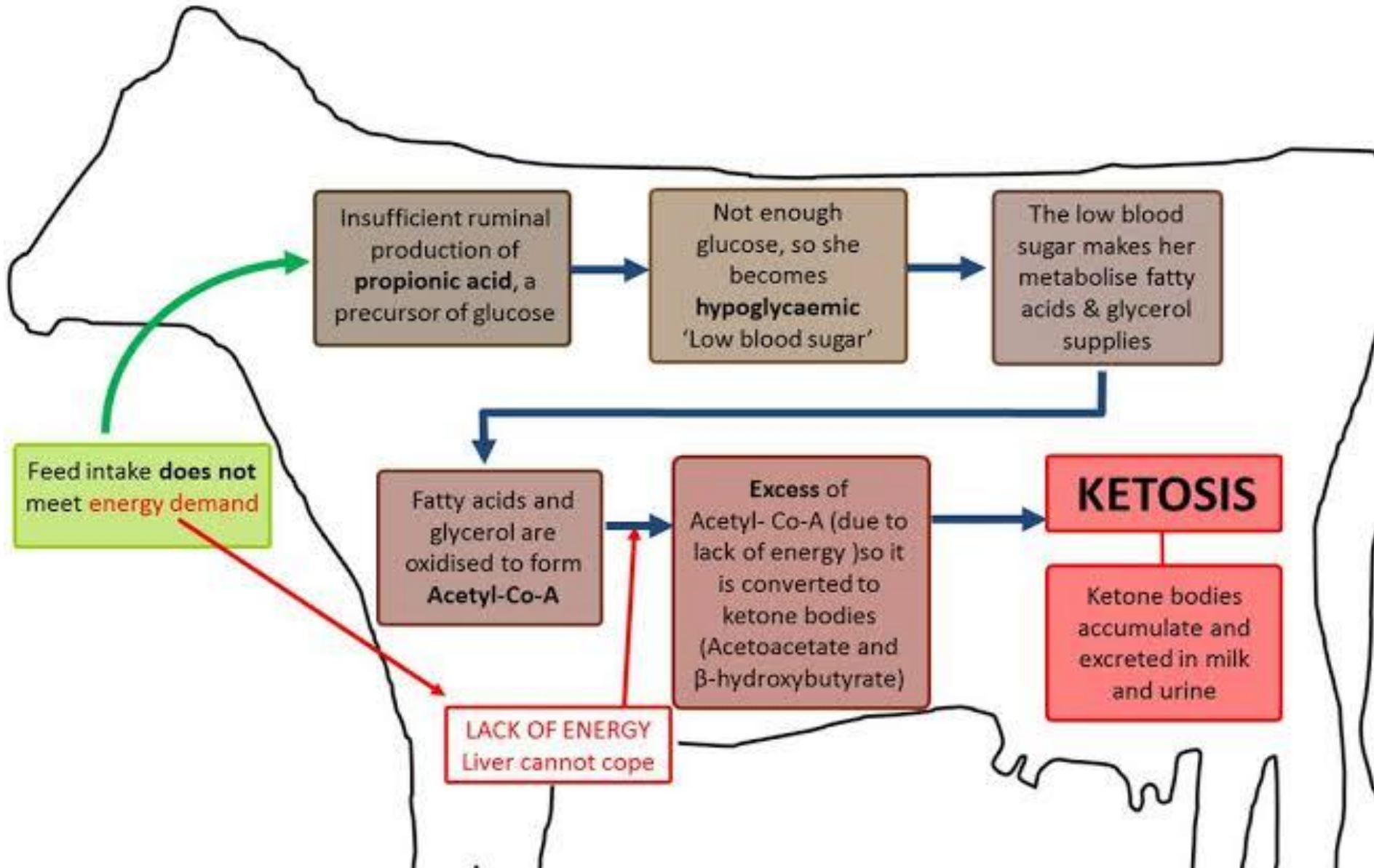
- I/V injection of **Calcium borogluconate** @300-600ml of 40% solution in combination with intramuscular or subcutaneous injection for slow release to avoid relapse as well as to prevent heart block.
- In complicated milk fever composite solutions containing Ca, Mg, P and glucose is recommended.
- **Mifex injection.**

# KETOSIS



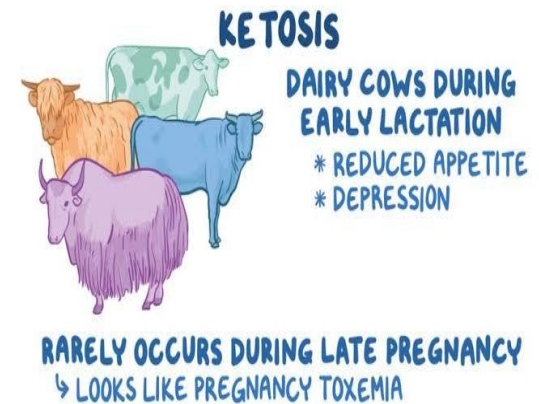
- **Synonym**-acetonemia, cow fever, post parturient dyspepsis(in cows)  
lambing sickness, twin lamb disease, pregnancy toxaemia(in ewes).
- Occurs in cattle and ewes in **negative energy balance**.
- Characterized by elevated concentration of ketone bodies(acetoacetic acid, BHB, acetone)in body tissues and fluid.
- Decreased blood glucose level.

# Insufficient feed intake causes Ketosis



## Factors responsible for this disorder may be:

- Inappetance around around calving.
- Excessive fatness around calving.
- Cow suffering with milk fever
- **Butyric content of silage**
- Ketosis in previous lactation



**Characteristic symptom-** sweetish chloroform like smell from milk, urine and breath.

Other symptoms-reduced rumen motility, decreased milk production, abnormal licking and chewing(pica).

# Prevention:

- Prevent starving as well as over feeding of cows.
- Niacin given orally-6-8gm/cow/day-20days prior to calving upto 3 months post parturition.
- **Sodium propionate** -100gm for 6 weeks daily in problematic herd.
- Concentrate diet alongwith good quality roughage should be given.

# Treatment:

.For cows-250ml propylene glycol with equal amount of water orally/day.

.Sheep-120gm sodium propionate in 250ml water twice daily for 10 days.

.12 gm niacin/day-1-2 weeks.

.Dexamatasone injection



# LACTATION TETANY

- **Synonym**-grass tetany, grass staggers, hypomagnesaemic tetany, winter tetany or wheat pasture poisoning.
- **Etiology**-low plasma magnesium (<1mg/dl) levels often accompanied by hypocalcaemia.
- **Symptoms**-muscular spasms, loss of consciousness, death due to respiratory problems.



# PREVENTION:

- **MgO** mixed with salt in ratio 75:25 fed ad lib.
- OR a salt lick mixed with 10 parts  $\text{MgSO}_4$  and Ca disphosphate each mixed with 80 parts of salt be provided.
- **Fertilizers high in N and K should be avoided.**

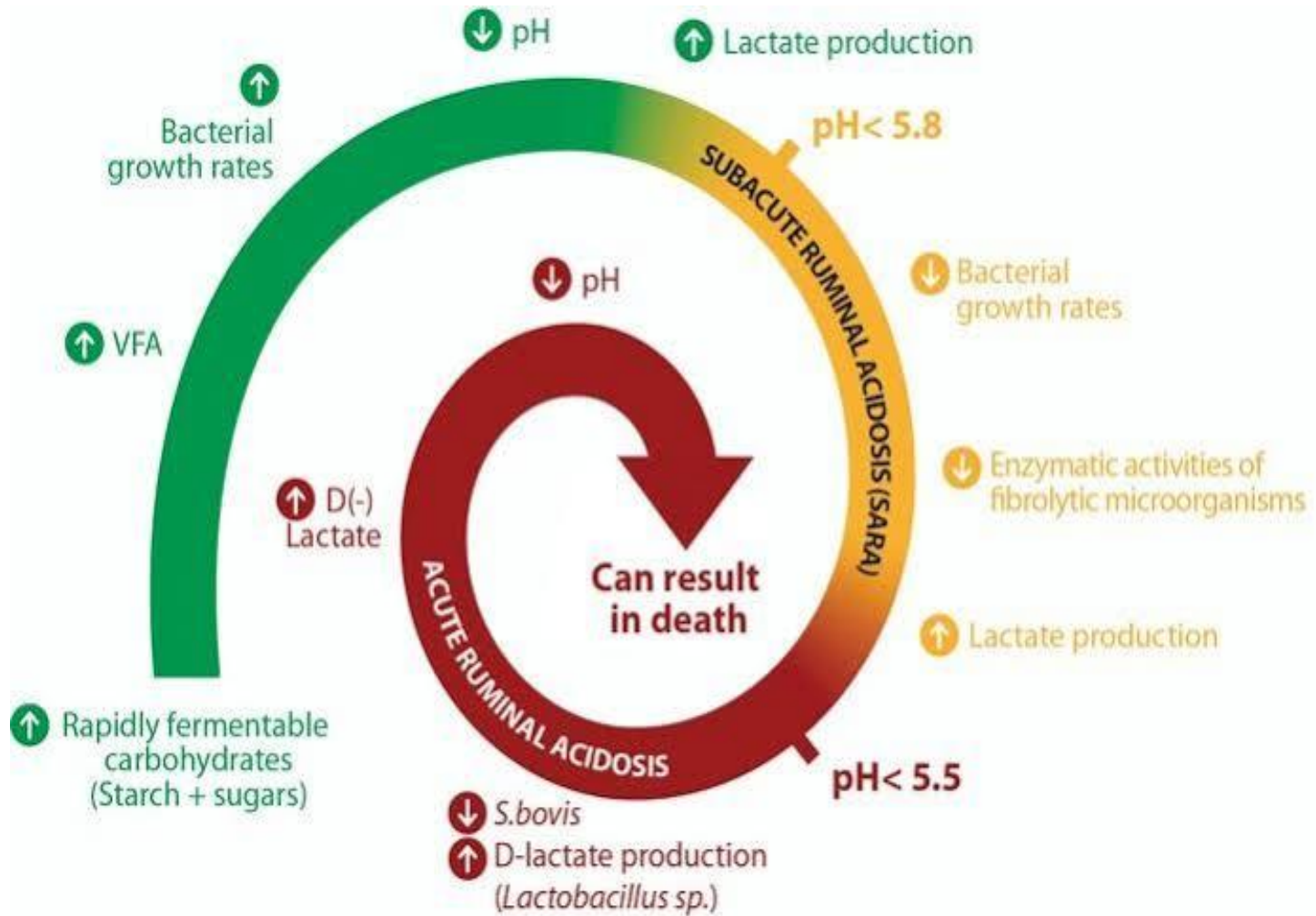


## TREATMENT:

- 200 ml of 50% solution of **epsom salt**( $\text{MgSO}_4$ ) given subcutaneously.
- Animals removed from affected pasture and fed 50-60gm  $\text{MgO}$  daily for 7-10 days.
- In calves-s/c 10 mg  $\text{MgSO}_4$  +sterile water followed by oral administration of 10-15gm of  $\text{MgO}$

# RUMINAL ACIDOSIS

- Decreased rumen pH from 6.8 to 5.6-5.1.
- May be lactic acidosis(**grain overload ,grain poisoning,acute indigestion**) or may be due to increased amount of VFAs only.
- Three types – acute-pH-5.2
  - sub-acute-pH-5.5-5.1
  - chronic-pH-5.6
- Sub-acute ruminal acidosis(**SARA**) is not associated with lactic acidosis.
- **Etiology**-ingestion of unaccustomed feed rich in ruminally fermentable carbohydrates.

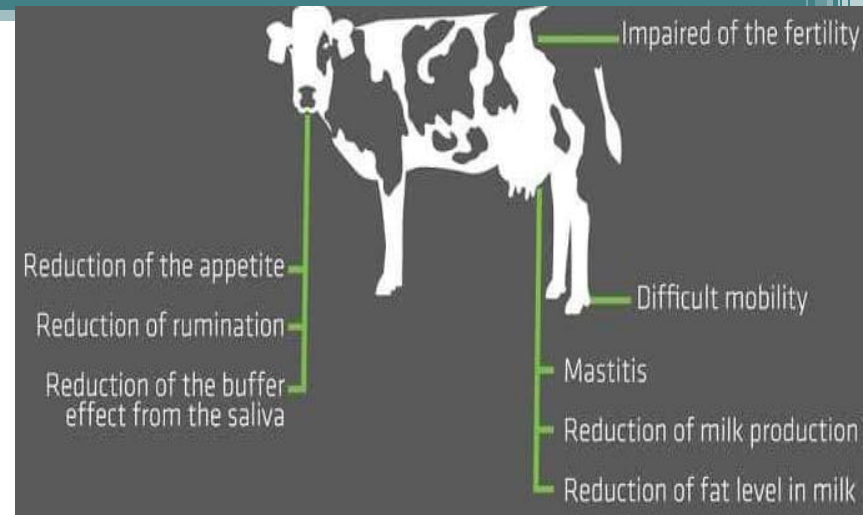


# Prevention-

- Proper balancing of fibre and non-fibre carbohydrate
- Ration should not be fed in separate components.
- Proper adaptation for highly fermentable feed is required.
- Including long fibre particles in diet –increase salivation.
- Addition of dietary buffers like **sodium bicarbonate**.
- Supplementing microbial feed additives, eg; **Megasphaera elsdenii** and **Selenomonas ruminantium**.
- Ionophores (monensin sodium) supplementation.

# Treatment:

- Drenching oral antacids-  
 $Mg(OH)_2, MgO, NaHCO_3$  @1GM/KG body weight.
- Withhold concentrate and feed roughage to stimulate saliva flow.
- Not providing water for 12-24 hrs. orally.
- Antibiotics like penicillin, tylosin, etc. Reduces the risk of liver abscessation.



# DOWNER COW SYNDROME

- A secondary recumbency developed from pressure damage to muscle and nerves.
- Often preceded by milk fever.
- **Etiology**-metabolic-hypocalcaemia, hypophosphatemia, hypomagnesemia, hypokalemia, etc.
- non metabolic-trauma ,infection disorders, etc.
- Downer cow may be alert or non alert.



**Characteristic symptom**-hindlimb are under body or stretched out behind(frog legged) and forelimbs functional( **Creeper's Cow**)



# Prevention:



- Effective strategies to prevent milk fever should be taken.
- Over feeding leads to fattening ,hence should be prevented.
- Comfortable bedding prior to calving should be provided.**Sand is ideal bedding material.**
- Prophylactic administration of calcium.

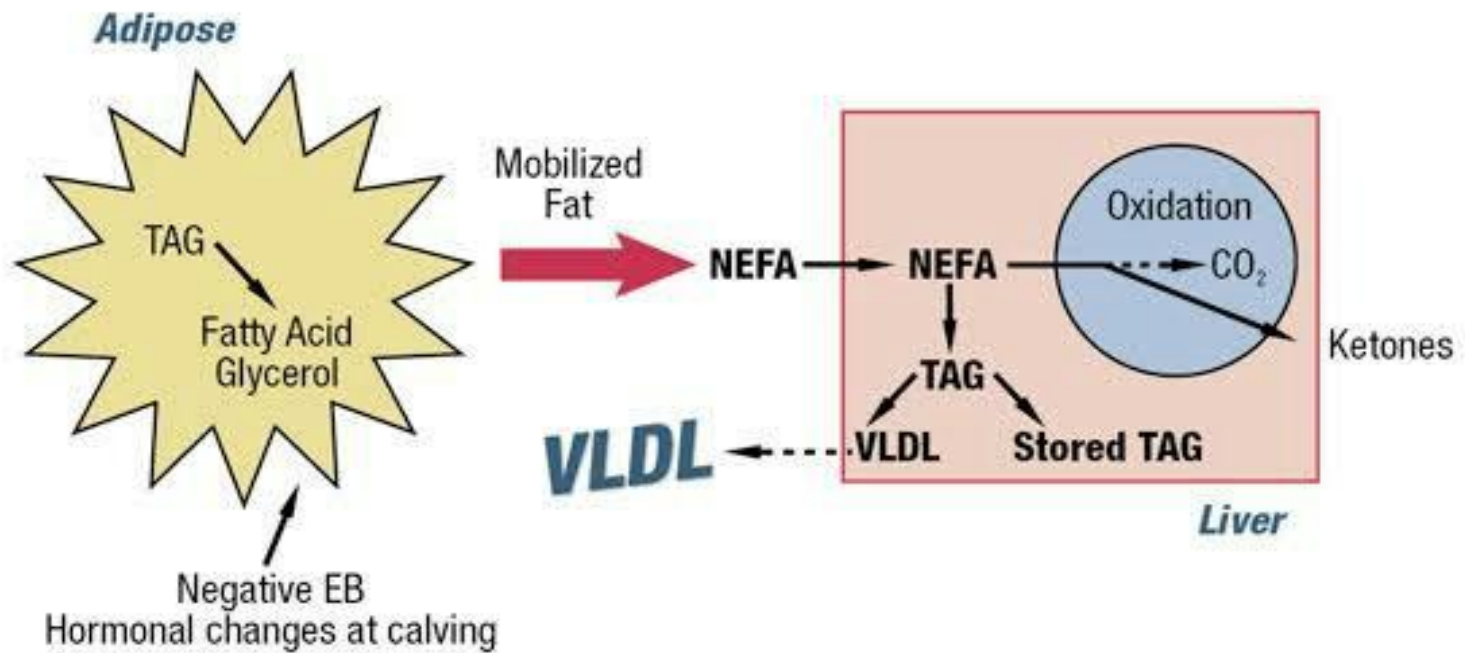
# Treatment:

- Calcium therapy should be given.
- Additional treatment of K,P and Mg should be given.
- Monitoring blood mineral status.
- Supportive care should be given.



# FATTY LIVER DISEASE

- **SYNONYM**-fat cow syndrome , hepatic lipidosis.
- **Etiology**-due to negative energy balance, non esterified fatty acids(**NEFA**) mobilizes from fat stores and accumulates as triglycerides in liver leading to fatty liver.
- Cows that are over-conditioned at calving(**BCS>3.5**) are likely to develop fatty liver.



# Prevention

- BCS of 2.5-3 should be maintained around calving.
- Sudden changes and stress should be avoided.
- Glucose supplementation.
- Slow release insulin compounds be given.

# Treatment:

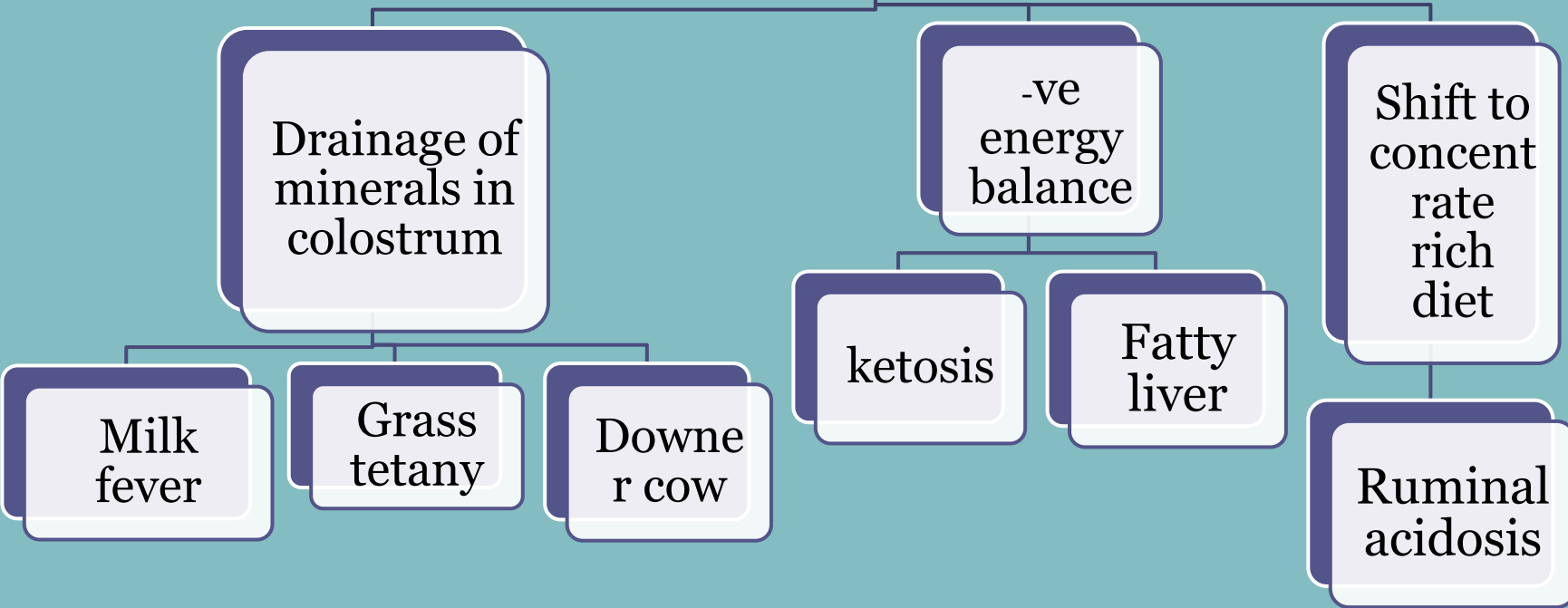
- I/V injection of 500ml of 50% solution of glucose/dextrose which may be combined with oral administration of 250 ml **propylene glycol**.
- Niacin-12 gm orally for 1-2 months.



Fat cows are more prone to lipidosi



# Cow around parturition



# LAMINITIS



- Commonly referred to as **founder** or **sinker**.
- Primarily a disorder of equine.
- Inflammation of laminae in the hoof occurs.
- May be caused due to excessive intake of starch, high grain diet, obesity, etc.
- Leads to lameness, loss of athletic performance, claw deformities such as **slipper foot**.
- Balanced ration low in starch content and adequate fibre should be fed.



# PUERPERAL HYPOCALCAEMIA

- **SYNONYM**- puerperal tetany, **eclampsia**, puerperal hypocalcaemia.
- A disorder of Ca metabolism in bitches.
- Clinical findings are restlessness and panting.
- Ca solutions given I/V results in rapid improvement in 15 minutes.



Quiz time...

???

## Fill in the blanks.

1. NEFA concentration is high in plasma in.....
2. Grain poisoning is also called as .....
3. Normal Ca level in blood plasma is .....
4. Metabolic disorder responds dramatically to ..... administration of needed metabolite.
5. Increased .....content of silage can lead to ketosis.

## Write true or false:

1. Proper administration of calcium in milk fever should be done since calcium is cardiotoxic.
2. Long fibre particles should be added separately in diet to prevent ruminal acidosis.
3. *Megasphaera elsdenii* is lactate producing bacteria.
4. Sweet chloroform like smell appears in bloat.
5. Grass staggers occurs when plasma Mg level falls below 2mg/dl.

# Multiple choice question:

1. Pregnancy toxaemia occurs in
  - a. Cows
  - b. Buffaloes
  - c. Ewes
  - d. Mare
2. Eclampsia is a disease of
  - a. Cows
  - b. Buffaloes
  - c. bitches
  - d. Mare
3. Propylene glycol is used for treatment of
  - a. Milk fever
  - b. Acidosis
  - c. Laminitis
  - d. Ketosis
4. Dietary cation anion balancing is effective to prevent
  - a. Ketosis
  - b. Fatty liver
  - c. Milk fever
  - d. Both a and b
5. Milk fever generally affects
  - a. calves
  - b. Heifers
  - c. Old cattle
  - d. None

# Match the following:

- |                                |                 |
|--------------------------------|-----------------|
| 1. S-shaped recumbent position | a.ketosis       |
| 2. BHB                         | b.milk fever    |
| 3. Cow fever                   | c.ketone bodies |
| 4. Creeper's cow               | d.acidosis      |
| 5. Ionophores                  | e.downer cow    |

Fill in the blanks:

1. Fatty liver
2. Ruminant lactic acidosis
3. 8.8-10.4 mg/dl
4. Systemic
5. Butyric acid

Match the column


- 1.B
- 2.C
- 3.A
- 4.E
- 5.D

True and false:

- 1.T
- 2.F
- 3.F
- 4.F
- 5.F

Multiple choice question:

- 1.c
- 2.c
- 3.d
- 4.c
- 5.c

A wooden-framed chalkboard with the words "Thank You" written in white chalk. The chalkboard is set on a wooden surface. To the left is a red rotary telephone, to the top right is a green plant, and to the right is a black typewriter.

Thank  
You