Clinical nutrition

with refer to some metabolic disorders

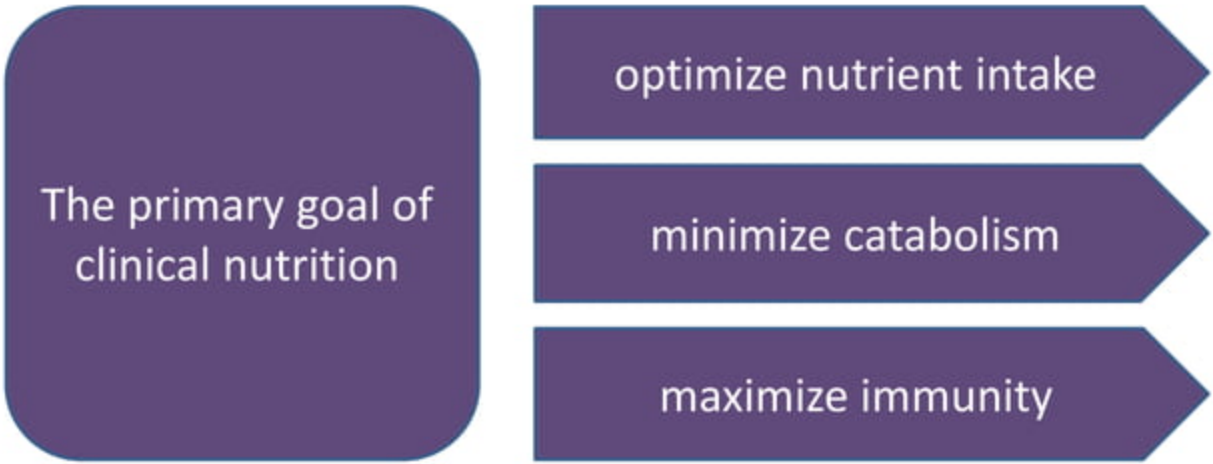
By dr. ali souissi
alyswisy@gmail.com

Clinical nutrition

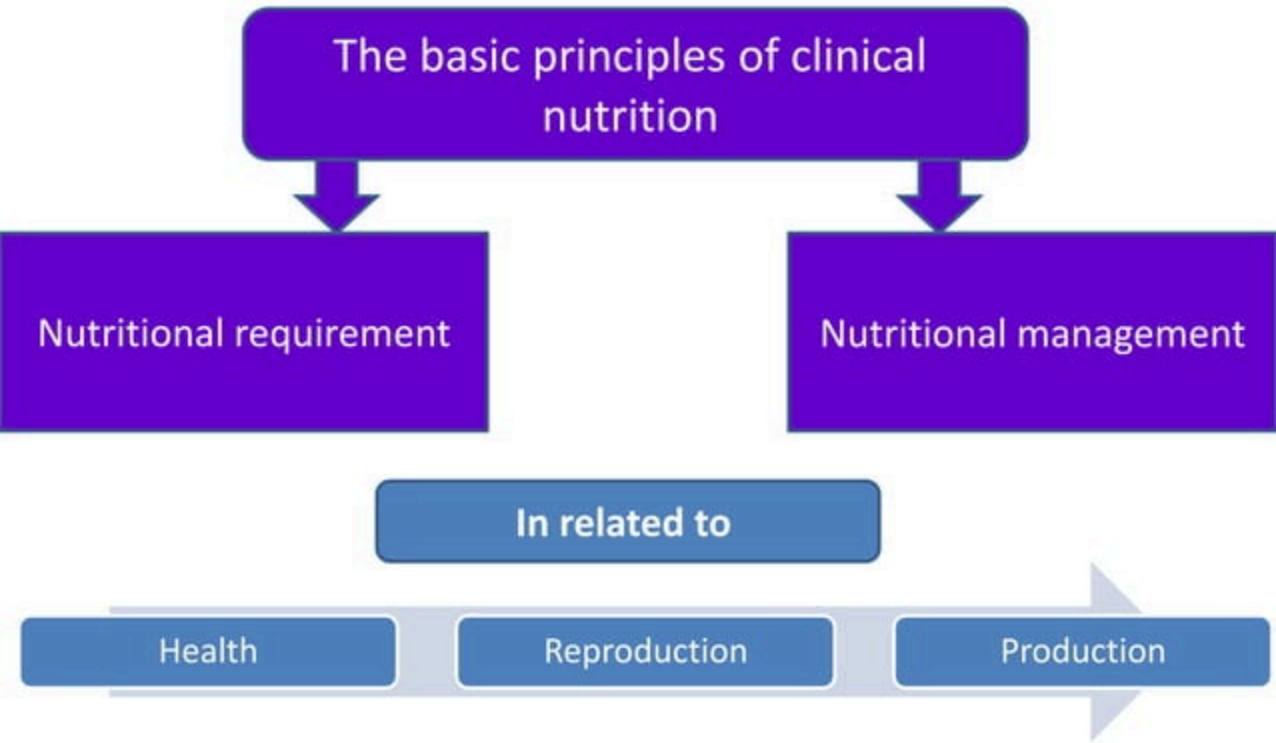
Clinical nutrition can be defined as the dietary management of clinically ill animals.

Or

The use of feed and nutritional supplements in a way to enhance health and prevent disease

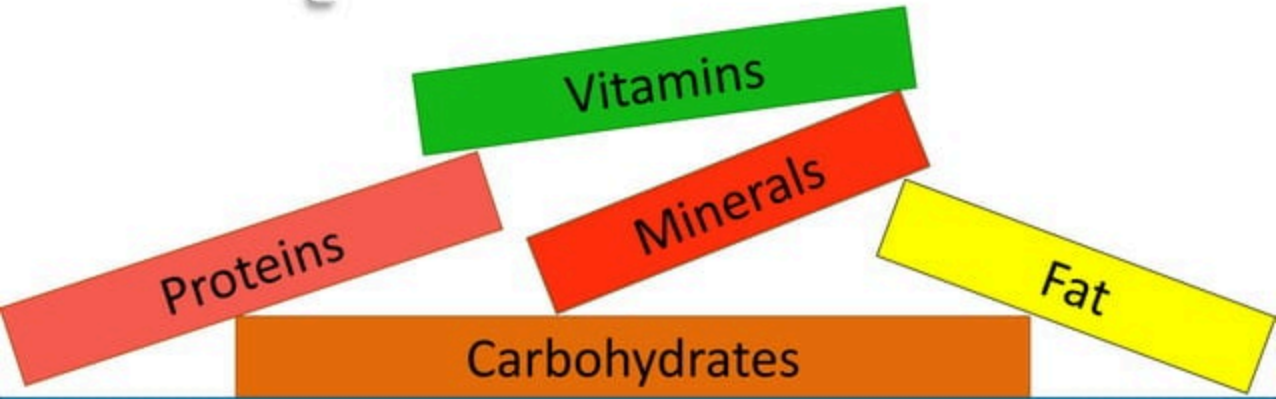


Clinical nutrition

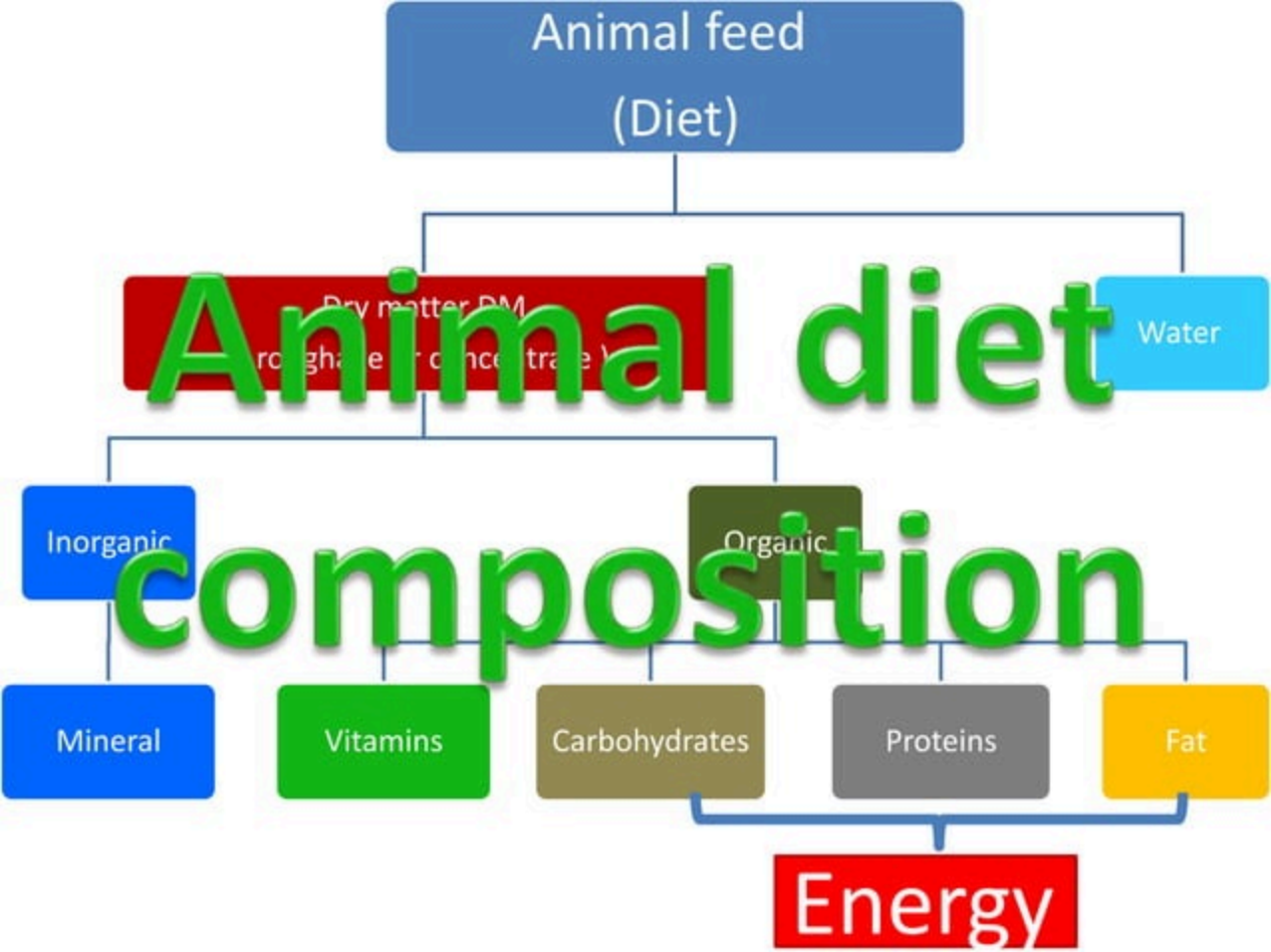


Nutritional requirements

Quantity + Quality



- **Nutrient requirements differ acc. To :**
  1. Age
  2. Level of production
  3. Current and/or desired body condition
  4. Breed
  5. Physiology
     - Lactation
     - Gestation
  6. Pasture activity
  7. Terrain
  8. Pest load
  9. Feed Additives
     - Ionophore
  10. Environment
     - Temperature
     - Season


Animal feed
(Diet)
Water
Inorganic
Organic
Mineral
Vitamins
Carbohydrates
Proteins
Fat
Energy
Animal diet
composition

Water

water

- Water is generally not discussed in great detail because beef cattle generally have free access to water.
- Water is one of the most important essential nutrients. Without good – quality water, production rapidly declined.
- Water functions :

1. important to ensure minerals do not exceed toxic levels or affect animal performance.
2. Important for digestive process.
3. Important for milk production.
4. Important for thermal regulation.

Water intake

- Animal's requirements for water are proportional to energy consumption; 1 ml of water for every kcal of metabolizable energy used.
- Lactation and high levels of minerals in water and feed also tend to increase water intake

Animal	Litre /day	Gallon /day
Beef cattle	26-66	6.5-17
Dairy cattle	38-110	9.5-28

Water related disorders

Decrease water intake

Increase water loss

Water born disease

Decrease water intake

Poor quality water

- Hardness
- pH deviation
- Contamination

  Fertilizer

  Fecal material

  Crop residue

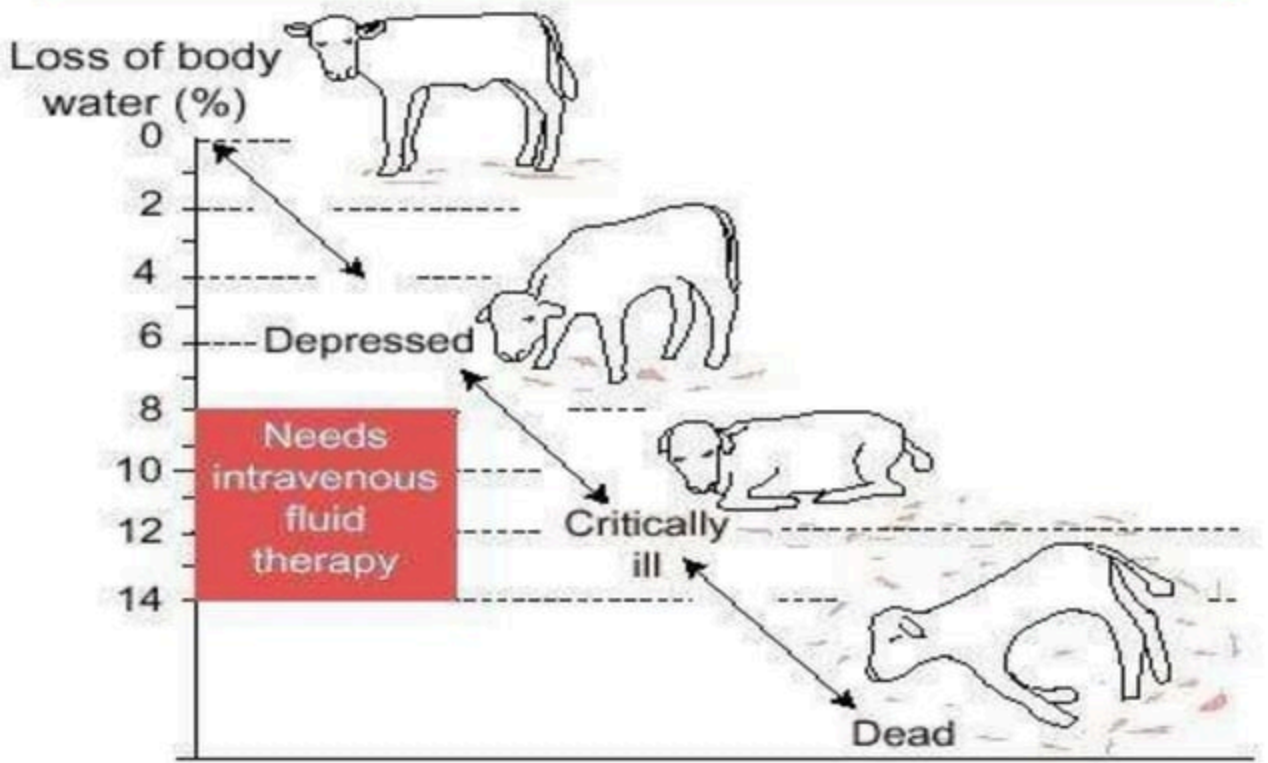
Decrease water intake

- On average, a dairy cow will consume 25 gallons of water each day.

- **Decrease milk production.**
- **reduce health status.**

decreased producer profitability.

excessive water loss

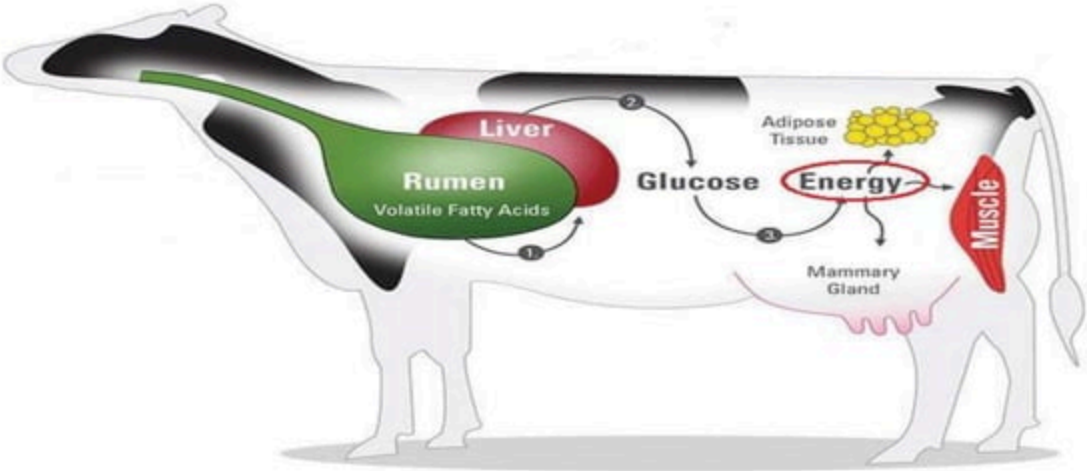


Water born disease

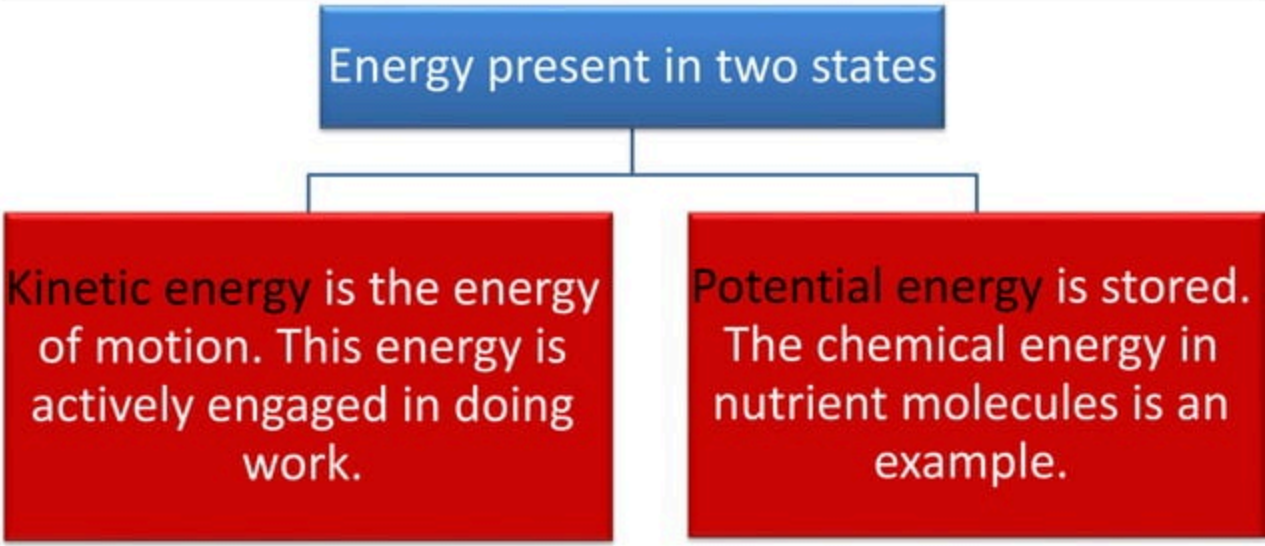
- Water act as a vector for a lot of diseases that affect cattle such as FMD , LSD , Cryptosporidiosis ..etc. of long list of harmful fatal diseases.
- So water must undergo high level of hygiene and biosecurity through cleaning, disinfection and frequented analysis

Energy

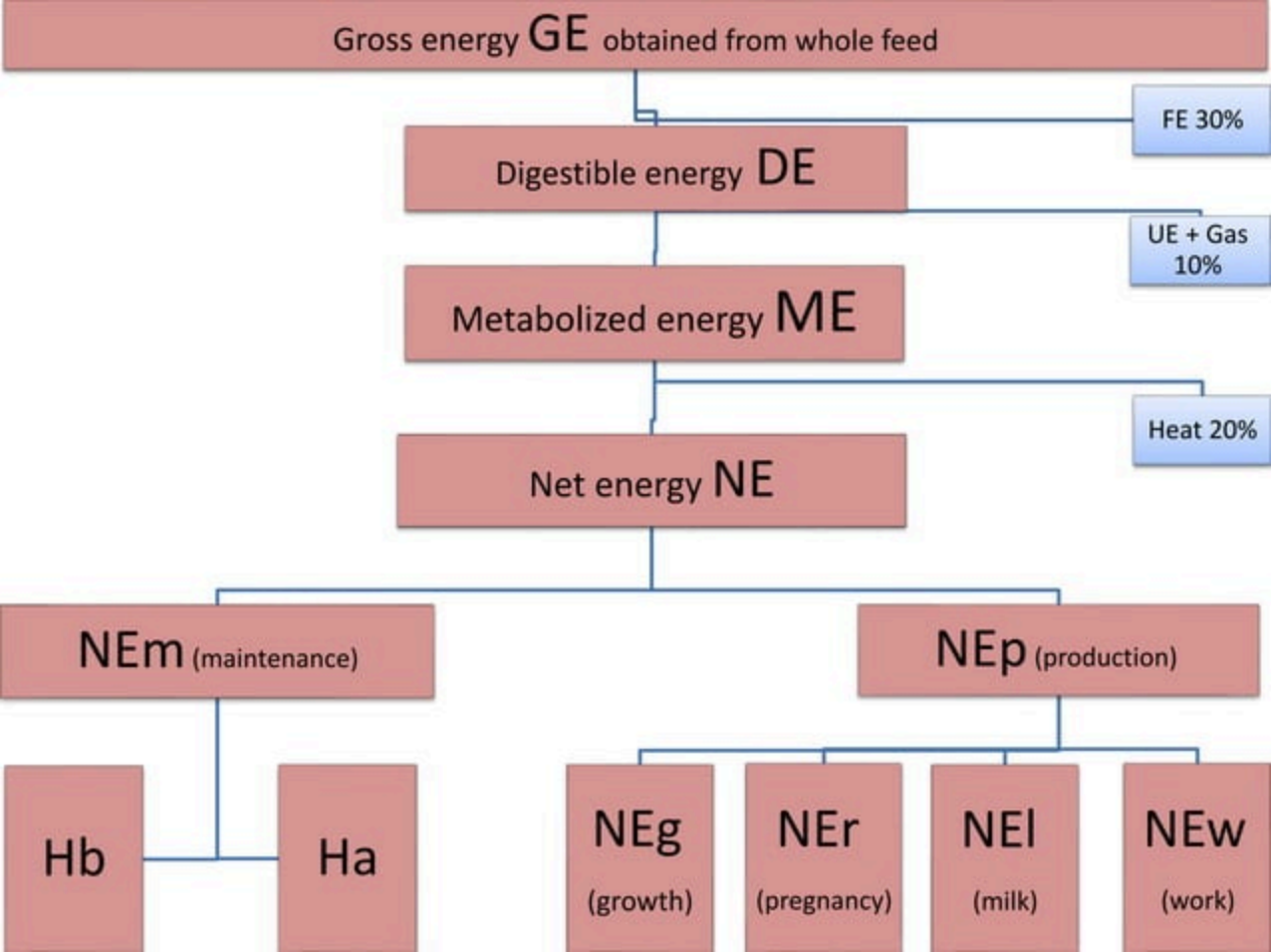
Energy is not actually a nutrient, but it is contained within protein, carbohydrates and fats. For practical purposes, energy will be considered a nutrient.



Energy is the most critical consideration in animal nutrition.



- It is measured as heat expressed as kilocalories (kcal)or mega calories (Mcal)
- Kcal = 1000 calories
- Mcal = 1000 kcal


Gross energy GE obtained from whole feed
FE 30%
Digestible energy DE
UE + Gas 10%
Metabolized energy ME
Heat 20%
Net energy NE
NEm (maintenance)
NEp (production)
Hb
Ha
NEg (growth)
NEr (pregnancy)
NEl (milk)
NEw (work)

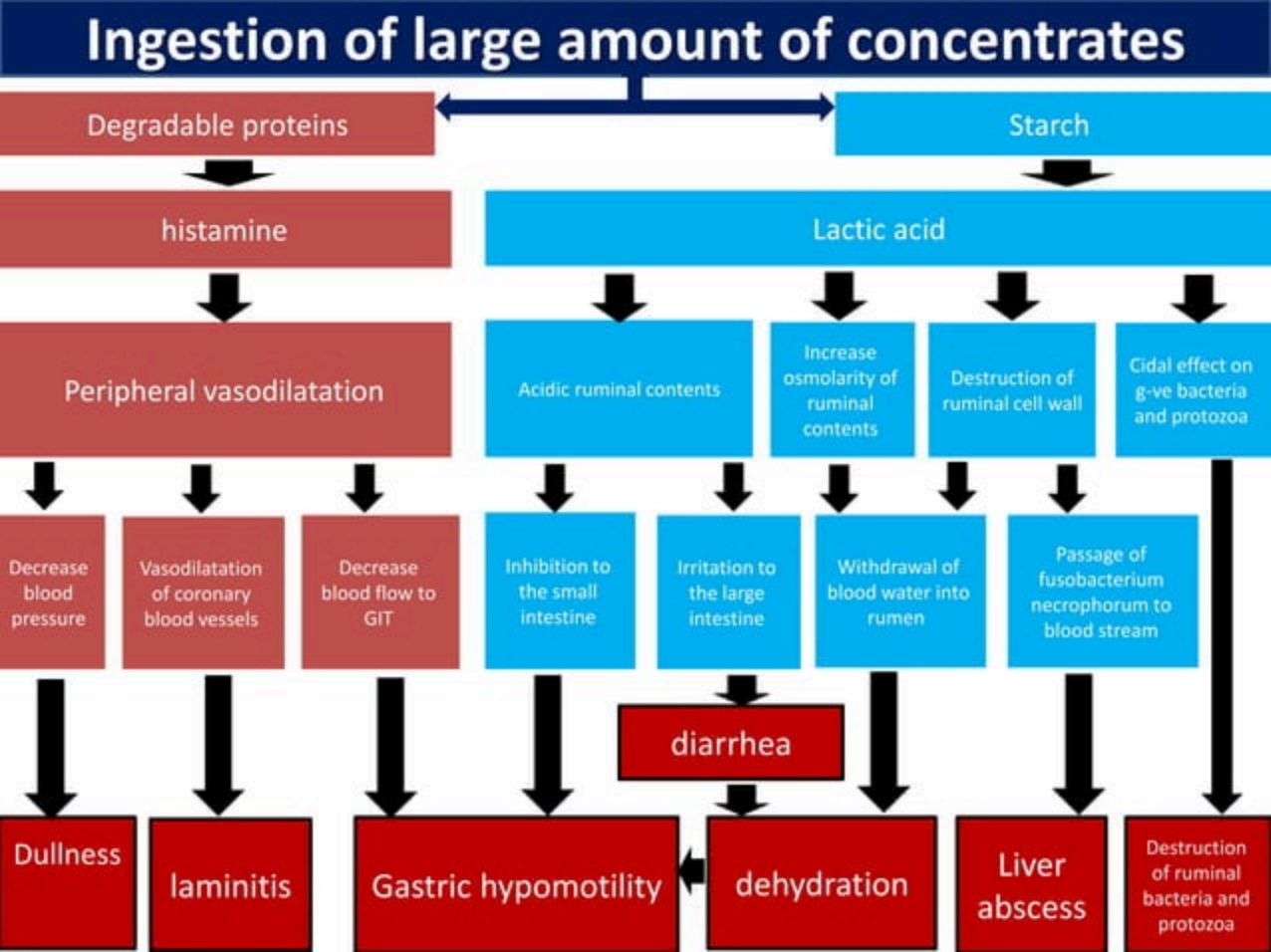
For an example

- Each kilogram of CPC dairy cattle feed 16% give 1.99 Mcal as NEl
- kg feed = 1990 Kcal

- Each kilogram of CPC fattening grower 14% give 1.25 Mcal as NEg
- Kg feed = 1250 Kcal

Energy

	
➢ Drop in production . ➢ loss of weight (emaciation) ➢ Animals die when they have lost about 25-30% of normal body weight. ➢ Death is thought to be due to protein depletion and loss of respiratory and cardiac muscle function. ➢ Energy restriction delays puberty. ➢ In adults it reduces estrus behavior, ovulation rates and libido. Conception and birth rates fall.	➢ Obesity predisposes to ketosis and fatty liver in recently calved cattle ➢ This may exacerbate chronic lameness. ➢ Reduces fitness for work. ➢ There is reduced reproductive efficiency in both males and females. ➢ Dystocia is more likely.


Ingestion of large amount of concentrates
Degradable proteins
Starch
histamine
Lactic acid
Peripheral vasodilatation
Acidic ruminal contents
Increase osmolarity of ruminal contents
Destruction of ruminal cell wall
Cidal effect on g-ve bacteria and protozoa
Decrease blood pressure
Vasodilatation of coronary blood vessels
Decrease blood flow to GIT
Inhibition to the small intestine
Irritation to the large intestine
Withdrawal of blood water into rumen
Passage of fusobacterium necrophorum to blood stream
diarrhea
Dullness
laminitis
Gastric hypomotility
dehydration
Liver abscess
Destruction of ruminal bacteria and protozoa

Energy related disorders

Obesity

Laminitis

Ketosis

Emaciation

Obesity

- High body score due to high concentrate level in ration leading to high energy deposited as fat.
- Predisposing to many problems laminitis, dystocia, ketosis, low fertility rate, fatty liver syndrome

laminitis

- Laminitis may be due obesity as high weight of animal press on feet of animal specially on hard ground.
- Laminitis may be due to excessive production of histamine leading to vasodilatation of blood vessels of feet pressing on sensitive lamellae .

ketosis

- Common after calving (early lactation)
- Insufficient Energy as energy demand.
- Decrease glucose level leading to fat utilization leading to increase ketone bodies in blood
- Signs:

loss of appetite , decrease milk production , dullness , acetone breath odor

emaciation

- loss of weight and body fat .
- Cause : negative energy balance , consequence to ketosis
- Treatment : correct the cause

Mineral

- compounds needed for structural integrity, metabolic function and immune function.
- They are classified as macro minerals or trace minerals depending on the amounts needed.

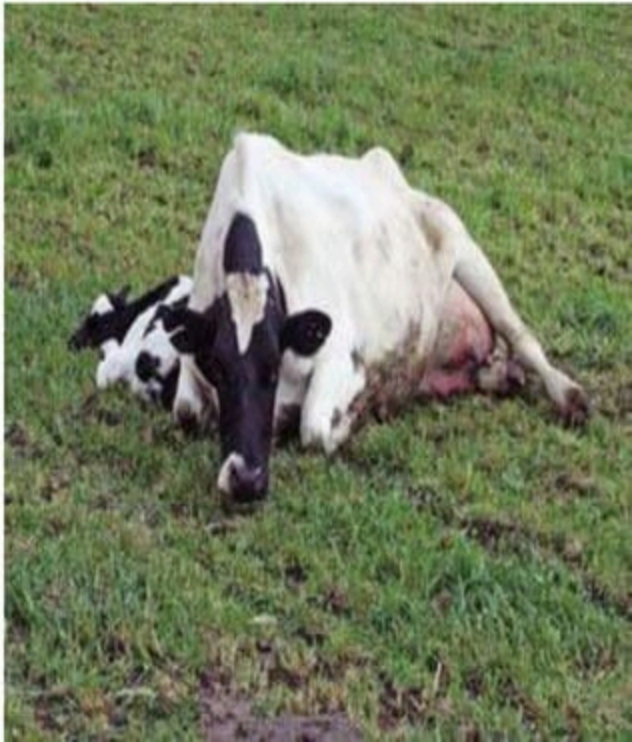
macro	micro
Ca	Fe
Na	I
Mg	Se
K	Cu
Cl	Co
P	Zn
S	Mn

Minerals related disorders

- Hypocalcaemia
- Hypomagnesaemia
- Hypophosphatemia
- Retained placenta
- Udder edema
- White muscle disease

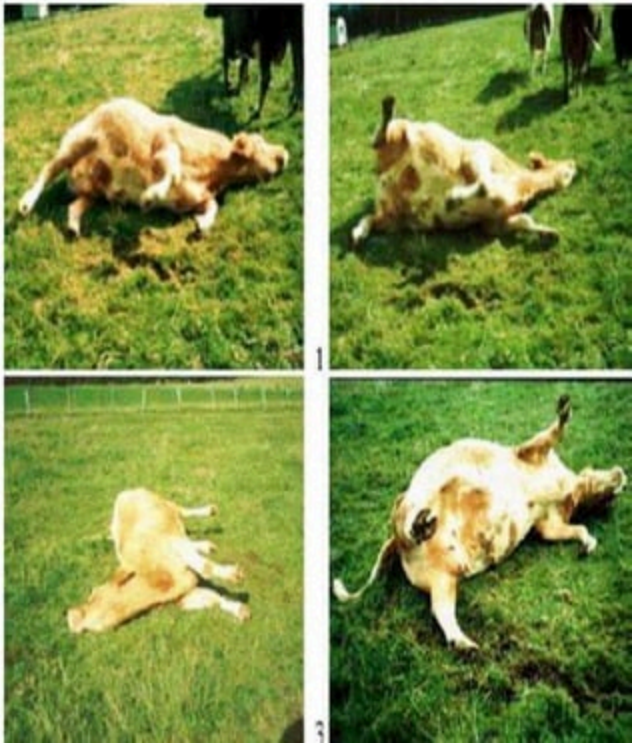
Hypocalcaemia

- " Milk fever "
- Due to high calcium demand and Low blood calcium. After calving.
- Metabolic disorder not nutritional disorder.
- Symptoms pass through 3 stages . Begin with anorexia then sternal recumbency and finally lateral recumbency and coma.
- Treatment : calcium injection



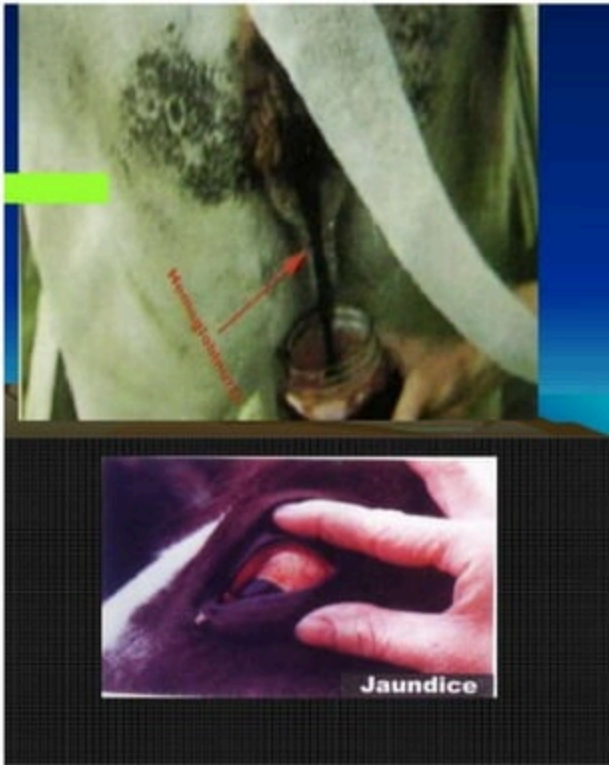
Hypomagnesaemia

- " grass tetany "
- Due to grazing lush grass, Low Mg, High K, N Interferes with absorption in digestive tract.
- Symptoms : unable to stand , stiff muscle convulsions then death
- Treatment : Mg supplement



Hypophosphatemia

- Post parturient Hb urea
- A condition in which the level of phosphorus in blood is too low.
- Common in high producing dairy cows after parturition
- Signs :
  - Hb urea , anorexia , jaundice
- Treatment :
  - Sodium acid phosphate injection
  - Add bran to ration



Retained placenta

- Normally, the membranes should be expelled in from half an hour to 4 or 5 hours after the birth of the calf.
- Causes : many causes leads to retained placenta but from nutritional aspect , retention of placentas is associated with a selenium deficiency.
- Treatment : hormonally

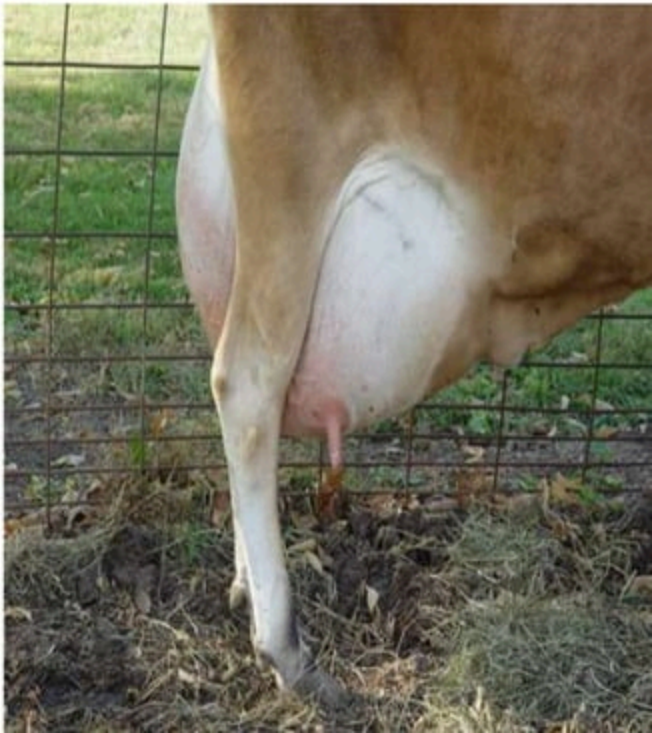
Udder edema

- Heifers with edema retain fluids in the intracellular spaces of mammary tissue, leading to swelling of the udder and teats that sometimes extends into the abdomen.
- Causes: Excessive sodium and potassium.
- Symptoms :

1. Tenderness and distended shape of teats.
2. Milk letdown.
3. increase the risk of mastitis.
4. Severe swelling can do permanent damage to the connective tissue that supports the udder.

- Prevent :

keeping sodium below 0.15 % of the diet and potassium below 1.4 % of the diet during the last three weeks before calving .



White muscle disease

- It is normally is seen in young calves and is associated with deficiencies of selenium or vitamin E, or both.
- Calves affected by the congenital form usually die within 2-3 days of birth due to cardiac muscle degeneration.
- Treatment :

Cattle affected by white muscle disease have been treated with sodium selenite and vitamin E.

- Prevention:

cows are given selenium, usually as sodium selenite four weeks before calving.

WHITE MUSCLE DISEASE

NORMAL MUSCLE

Vitamins

- Vitamins are micronutrients because they are required in small quantities in the digesta.
- In general, vitamins function metabolically either as coenzymes or as hormones.
- Absorption is usually limited to the small intestine.
- Vitamins can be grouped into two categories, fat soluble and water soluble.

Fat soluble vitamins	Water soluble vitamins
• A • D • E • K	• C • B complex (Niacin, Thiamin, B12, Choline, Biotin)
• Must be furnished in diet except vit K	• Can be synthesized by rumen microbes
• Excess can be stored	• Excess secreted with urine

Vitamins related disorders

Hypovitaminosis

deficiency or lack of a vitamin in the food.

Hypervitaminosis

Vitamin excess may result in serious disease.

Vit. A

source	deficiency
Carrots and green foods	• adequate green food leads to abortion or the birth of weak, blind calves, or of those suffering from diarrhea which die within a few days. • Corneal lesions and blindness may also result in growing cattle.

Vit. D

source	deficiency
• (calciferol), is the anti-rachitic principle found in cod-liver oil and cow's milk.	The absence of this vitamin causes rickets.

Vit. E

source	deficiency
(tocopherol) This vitamin is found in oil of seeds and milk .	1. It is necessary for fertility. 2. Vitamin E deficiency is associated with muscular dystrophy. 3. Its absence from a diet has been shown to cause sterility in rats by inducing firstly the death, and later the absorption, of the embryos.

Vit. K

source	deficiency
• Present in alfalfa. • Synthetic preparations are available	concerned with the formation of PROTHROMBIN, and hence regarded as 'the antiinternal-haemorrhage factor' so increase bleeding time

Vit. C

Source Most animals can produce sufficient vitamin C for their own requirements	deficiency
(ascorbic acid) it is found in the juices of most fruits and vegetables.	some cases of infertility may, it is believed, be due to a deficiency, and some cases of navel-ill benefit, it is said, from vitamin C treatment. In hot weather and other stressful situations, additional vitamin C may be needed for all animals.

Vit. B complex

Source All those vitamins can be synthesized in rumen	deficiency
Vitamin B1 (thiamin) is present in the husks of cereal grains	Vitamins of the B complex are mostly synthesized in the rumen, but in the newborn calf a deficiency may occur. this deficiency include loss of appetite, a staggering gait, and muscular spasms.
Vitamin B2 (riboflavin) present in the husks of cereal grains and milk	
Vitamin B3 (pantothenic acid). Necessary for skin health, and growth.	
Vitamin B6 (pyridoxine)yeast and cereals, is important for growth and protein metabolism.	
Vitamin Bl2 is the anti-pernicious anemia	
Biotin, formerly known as vitamin H, is another of the B group of vitamins. It is necessary for the health of skin and hoof	

Good nutritional management guidelines to keep metabolic disease low

- ✓ Feed a ration balanced for protein, energy, fiber, vitamins and minerals.
- ✓ Group cows according to production and adjust body condition accordingly during lactation.
- ✓ Dry cows off at a 3.5 body condition score, the desired score for the dry period and at weaning. Maintain this condition throughout the dry period, avoiding the fat cow syndrome and related metabolic disorders.
- ✓ Provide exercise for dry cows.
- ✓ Maintain a balance of forage-to-concentrate in the total ration after calving to maximize intake but to prevent digestive upsets during adaptation to the peak lactation ration.
- ✓ Feed grass hay or pasture to dry cows to minimize calcium intake to prevent milk fever.
- ✓ Limit grain feeding prior to calving to about 0.5 kg increase per day starting about 15 days ahead of calving. By the 15th day you'll be feeding 6 kg.
- ✓ Limit corn silage fed to dry cows to 15-20 kg daily, and feed 5 kg of grass hay or equivalent forage.
- ✓ Limit concentrate feeding after peak lactation and conception have occurred.
- ✓ Maintain a 12- to 13-month calving interval to avoid long dry periods by providing good health and nutrition measures and expert reproductive practices.

Thank you for your time