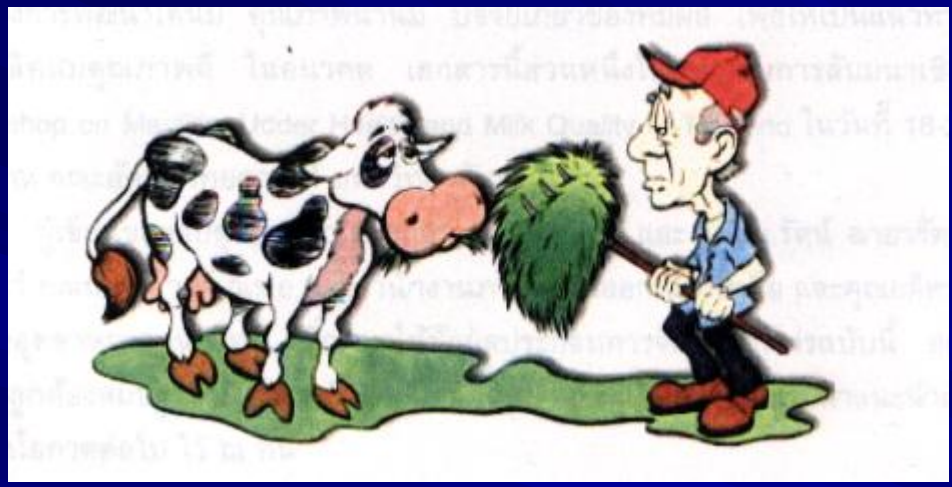
ANIMAL HEALTH AND FEEDING MANAGEMENT FOR DAIRY CATTLE



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INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Metabolic :	**CAUSE**
KETOSIS (2.1%)	**low FIBER**
	NSC
	PROTEIN
	low FAT
	high BODY CONDITION at CALVING
MILK FEVER (4.3%)	**high Ca**
	low PHOSPHORUS
	low MAGNESIUM
	high ENERGY
	high BODY CONDITION at CALVING

INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Metabolic :	**CAUSE**
RETAINED FETAL MEMBRANES (9.4%)	low Se / VIT. E / VIT. A
FATTY LIVER	NSC high BODY CONDITION at CALVING
GRASS TETANY	low MAGNESIUM
RUMINAL ACIDOSIS	high NSC low FIBER / FIBER LENGTH
LEFT DISPLACED ABOMASUM (1.2%)	CHOPPED vs LONG FORAGE PHYSICAL FORM KETOSIS BODY CONDITION

INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Infectious :	**CAUSE**
MASTITIS (14.1%)	**low HYGIENE**
	low Se / VIT. E / VIT. A
METRITIS (9.6%)	**high BODY CONDITION AT CALVING**
	RETAINED FETAL MEMBRANES
	DYSTOCIA
	PYOMETRA
	low HYGIENE

INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Physical :	**CAUSE**
FEET/LEG (3.8%)	ENVIRONMENT STALLS/BEDDING low HYGIENE low Se / Cu / Zn / high BODY CONDITION AT CALVING high LAMINITIS
DYSTOCIA	AGE BULL MILK FEVER CONDITION LOSS BODY CONDITION AT CALVING

INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Physical :	**CAUSE**
DOWNER COW (0.4%)	**MILK FEVER**
	DYSTOCIA
	GRASS TETANY
	INJURY

INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Reproductive :	CAUSE
CYSTIC OVARIES (7.9%)	low Mn / Se / VIT. E METRITIS
ANESTRUS (4.9%)	low ENERGY low Zn / Se / Co / I / Mn /Cu high PROTEIN
INFERTILITY (14%)	low ENERGY low PROTEIN low Cu / Zn / Se / Mn low CAROTENE CONDITION LOSS

INCIDENCE AND ASSOCIATION OF HEALTH PROBLEMS AND RISK FACTORS IN DAIRY HERDS

Reproductive :
ABORTION (1.3%)

CAUSE
low IODINE
low VITAMIN A
TOXINS : ZEARALENONE

EFFICIENCY OF LIVESTOCK IN COVERING FEED NUTRIENTS TO EDIBLE PRODUCTS

	CONVERSION EFFICIENCY (%)	
ANIMAL	PROTEIN	ENERGY
BEEF CATTLE	4	3
SWINE	14	14
BROILERS	23	11
TURKEYS	22	9
DAIRY CATTLE	25	17

CONSIDERATIONS ON DAIRY CATTLE FEEDING

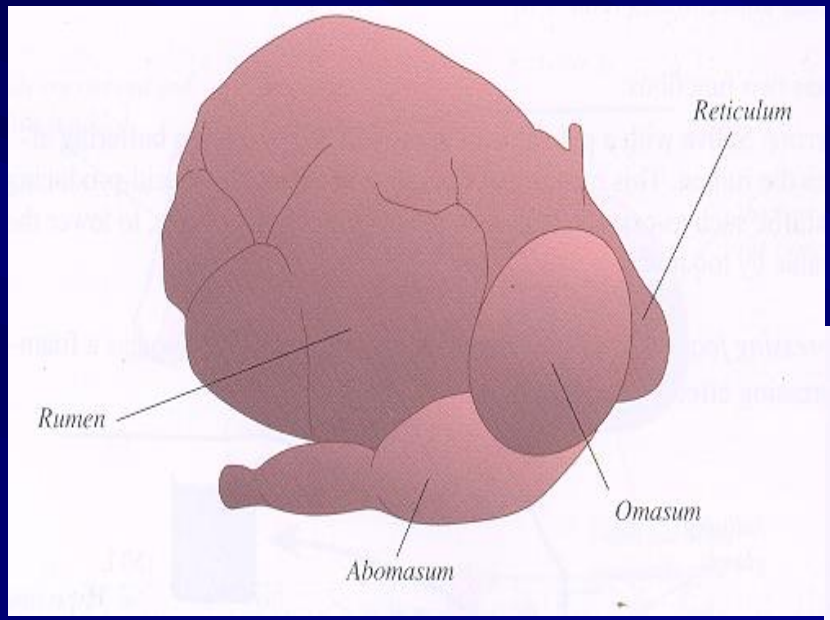
- *INTAKE*
- *OPTIMAL RUMEN ECOLOGY or HEALTHY RUMEN*
- *DIGESTION & ABSORPTION*
- *NUTRIENTS UPTAKE RELATED TO MILK COMPOSITION*
- *NUTRIENT REQUIREMENT*
- *PRACTICAL & ECONOMICAL FEEDING*

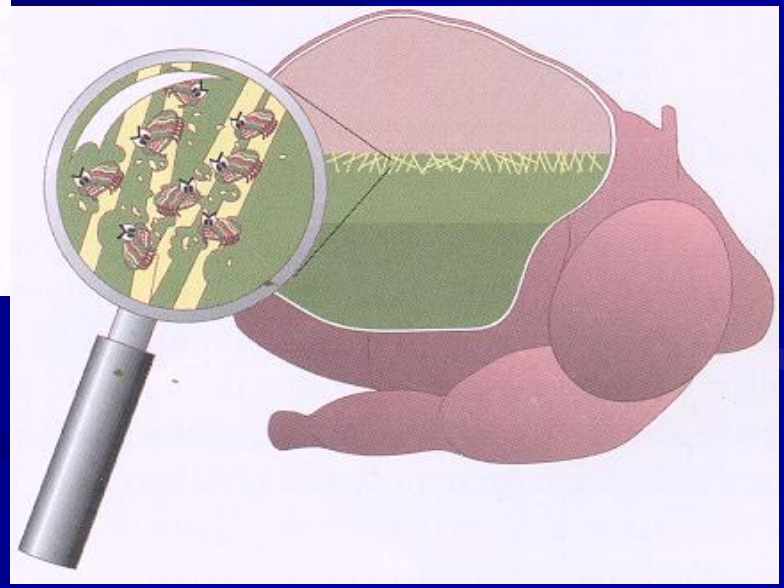
INTAKE (1)

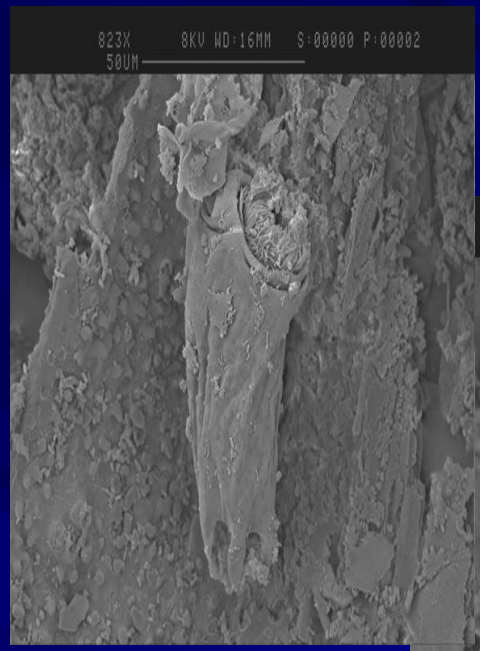
INTAKE (2)

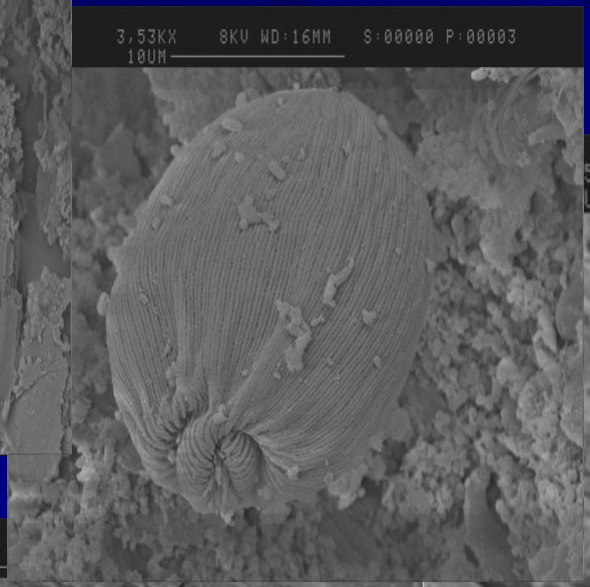
- *CELL WALL CONSTIUENTS : GUT FILL or DISTENSION*
- *PROTEIN CONTENTS : < 7 %CP*
- *ENERGY CONTENTS : 2.0 M cal ME/kg DM*
- *PHYSICAL FORMS : EFFECTIVE FIBER*
- *FREQUENCY : increase INTAKE*
- *MIN. INTAKE : 50 g/kg $W^{0.75}$ OR 1.58 % BW*
- *MAX. INTAKE : ???? > 3-4 % BW*

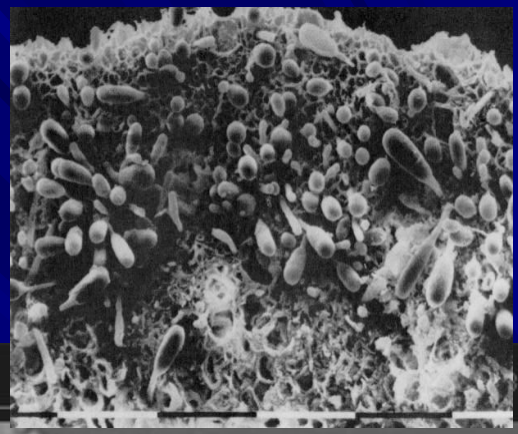
OPTIMAL RUMEN ECOLOGY (1)

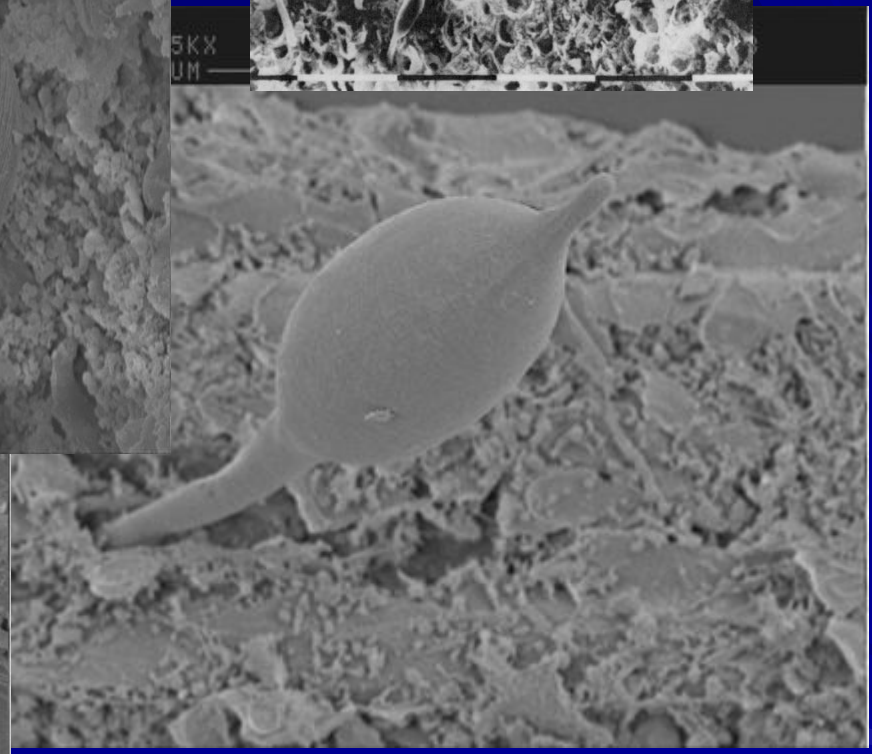


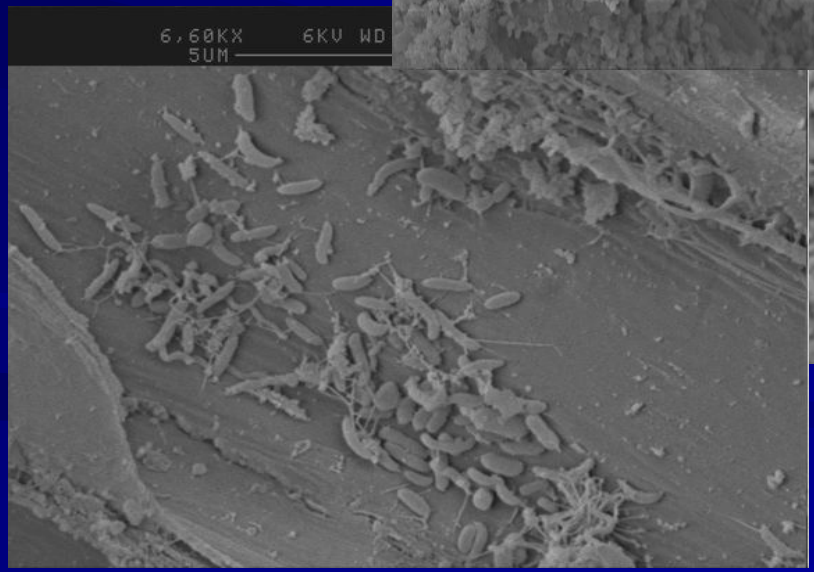








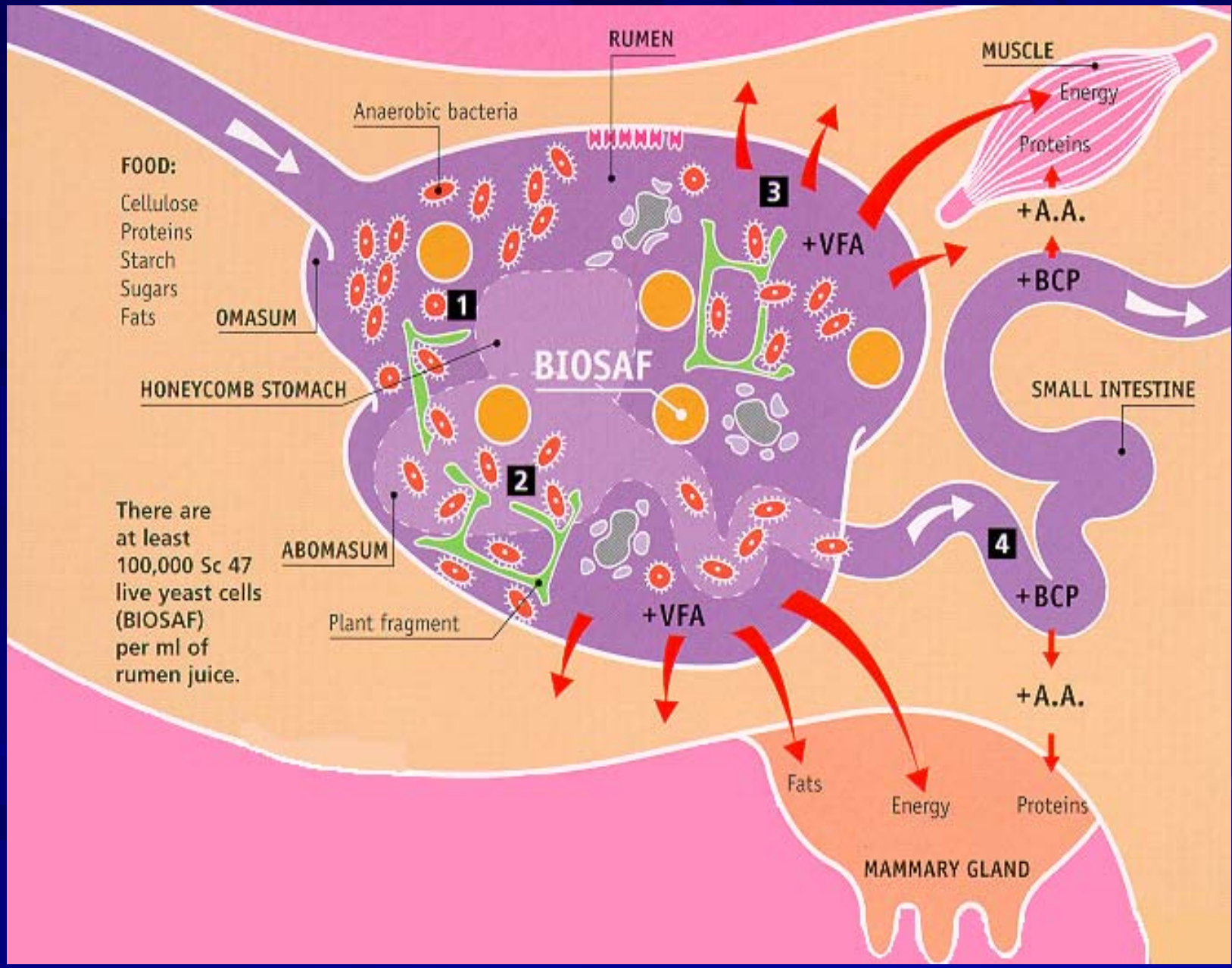




Microorganism in the Rumen

OPTIMAL RUMEN ECOLOGY (2)

- ***MICROORGANISMS : BACTERIA x10^{8}-10^{10} , PROTOZOA x10^{5} , FUNGI x10^{3}-10^{6} cells/ml***
- ***RUMEN pH : 6 - 7***
- ***AMMONIA-NITROGEN :***
  - ***min. 50 mg/L,***
  - ***highest digestion 100 mg/L,***
  - ***highest intake 200 mg/L***
- ***CONTINUOUS FERMENTATION :***
- ***MICROBIAL PROTEIN SYNTHESIS : ~ 50 % of Req.***


RUMEN
MUSCLE
Energy
Proteins
Anaerobic bacteria
FOOD:
Cellulose
Proteins
Starch
Sugars
Fats
OMASUM
3
+VFA
+A.A.
+BCP
1
BIOSAF
HONEYCOMB STOMACH
SMALL INTESTINE
2
There are at least 100,000 Sc 47 live yeast cells (BIOSAF) per ml of rumen juice.
ABOMASUM
4
+BCP
Plant fragment
+VFA
+A.A.
Fats
Energy
Proteins
MAMMARY GLAND

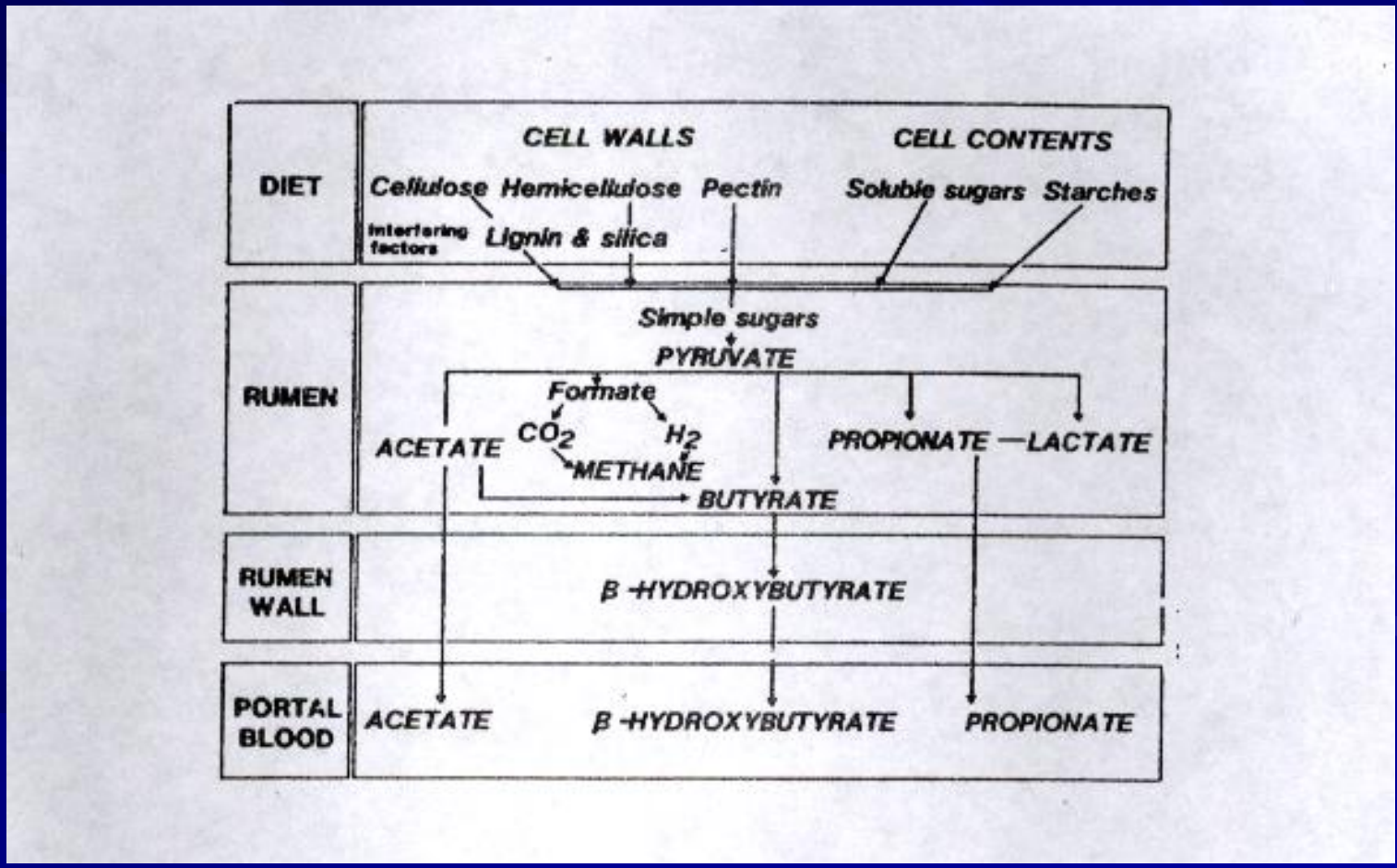
DIGESTION & ABSORPTION (1)

- ***CARBOHYDRATE :***
- ***NON-STRUCTURAL CARBOHYDRATE (NSC) : sugars, starch, fructosans***
- ***STRUCTURAL CARBOHYDRATE (FIBER) : cellulose, hemicellulose, pectin substances, beta-glucans***

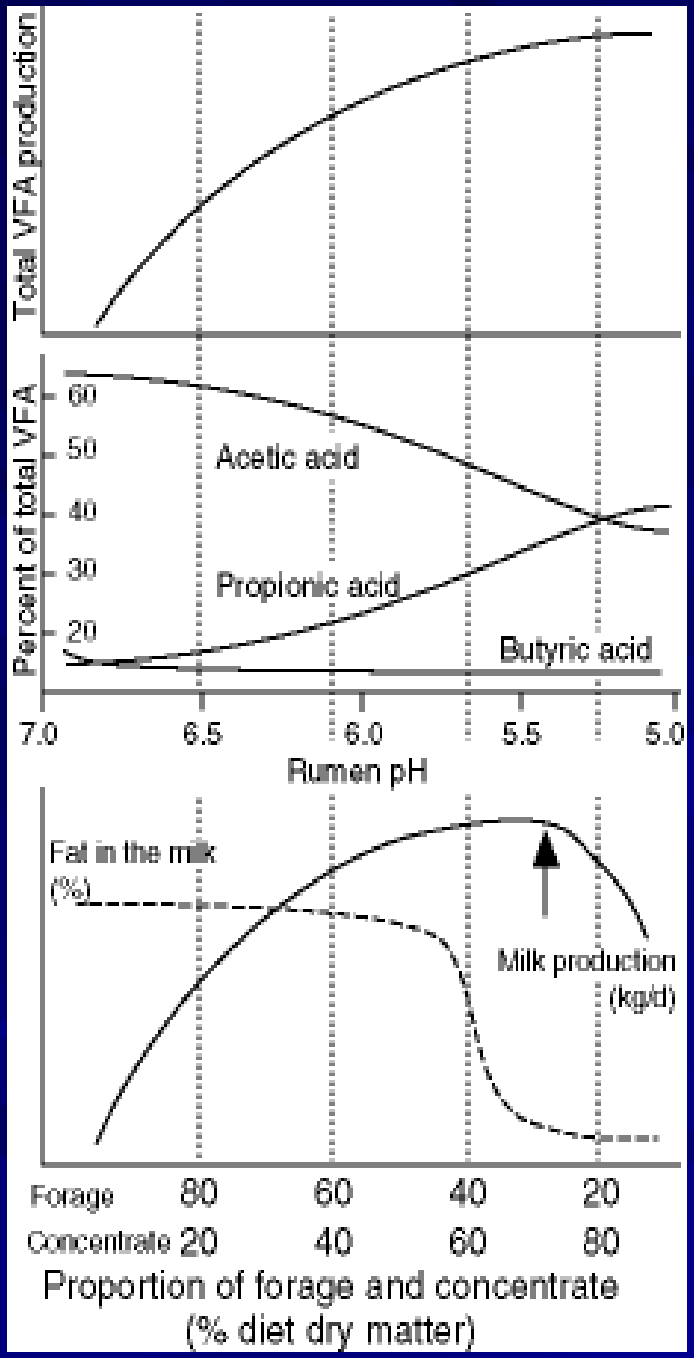
- ***END PRODUCTS : VOLATILE FATTY ACIDS (VFA) =***
- ***C_2, : C_3 : C_4***

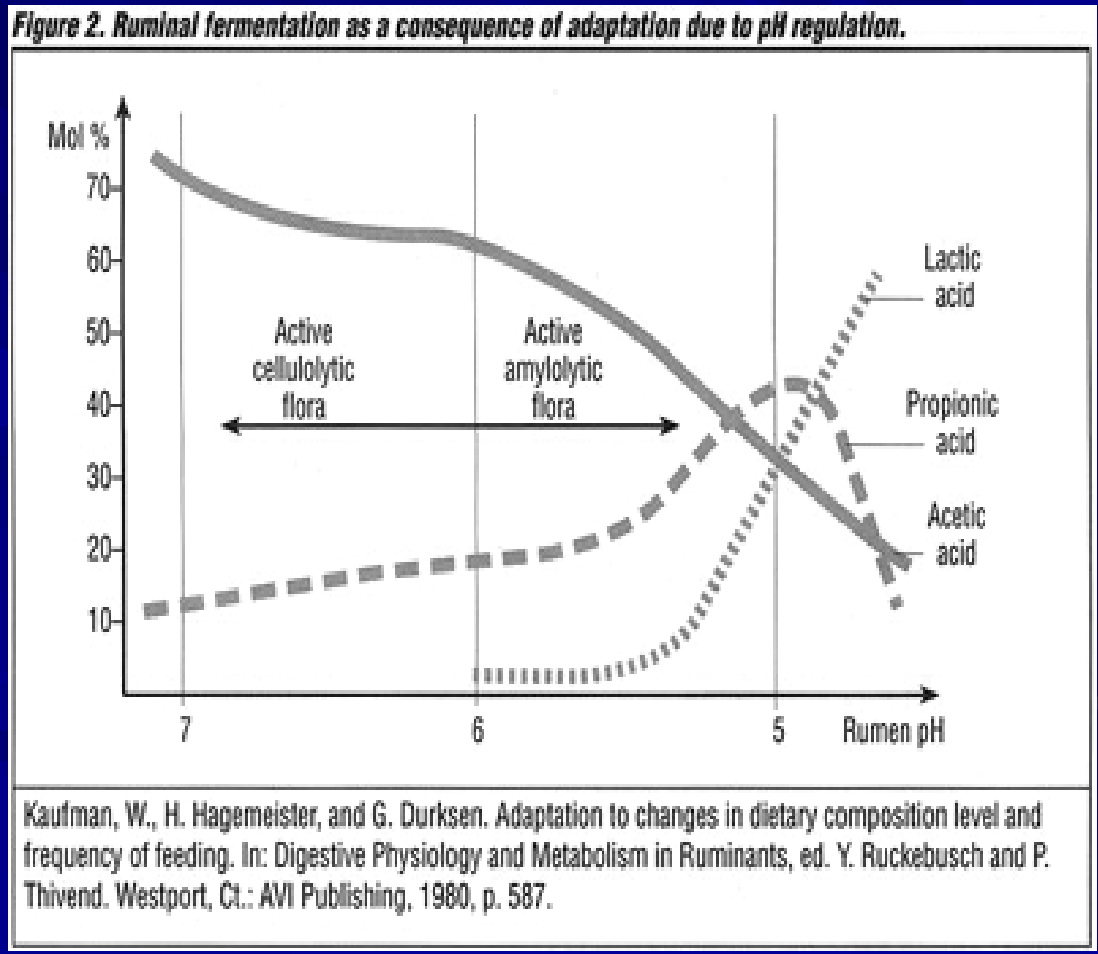
- ***HIGH CONCENTRATE : high C_3 ~ 25-30 % , low C_2 ~ 65 %***
- ***HIGH FIBER : low C_3 ~ 20-25 %, high C_2 ~ 70-75 %***
- ***ABSORPTION : RUMEN***

DIGESTION & ABSORPTION (2)



DIGESTION & ABSORPTION (2)





DIGESTION & ABSORPTION (3)

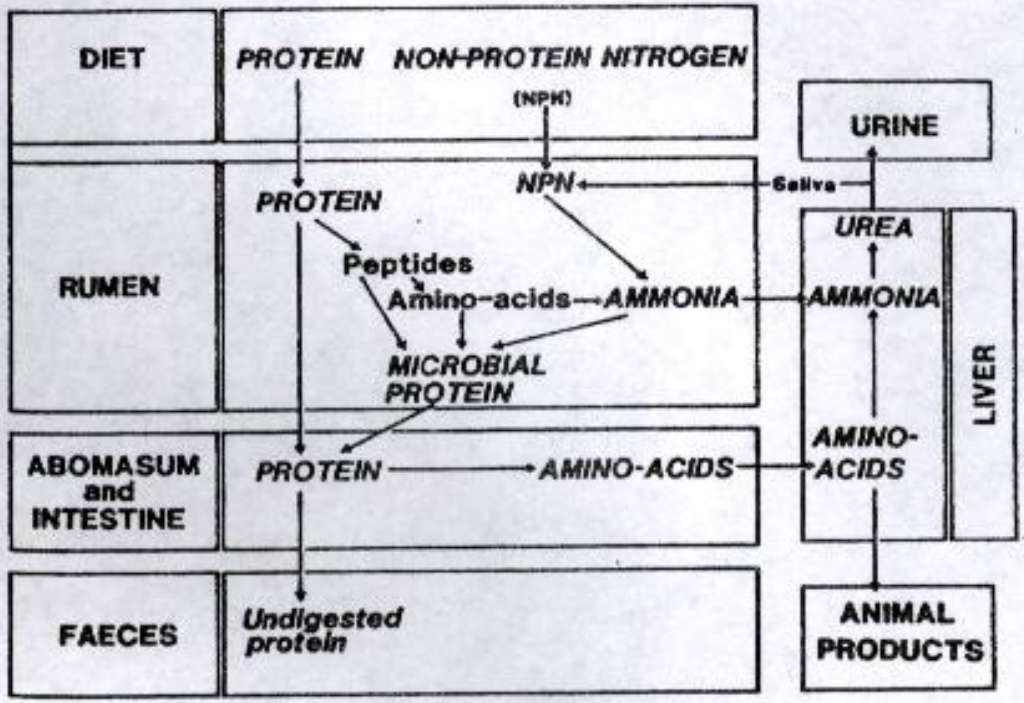
- ***PROTEIN :***
- ***TRUE PROTEIN & NON-PROTEIN NITROGEN (NPN)***

- ***RUMEN DEGRADABLE PROTEIN (RDP)***
- ***END PRODUCTS : AMMONIA-NITROGEN (NH_3-N)***

- ***MICROBIAL PROTEIN SYNTHESIS : NH_3-N + KETO ACIDS***
- ***RUMEN UNDEGRADABLE PROTEIN (UDP) or BYPASS PROTEIN***

- ***ABSORPTION : SMALL INTESTINE AS AMINO ACIDS***

DIGESTION & ABSORPTION (4)



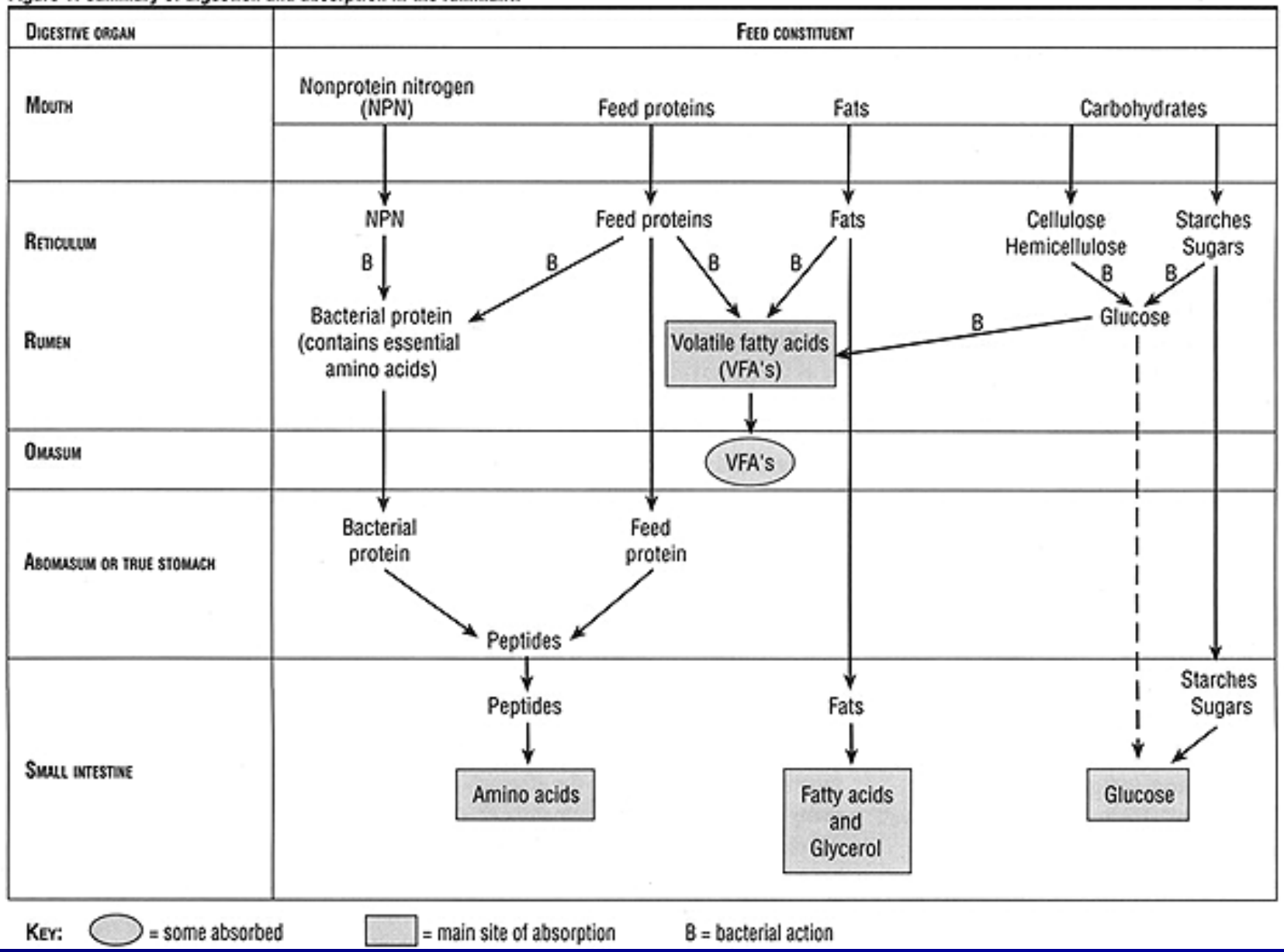
DIGESTION & ABSORPTION (5)

- ***LIPID :***
- ***TRIGLYCERIDES, PHOSPHOLIPIDS, GALACTOLIPIDS***

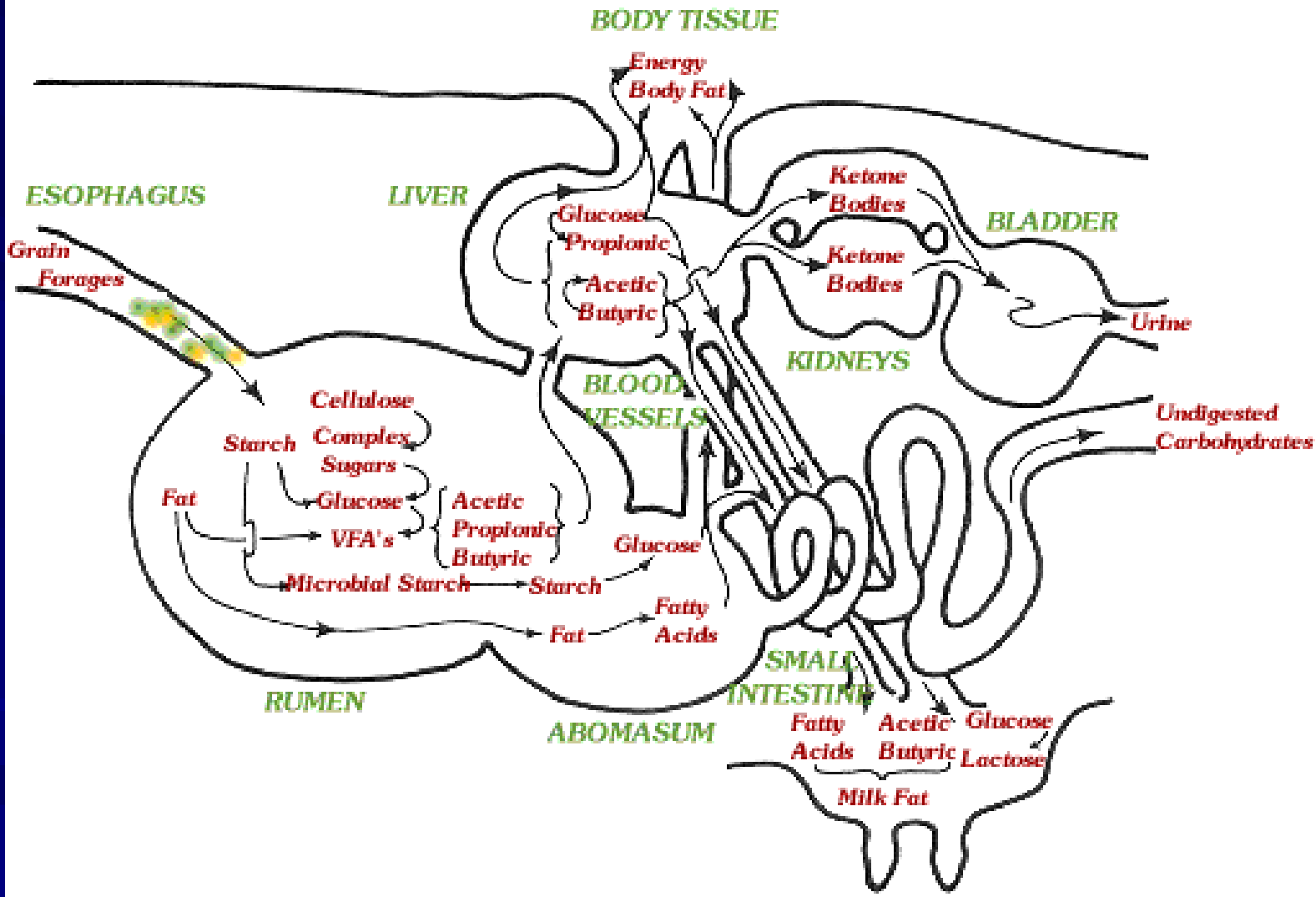
- ***END PRODUCTS : FREE FATTY ACIDS (most SATURATED FATTY ACIDS) : medium (C_{10} -C_{16}) & long chain (C_{18} -C_{22}) FA***

- ***ABSORPTION : SMALL INTESTINE AS FATTY ACIDS***

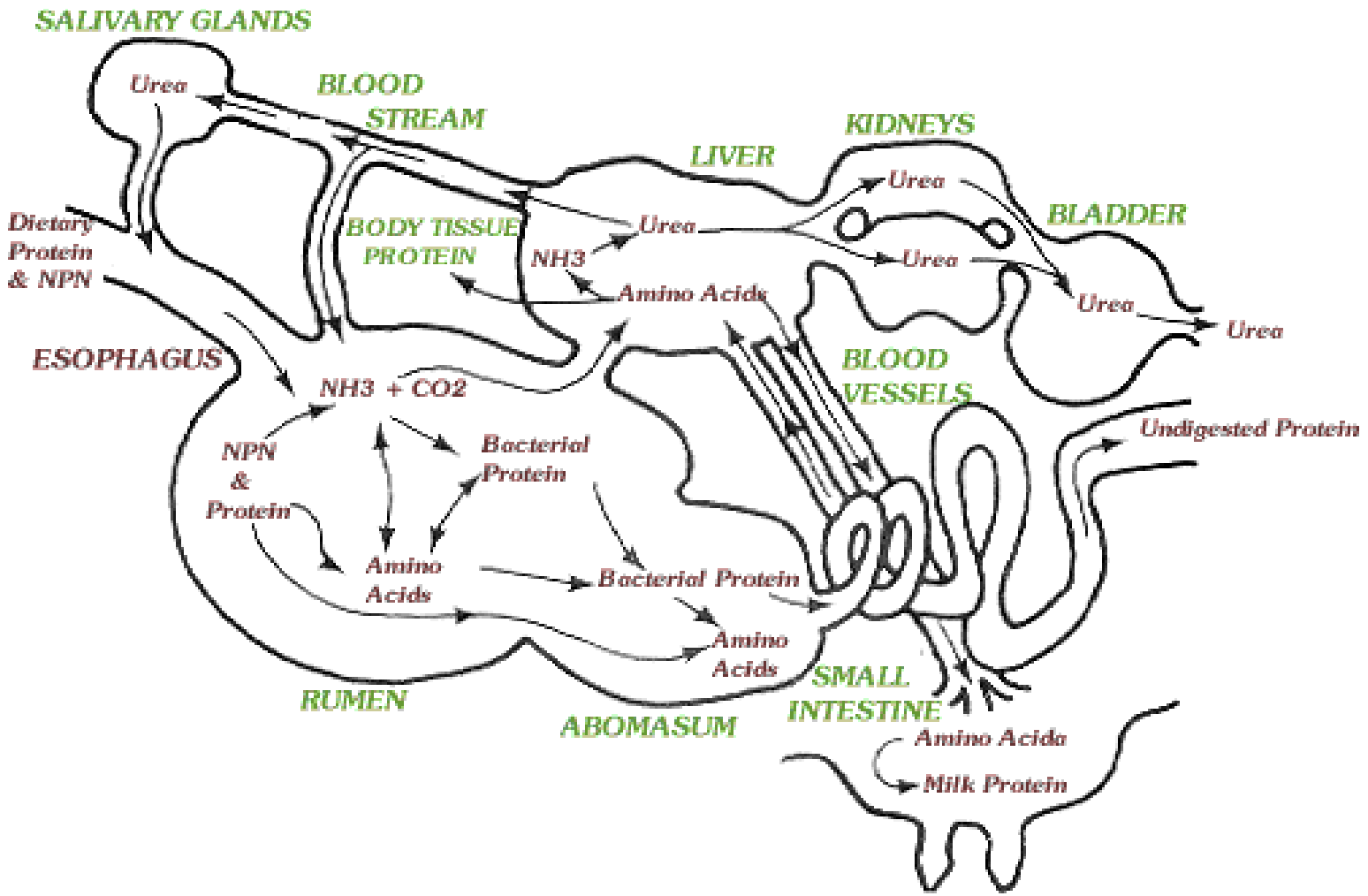
Figure 1. Summary of digestion and absorption in the ruminant.



ENERGY PATHWAYS IN THE DAIRY COW



NITROGEN PATHWAYS IN THE DAIRY COW



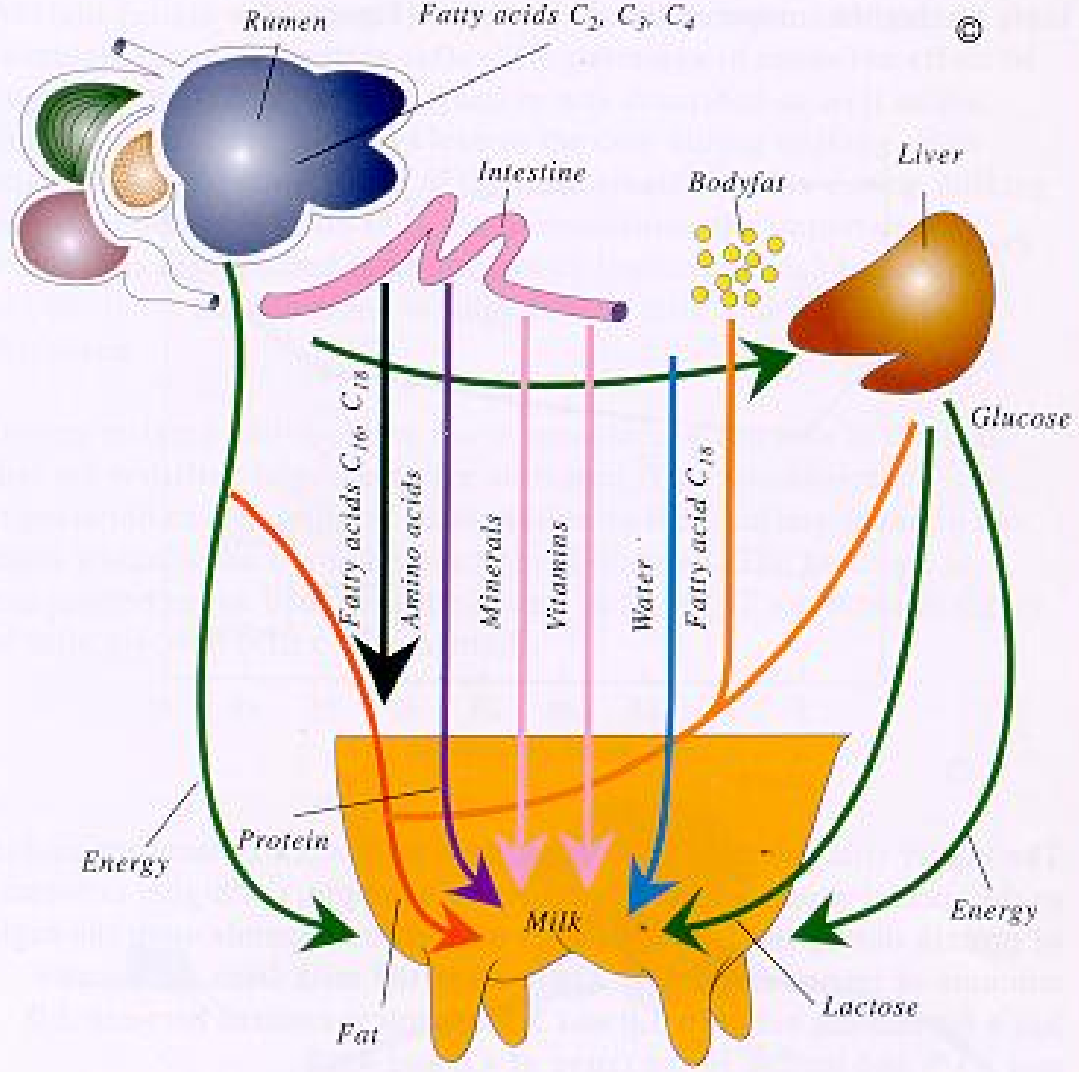
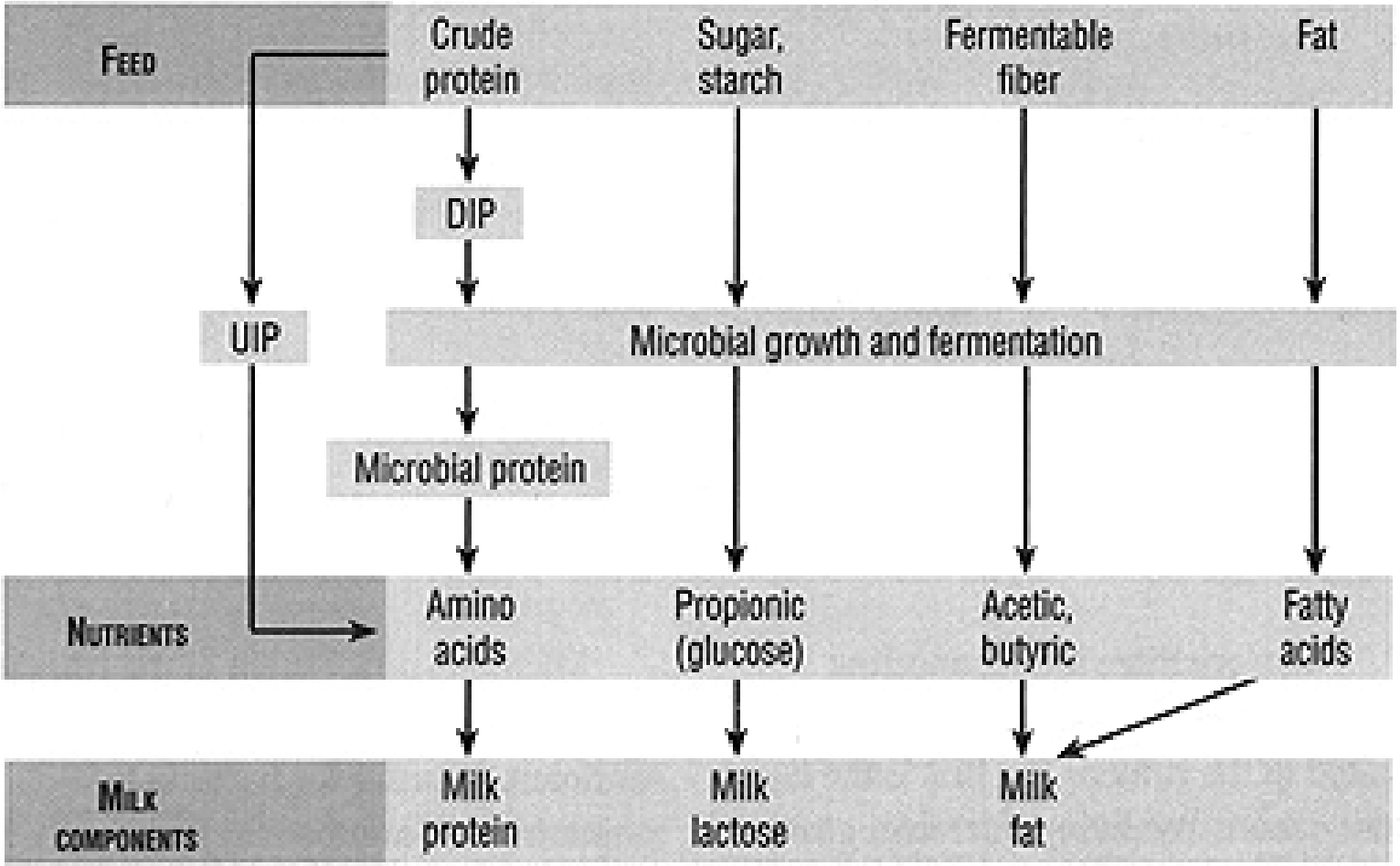


Figure 10.
Precusors of milk, transported where the syntesis of milkfat, milk-protein and lactose take place, to the udder.

Figure 3. Feed, nutrient flow from the rumen, and milk components.



Source: Snilfen, C. J. and H. H. Herdt. The Veterinary Clinics of North America: Food Animal Practice, Vol 7, No 2. Philadelphia, Pa.: W. B. Saunders, 1991.

Note: UIP = undegradable intake protein; DIP = degradable intake protein.

Animal Health and Feeding Practices

- ***Rumen acidosis*** *: low pH in the rumen*
- ***Pregnancy Toxaemia / Ketosis*** *: high ketone body in blood (acetone, BHBA, ect)*
- ***Milk fever*** *: low Ca in blood*
- ***Grass tetany*** *: low Mg in blood*
- ***Abomasal displacement***
- ***Bloat*** *: an excess accumulation of gas*

Rumen Acidosis

- ***Feedlot cattle and high producing dairy cattle***
- ***High concentrate in ration***
- ***Steptococcus bovis and Lactobacillus sp.***
- ***pH < 5.0***

- ***Leads to :***
  - ***Laminitis***
  - ***Rumenitis***
  - ***Cerebrocortical necrosis (CCN) or***
  - ***Polioencephalomalacia (PEM)***

Rumen Acidosis (2)

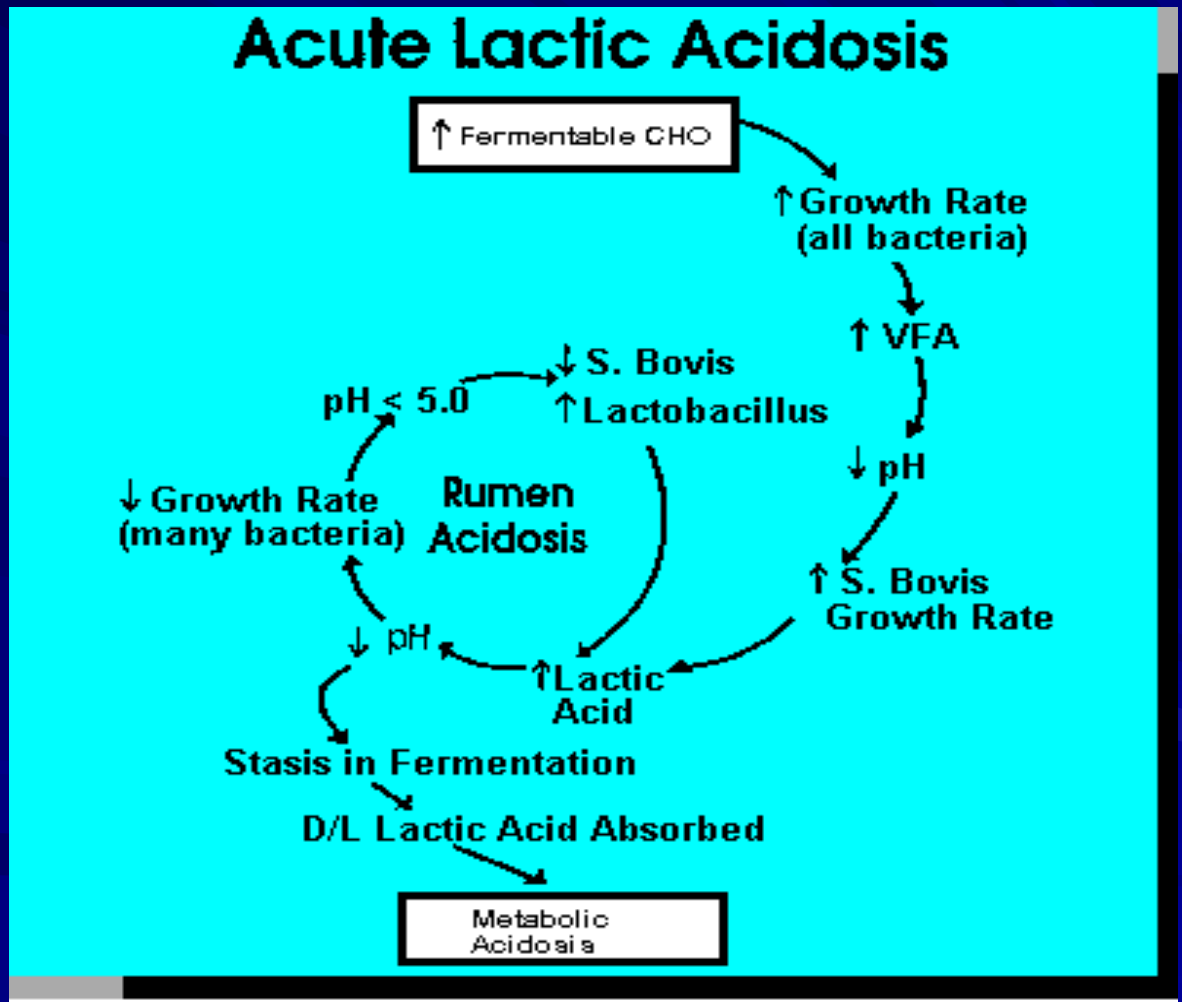


Figure 1. Sequence of events associated with the induction of acute ruminal lactic acidosis (32).

Rumen Acidosis (3)

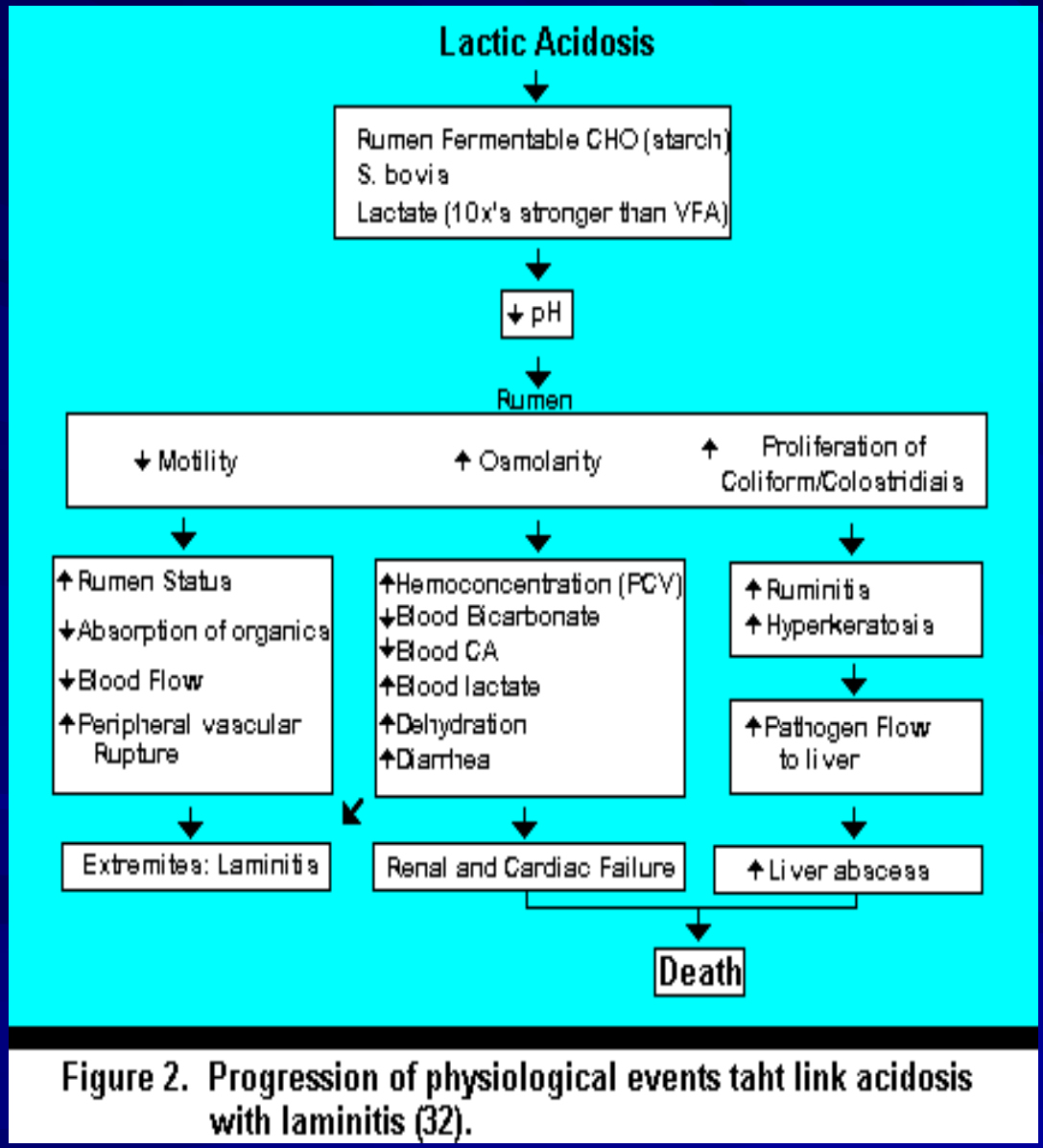


Figure 2. Progression of physiological events taht link acidosis with laminitis (32).

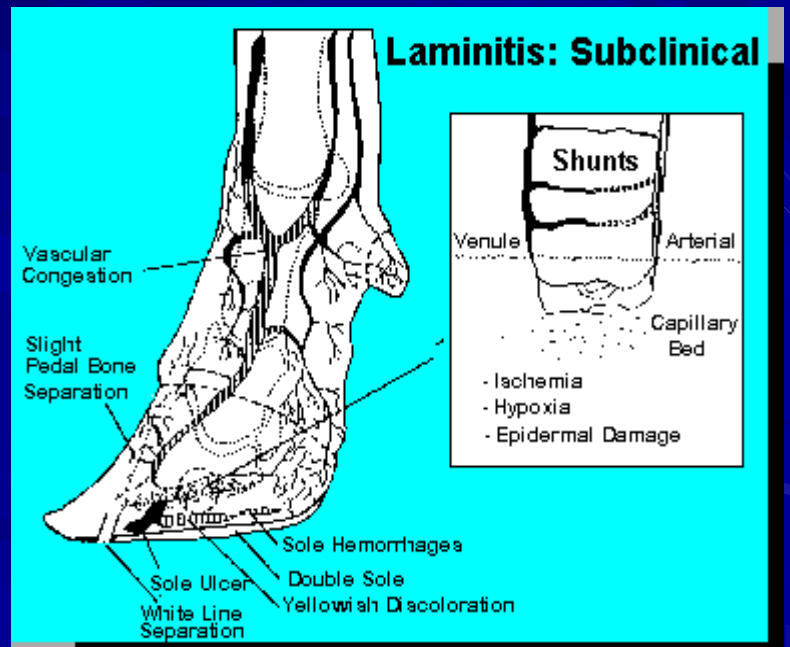


Figure 4. Stages of laminitis development; subclinical (32).

Treatment

- **In severe cases, treatment is heroic and may involve a rumenotomy in which the rumen is surgically emptied out.**

- **Supportive therapy includes iv fluids, rumen transfaunation (rumen juice from a healthy animal), alkalinizing solutions for the rumen (only done with caution), antibiotics and nursing care.**

- ***Polioencephalomalacia* : This is a neurological disease caused by real or relative thiamine deficiency. Thiamine (vitamin B1) is made by the normal bacteria in the rumen.**

Prevention

- **Rations should be formulated and balanced correctly for the correct production group.**

- **Forage should be fed before grain and the daily amount divided into at least 3 separate feedings.**

- **A total mixed ration (TMR) helps keep the rumen flora happy by not overwhelming them with carbohydrate at any one time.**

- **Feed changes all need to be made gradually over several days so the flora have time to adapt.**

Ketosis

- *Occur after calving*
- *Negative balance : Low glucose in blood*
- *Metabolized body fat*

- *Accumulation of ketone bodies*
  Acetoacetate, acetone, beta-hydroxybutyrate (BHBA)

Table 1. Interpretation of serum ß-hydroxybutyrate levels in the evaluation of late gestation ewe nutritional status

Status	Serum ß-hydroxybutyrate (mmol/L)
Normal	< 0.70
Moderate under feeding	0.80 - 1.6
Severe under feeding (subclinical pregnancy toxaemia)	1.6 - 3.0
Pregnancy toxaemia	> 3.0

conservative treatment regime :

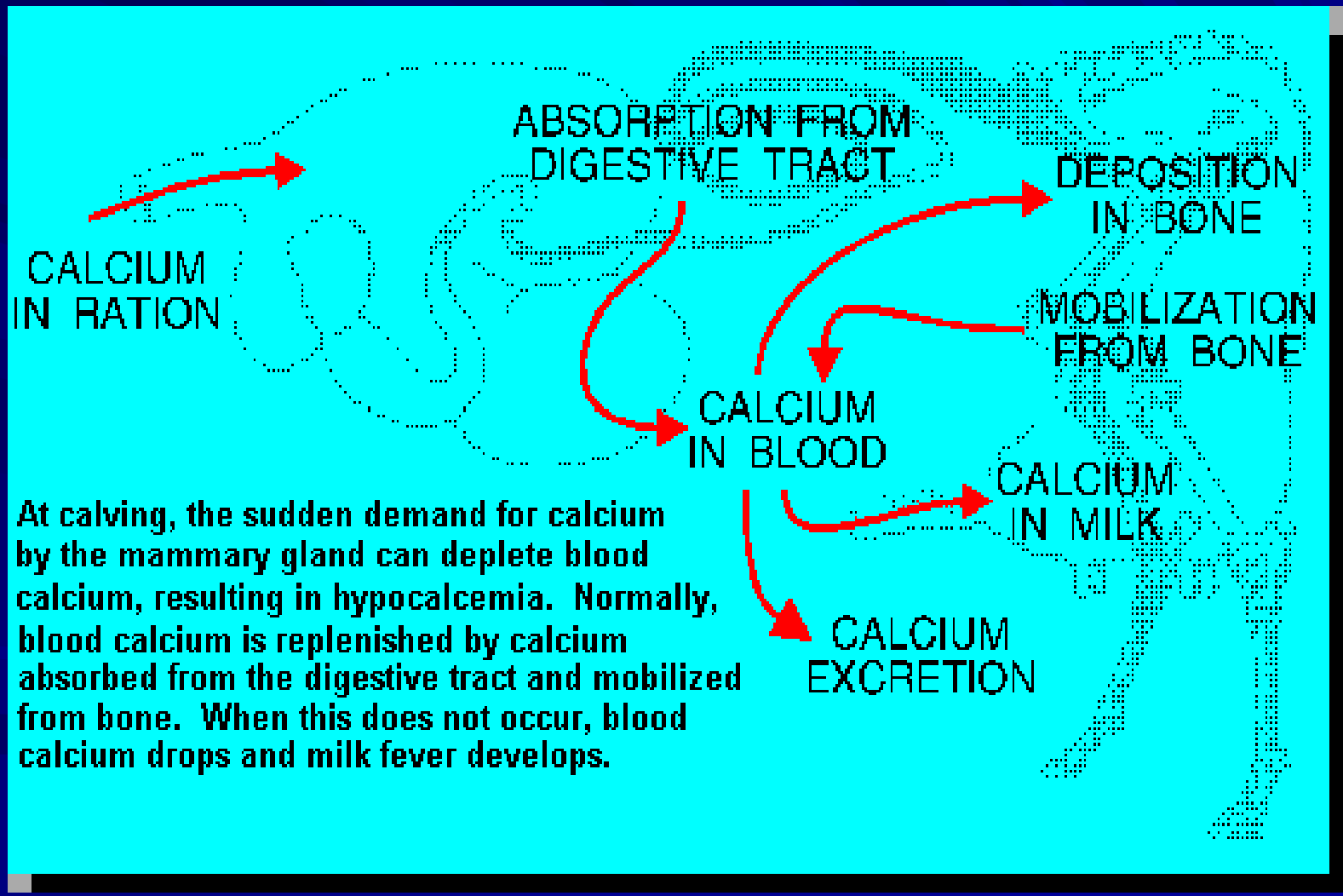
- supplementation with propylene glycol (600 mg/ml) at a rate of 60 ml/ BID per OS for a minimum of 3 days;
- improved nutrition and feeding management; and
- treatment of any predisposing condition.

Milk Fever

- ***Parturient paresis***
- *occurs 3-4% of herd*
- *Old cows > young cows*
- *Ca 5 mmol/L --------> 1.5-3.5 mmol/L*

- ***Homeostasis***
- *Parathyroid hormone (PTH)*
- *Calcitonin*
- *Vit. D_3 (1,25-dihydroxycholecalciferol)*

Milk Fever (2)


CALCIUM IN RATION
ABSORPTION FROM DIGESTIVE TRACT
DEPOSITION IN BONE
MOBILIZATION FROM BONE
CALCIUM IN BLOOD
CALCIUM IN MILK
CALCIUM EXCRETION
At calving, the sudden demand for calcium by the mammary gland can deplete blood calcium, resulting in hypocalcemia. Normally, blood calcium is replenished by calcium absorbed from the digestive tract and mobilized from bone. When this does not occur, blood calcium drops and milk fever develops.

Treatment

- **Clinical cases of hypocalcaemia are usually treated with calcium borogluconate solution (20 mg Ca++/ml) iv and sc. Response should be dramatic.**

- **It is important that iv treatment only be given in the face of strong clinical evidence of disease. Calcium can easily cause death if given i.v. to an animal with normal calcium levels.**

Prevention

- **Long term under nutrition is required for primary hypocalcaemia to develop.**

- **Over-feeding of calcium in late gestation by feeding alfalfa without balancing with anionic salts has been associated with hypocalcaemia in cattle.**

- **Feeding an anionic ration in late gestation will also improve calcium absorption from the gut and from the bones.**

- **The ration in late gestation and early lactation should also have a calcium:phosphorus ratio of greater than 1.5 to 1.**

- **Prevention of pregnancy toxaemia will also help to prevent hypocalcaemia as well**

Ca deficiency

Mg deficiency

Grass Tetany

- ***Hypomagnesemia***
- ***Normal Mg in blood 0.7-1.0 mmol/L -------> 0.4 mmol/L***

- ***Low Mg absorption due to***
- ***high potassium in diet : >20 g/kgDM***
- ***low sodium in diet : <1 g/kgDM***
- ***high protein diet : magnesium ammonium phosphate***

DISPLACED ABOMASUM

- Incidence less than 1 to 75% of the cows

- Precise etiology is unknown
- The dietary factor associated :
  - a low-roughage, high concentrate diet.

- Milk production gradually declines and may eventually cease.

Bloat or Rumen Tympany

- ***Legume bloat or Frothy bloat :***
  - ***Protein & Pectin***
  - ***Saponins***
  - ***Amines : histamine, tyramine etc.***
- ***Tannin***
- ***Grain bloat :***
  - ***Bacteria : amylase***
- ***Mucin in saliva***

SUMMARY

	Components			
	Energy	Vit.	Min.	Homeostatic Stress breakdown
Ketosis	+(?0)			+(g)
Paturient paresis			++(Ca)	+(Ca)
Grass tetany			++(Mg)	?(Mg)
Cerebrocortical necrosis	+(*)	+(b)		
Bloat	+(*)			
Acidosis	++(*)			

Feeding Practices to Dairy Cattle

NUTRIENTS REQUIREMENTS (1)

Energy requirements (NRC, 1988)

- ***Maintenance : $0.133W^{0.75}$ M cal ME***
- ***Milk production : 1.2 M cal ME / kg milk***
- ***Gain : 8.6 M cal ME / kg gain***
- ***Loss : 4.95 M cal ME /kg loss***

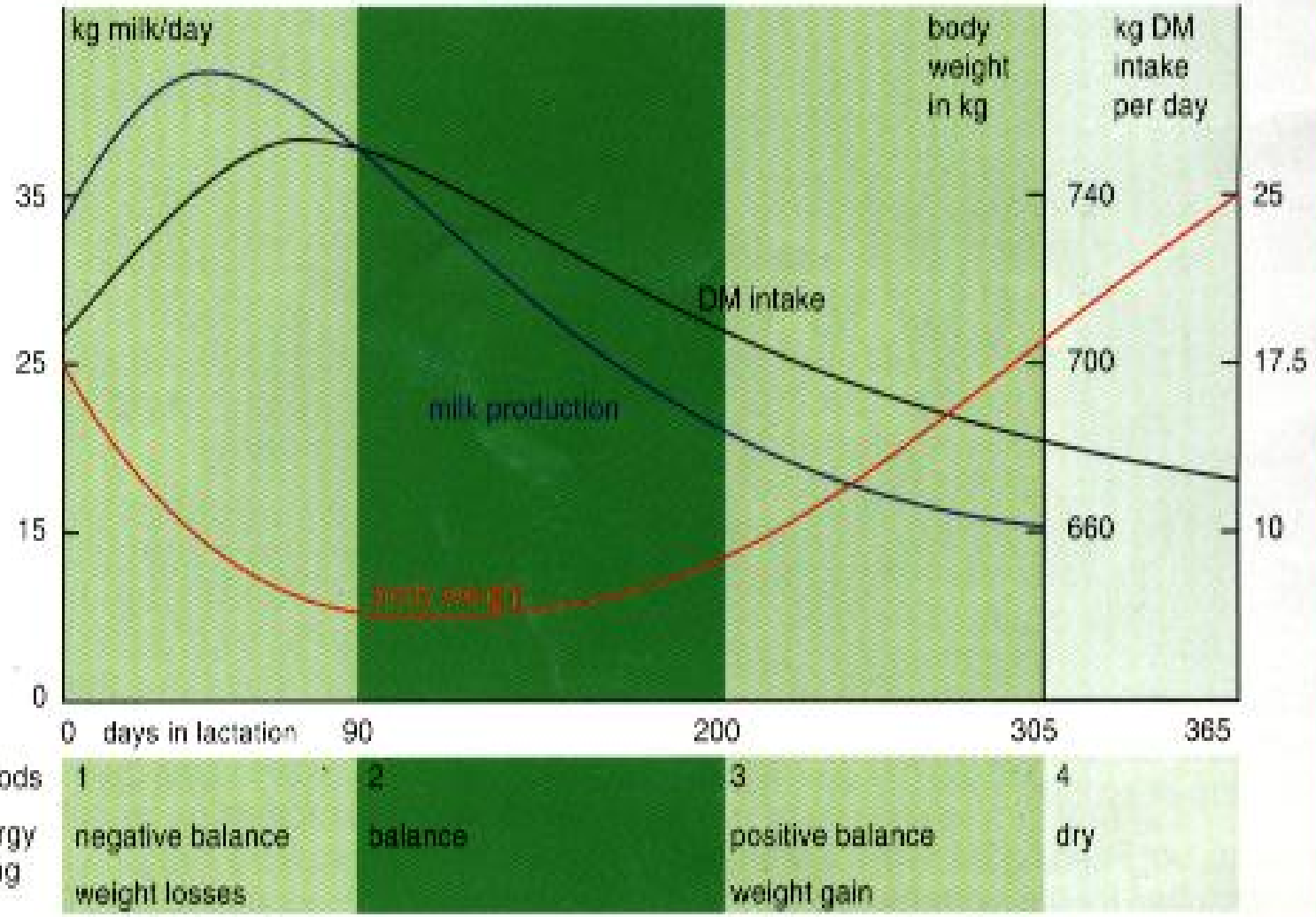
Nutrient requirements (ARC, 1980)

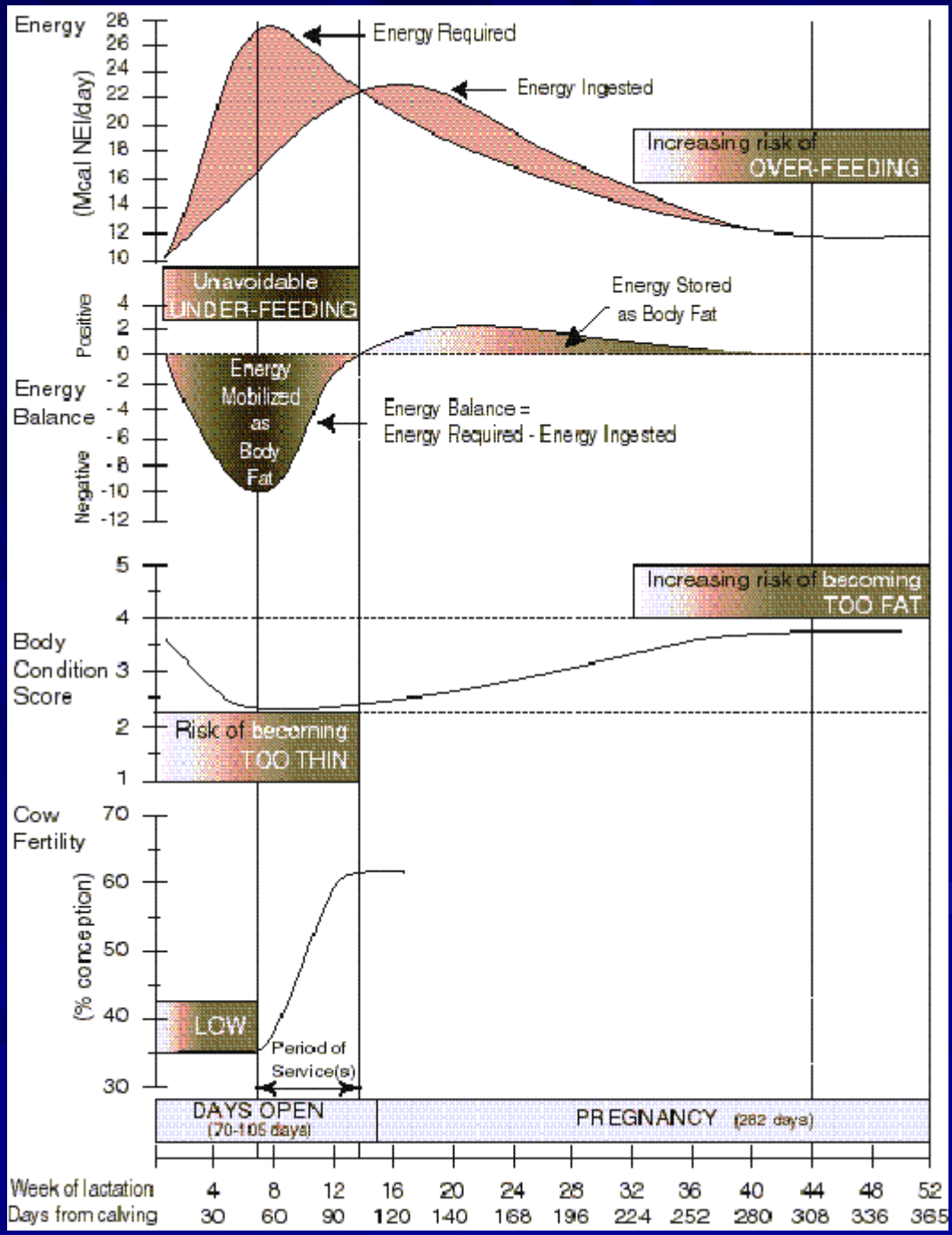
	M	10 kg	20 kg	30 kg
ME, M cal/kg	1.77	2.20	2.63	2.63
Protein, %	7.78	9.60	11.84	12.0

NUTRIENT REQUIREMENTS (2)

BW	FAT	GAIN	MILK YIELD, kg/d				
400	5.0	.22	<6	13	19	26	>33
500	4.0	.23	<8	16	25	33	>41
ME, M cal/kgDM			2.28	2.42	2.57	2.71	2.71
CP, %			12	15	16	17	18
ADF, %			21	21	21	19	19

Figure 1 Various changes during the lactation cycle




Energy
(Mcal NE/day)
Energy Required
Energy Ingested
Increasing risk of OVER-FEEDING
Unavoidable UNDER-FEEDING
Energy Stored as Body Fat
Positive
Energy Balance
Negative
Energy Mobilized as Body Fat
Energy Balance = Energy Required - Energy Ingested
Increasing risk of becoming TOO FAT
Body Condition Score
Risk of becoming TOO THIN
Cow Fertility
(% conception)
LOW
Period of Service(s)
DAYS OPEN (70-105 days)
PREGNANCY (282 days)
Week of lactation
Days from calving

PRACTICAL & ECONMICAL FEEDING

- *QUANTITY & QUALITY OF ROUGHAGE*
- *QUALITY OF CONCENTRATE*
- *LEAST COST RATION*
- *FEEDING EVALUATION & FORMULATION*

PRACTICAL & ECONMICAL FEEDING : QUANTITY & QUALITY OF ROUGHAGE

ROUGHAGE	%DM	%CP	M cal ME	%TDN
RICE STRAW (RS)	92.5	4.2	1.62	44.8
RUZI GRASS, fresh	30	10-12	1.8-2.0	55-60
RUZI DRIED GRASS	92	5	1.7	50
BAGASSE	95	2	1.3	40
UREA-TREATED RS	50	7-8	1.9	55

PRACTICAL & ECONMICAL FEEDING :
QUALITY OF CONCENTRATE : ENERGY

ENERGY SOURCES	% DM	% CP	M cal ME	% NSC
CASSAVA CHIP	90	2.2	2.98	90-95
CORN MEALS	90	10.5	3.21	84.2
RICE BRAN	90	14.4	2.56	25
MOLASSES	75	4	2.61	84.4
SORGHUM	90	12.8	2.69	-

PRACTICAL & ECONMICAL FEEDING :
QUALITY OF CONCENTRATE : PROTEIN

PROTEIN SOURCES	%DM	%CP	M cal ME	%RUDP
SOYBEAN MEALS	92	48.8	3.01	28
COTTONSEED MEALS	91	45	2.70	43
DRIED BREWERS GRAIN	92	29.9	2.55	53
SUNFLOWER MEALS	92	48.9	2.75	40
UREA	100	280	0	0

THANK YOU ***very much***