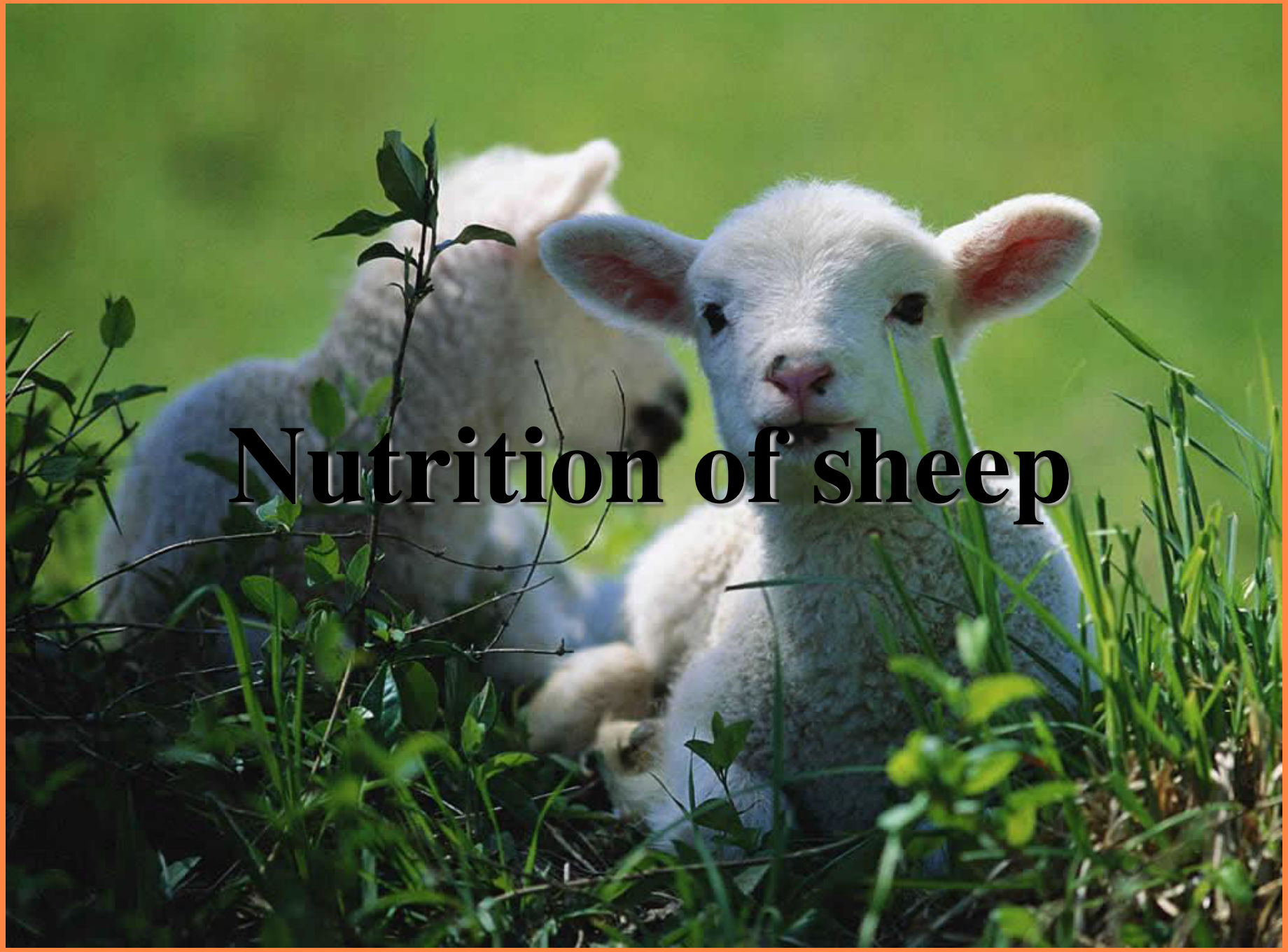

Nutrition of sheep

Objectives

1. To identify feed-related problems of sheep and goat production.

2. To identify alternative strategies for feed resource development.

3. To learn the structure and functions of the ruminant digestive tract and possible ways of manipulating it to improve utilization of coarse feedstuff.

4. To learn the feeding habits of sheep and goats and implications for feeding and nutrition.

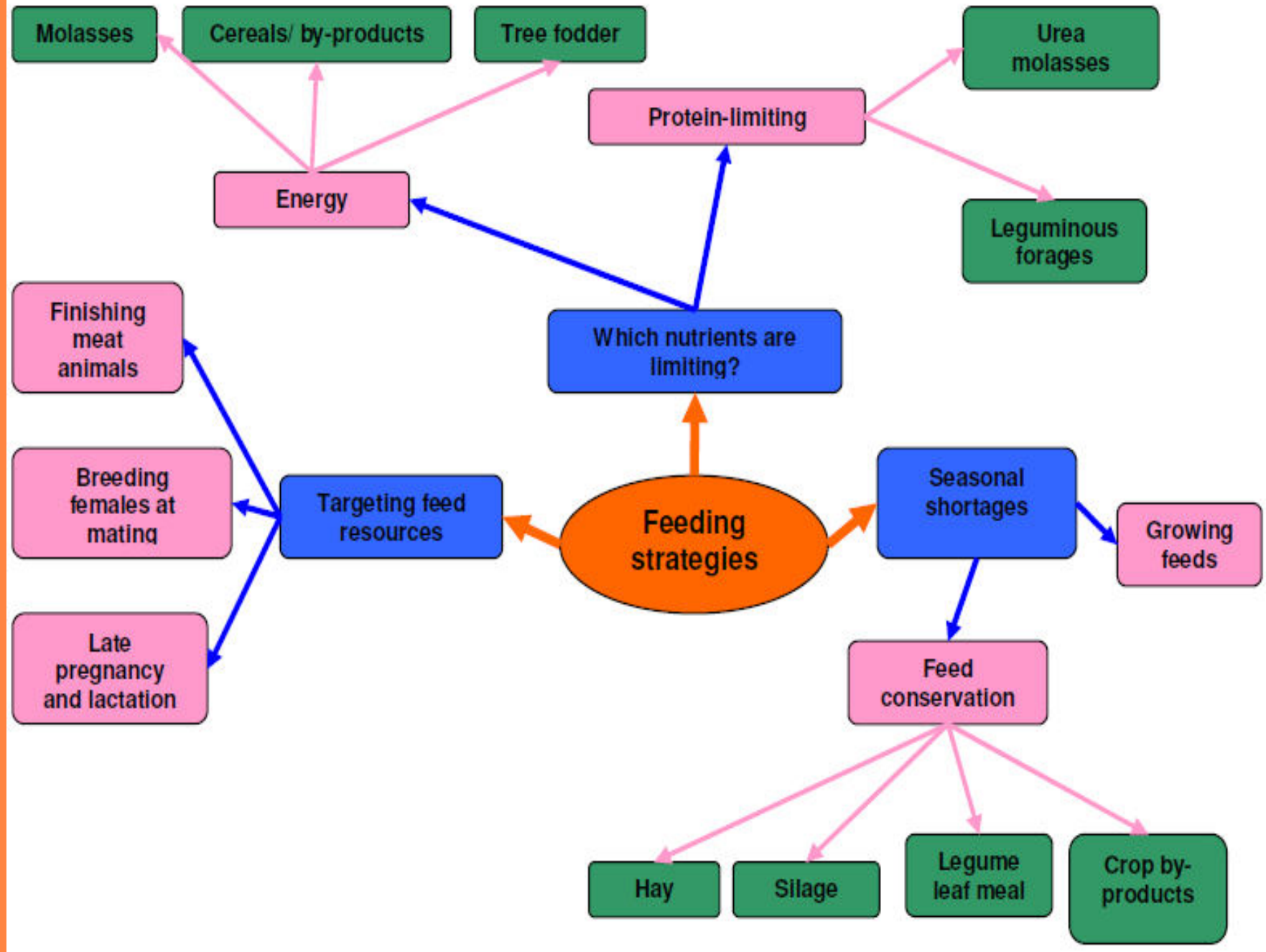
- 5. To learn methods to improve the feeding value of roughages
- through chemical treatment.
- 6. To learn the advantages and disadvantages of urea treatment and supplementation using urea molasses blocks.

Objectives

7. To identify strategies for feeding sheep and goats during drought periods.
8. To learn appropriate methods of grassland and grazing management.
9. To learn appropriate feeding practices for different classes of sheep and goats.
10. To identify the characteristics and feeding value of common feedstuff.

Expected Outputs

1. Recognition of feed-related problems of sheep and goats in different agro-ecological zones.
2. Knowledge and ability to practice alternative strategies for better feeding of sheep and goats.
3. Skills to transfer improved sheep and goat feeding methods to producers resulting in improved productivity of sheep and goats.


Molasses
Cereals/ by-products
Tree fodder
Urea molasses
Protein-limiting
Energy
Leguminous forages
Finishing meat animals
Which nutrients are limiting?
Breeding females at mating
Targeting feed resources
Feeding strategies
Seasonal shortages
Growing feeds
Late pregnancy and lactation
Feed conservation
Hay
Silage
Legume leaf meal
Crop by-products

Nutrition for Health

- It is well established that good nutrition is necessary for proper immune system function.
- Excess nutrition can also impair immune system function
- Although nutrition may be adequate for production, it may not be adequate for immune system functioning.

Nutrition for Health

- Goats are normally healthy animals except for what man does to them:
- Crowding, poor ventilation, stress (nutrition/shipping/change peers)
- Bringing diseases in with new animals, equipment, boots, clothes
- Raising your own germs by lack of sanitation/rodents etc.

Nutrition for Health

- Many goats, given the opportunity (good environment and plenty of pasture to select from) will take care of themselves.

Objectives

- Describe the classes of nutrients required for health and production
- Discuss how we may provide for these nutrients
- Evaluation of body condition to fine-tune your feeding program

Goals of sheep nutrition

1. Increase of reproduction
2. Rearing of lambs
3. Milk production
4. Meat production

Key data of sheep breeding

Duration of pregnancy: 136-155 days

Duration of lactation: 3-4 months

Ovarian cycle: 16 days

Time of weaning: 30-40 days (early weaning)

3-4 months (mating yearly)

Body weight of a newborn lamb: 2.5-6 kg

Nutrient requirements of sheep

1. Maintenance requirement :

   includes nutrient demand for „work” of feed intake and digestion (in thermoneutral zone: -4 to 20°C)

   + wool production

   a. dry matter: 2.5-6.0 kg/100 kg BW

   (in average 3-5 kg);

Nutrient requirement of sheep

b. Energy requirement:

NE_m, MJ = 0.31 MJ × $W^{0.75}$ for adult ewes grazed

(in stall: 0.2846 MJ × $W^{0.75}$)

Breeding sheep: NE_L

Ewes: foetus, milk production;

Rams: breeding period.

c. Energy demand of lambs and growing sheep:

$NE_m + NE_g$

Nutrient requirement of sheep

d. Protein: in metabolizable protein (MP)

Extended requirement:

maintenance + wool production

Maintenance: MP, g = $2.60 \times W^{0.75}$

Wool production: protein quantity produced daily/0.4

Crude protein content of cleaned wool: 80%

Nutrient requirements of sheep

Macrominerals for maintenance

Ca = 4.4 g per 100 kg BW,

P = 3.4 g per 100 kg BW.

Na: 2.0 g per kg feed (acid-alkali balance; milk production, plants rich of potassium)

Na-deficiency: chewing wool (*allotriophagia*)

S: wool production → ceratine, cystine (methionine);

Optimal S:N = 1:7 (in feeds: S:N = 1:10-15);

S-supplementation: $NaSO_4$ and/or $(NH_4)_2SO_4$

Nutrient requirements of sheep

Microminerals (mg /DM kg):

Fe, Mn Zn, Cu, I, Se, Mo, Co =

= gross requirement (maintenance production).

Vitamins:

- water-soluble + K are produced in the rumen;

Possible deficiencies:

vitamin A - in mother ewes,

vitamin E - in suckling lambs.

Nutrient requirements for wool production

Included in requirement for maintenance:

- growth of folliculi beginning to grow in the uterus,

Determined:

- by energy - width of wool;
- by protein - length of wool.

Demand: ß-carotine, S, Na, Zn, Cu, I.

Nutrient requirements of sheep

Special demands

- mothers: during „ flushing”; steaming up
- breeding rams: breeding period;
- lambs: fattening;
- growing sheep: development;

All of nutrient requirements:
for maintenance + production
Influencing factors:
body weight + production level

Nutrition of mothers

Higher nutrient requirement is needed: concentrate supplementation.

1. „Flushing”,
2. Last 6 weeks of pregnancy, Steaming up
3. Milk production.

Body condition scoring (BSC)

1. **Mother ewes:**

   before mating and at the end of pregnancy

   Optimal: BCS 3;

   (BCS 2 or 4 are both to be avoided)

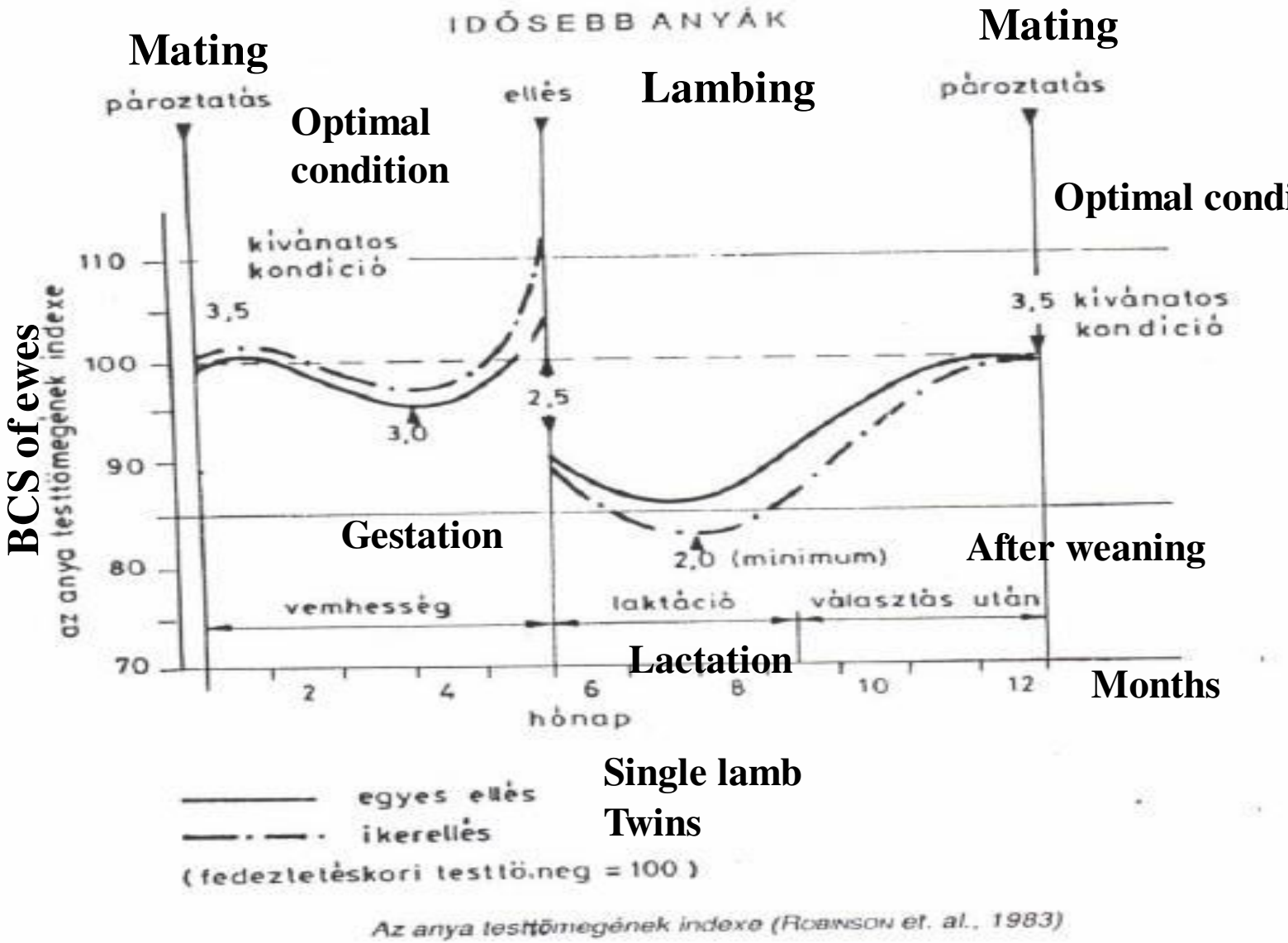
2. **Breeding rams:**

   to improve BCS by the time of mating

   up to the **optimal BCS 3;**

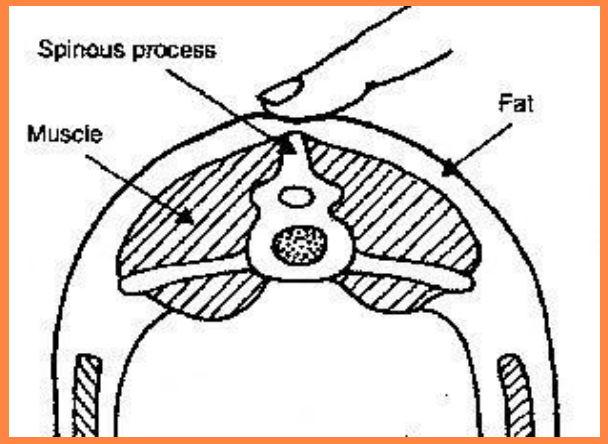
   (higher BCS is especially unbeneficial)

Adult ewes

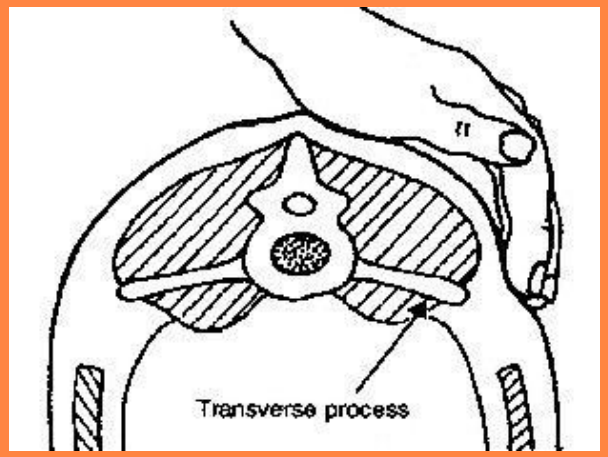


Optimal body condition scores of ewes during reproduction cycle

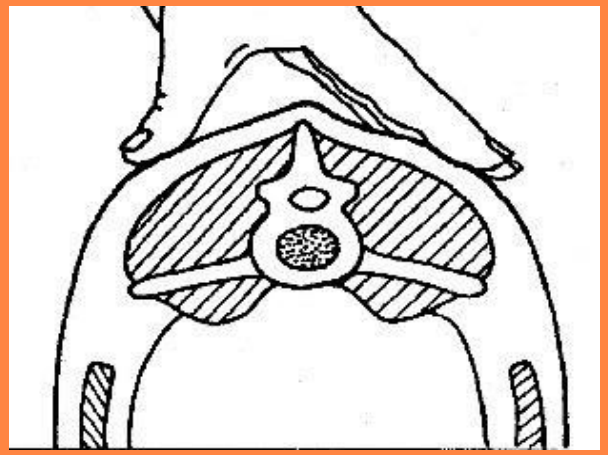
Body condition scoring of sheep



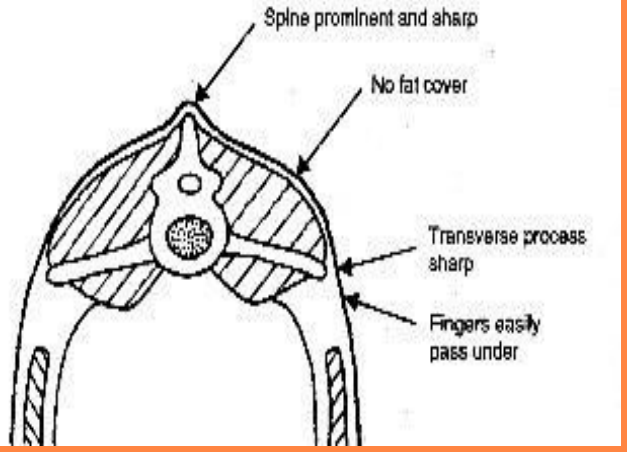
1. Feel for the spine in the center of back, behind the last rib and in front the hip bone.



2. Feel for the tips of the transverse processes.

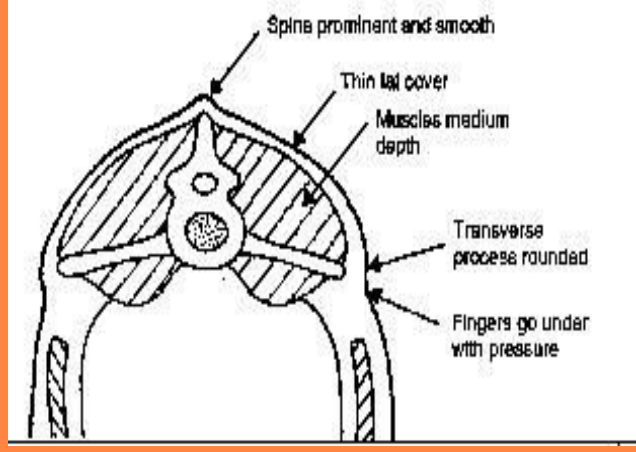


3. Feel for the fullness of muscle and fat cover.

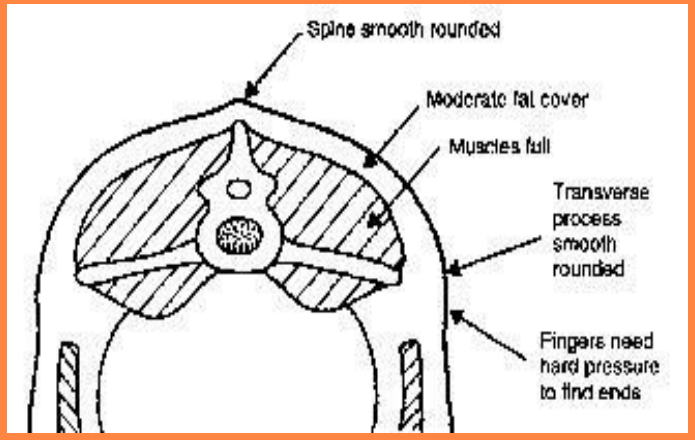


Condition 1
← Emaciated

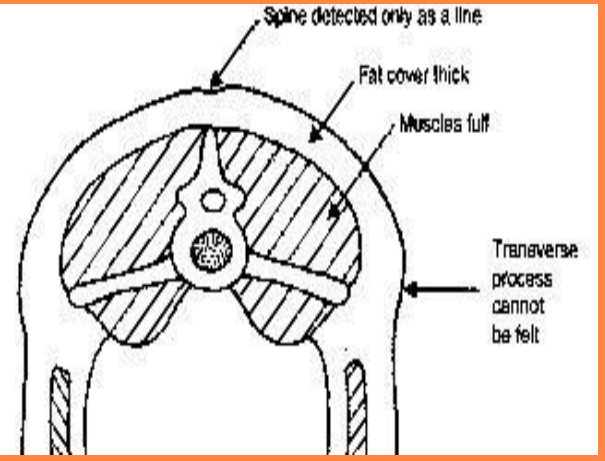
Condition 2
Thin →



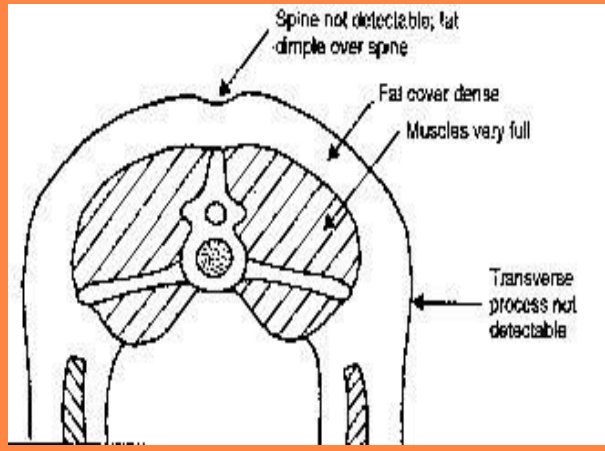
Condition 4
↓ Fat



Condition 3
← Average



Condition 5
Obese →



Body condition scores of sheep

„Flushing”

Goal: improvement of body condition

Nutrition: by „supporting” diet

(roughages + 0.3-0.4 kg concentrate)

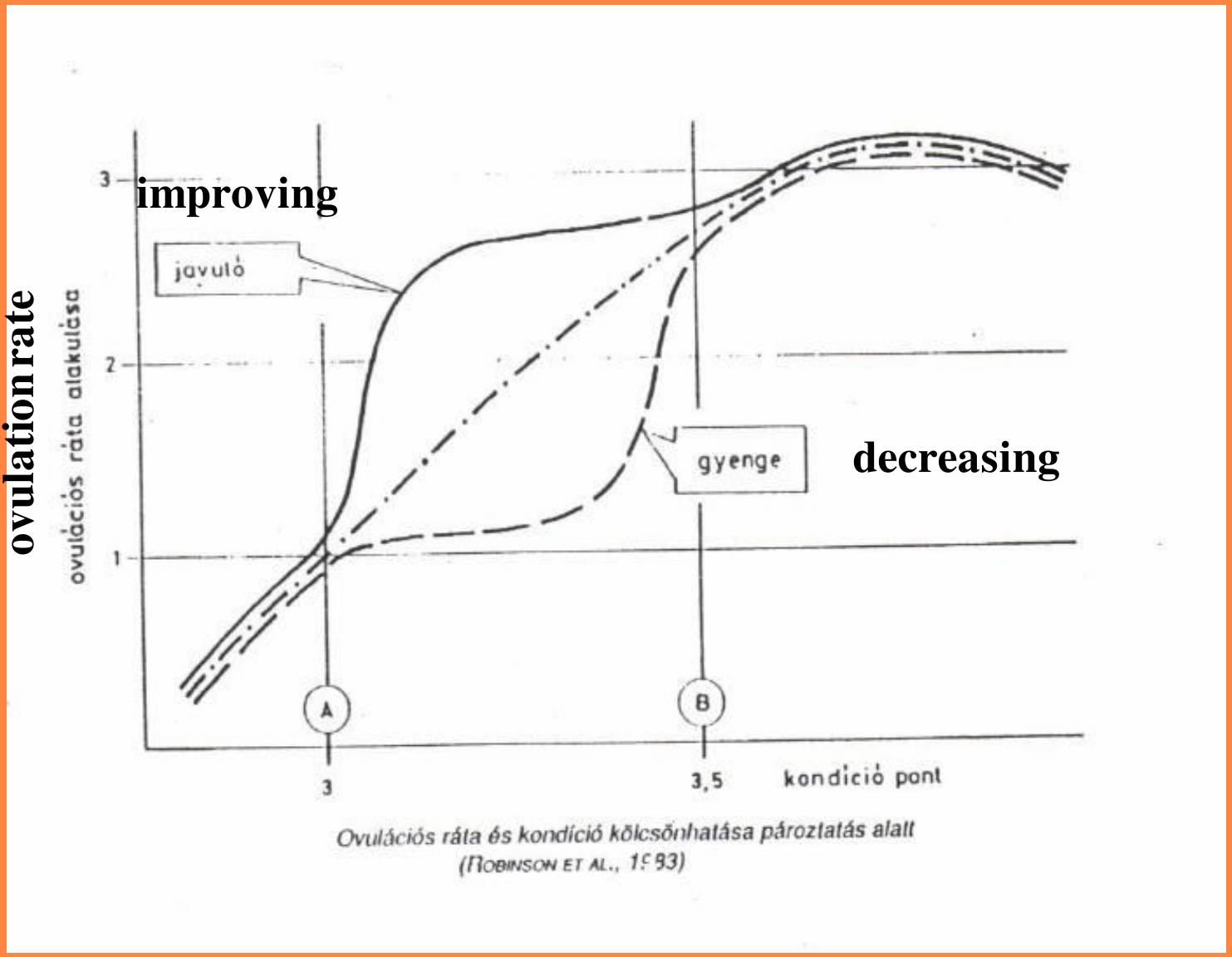
Period: 2-3 weeks before the planned mating

Feeding method: roughage + concentrate (oat, rye!) = energy supplementation

P-supplementation: +10% for the optimal ovarian activity

ß-carotine : in good-quality roughages

- **steaming up**
- the practice of commencing to feed extra rations, especially of grain and concentrates, to late pregnant cows in an attempt to promote maximum milk production from the very beginning of the lactation. Feeding usually commences about 4 weeks before the due date.



Ovulációs ráta és kondíció kölcsönhatása pároztatás alatt
(Robinson et al., 1993)

Correlations between the ovulation rate and the body condition during mating period

Nutrition of ewes 1

2 feeding phases:

1. Extended maintenance requirement:
   a. „empty” (non-pregnant ewes),
   b. in the first 3.5 months of pregnancy.

Roughages (pasture grass, silage, straw) cover the requirement.

(They can take in 13-14% of the daily dry matter requirement.)

Nutrition of ewes 2

2. The first 3.5 months of pregnancy:

- better efficiency ratio ;
- lower transformation loss
  (anabolic effect of gestation).

Supplementation with concentrate:

- during „flushing”,
- in the last week of pregnancy,
- during milk production.

Nutrition of ewes during lactation

Requirement: extended maintenance
+ milk production

Crude fibre content of daily ration: 18-23%

Differences: between single lambs
and twins (or triplets).

Period of lactation: 3-4 months;

Peak of milk yield: 3-4 weeks after lambing.

Body weight change < 0.5 % BW

Negative energy balance: weeks 3-5 of lactation

Nutrient requirements of milk production

Composition of average ewe milk:

200 g/kg dry matter, including 80 g milk fat, 60 g milk protein, 50 g lactose,

10 g minerals.

Requirement of 1 kg of ewe milk :

6.0 MJ NE, 130 g protein,

4.0 g Ca, 2.5 g P, 2 g NaCl

(Requirement of MP: milk protein content (g/kg milk)/0.65

For 1 kg milk: 60/0.65 = 92 g MP

In the case of twins: more milk by 20-80%.

Milk production of ewes in the lactation period

Milk production		Total
Number of lambs	1	100-125 kg
	2	150-160 kg
	3	160-180 kg

With one lamb	Month	Total, kg	Daily, kg
	1	40	1.2-1.3
	2	30	1.0
	3	20	0.6
	4	10	0.3

Feeding of ewes during weaning

1. 1 week before weaning:

   withdrawal of concentrate from the ewe;
2. 1 day before weaning:

   withdrawal of feed and water;
3. After weaning:

   water + roughage of low quality

Feeding of ewes 4-6 weeks before mating

More intense nutrient supply:

good quality roughages

+ 0.2-0.4 kg concentrate

Feeding of non-pregnant and early pregnant ewes

In summer (in extra dry period):

pasture+ 0.5-1 kg hay/day

Winter: pastures (rye, winter barley, rape)

+ 2-3 kg haylage of grass or corn silage

+ 1 kg hay

Feeding of mother ewes 6 weeks before parturition (steaming up):

Roughages + 0.3-0.5 kg concentrate

of 14% MP-content)

Feeding of mother ewes after parturition:

Good quality pasture

+ 0.5- 1.0 kg hay

+ 0.3-0.6 kg concentrate

Nutrition of suckling lambs

1. Natural lamb feeding technology:

- small nutrient storage,

- high growth efficiency.

200 g weight gain/1 kg ewe milk;

- small stomach volume, higher dry matter intake capacity

„Lamb school”: from the 2nd weeek;

good quality grass hay,

Weeks 4-6: adequate rumination;

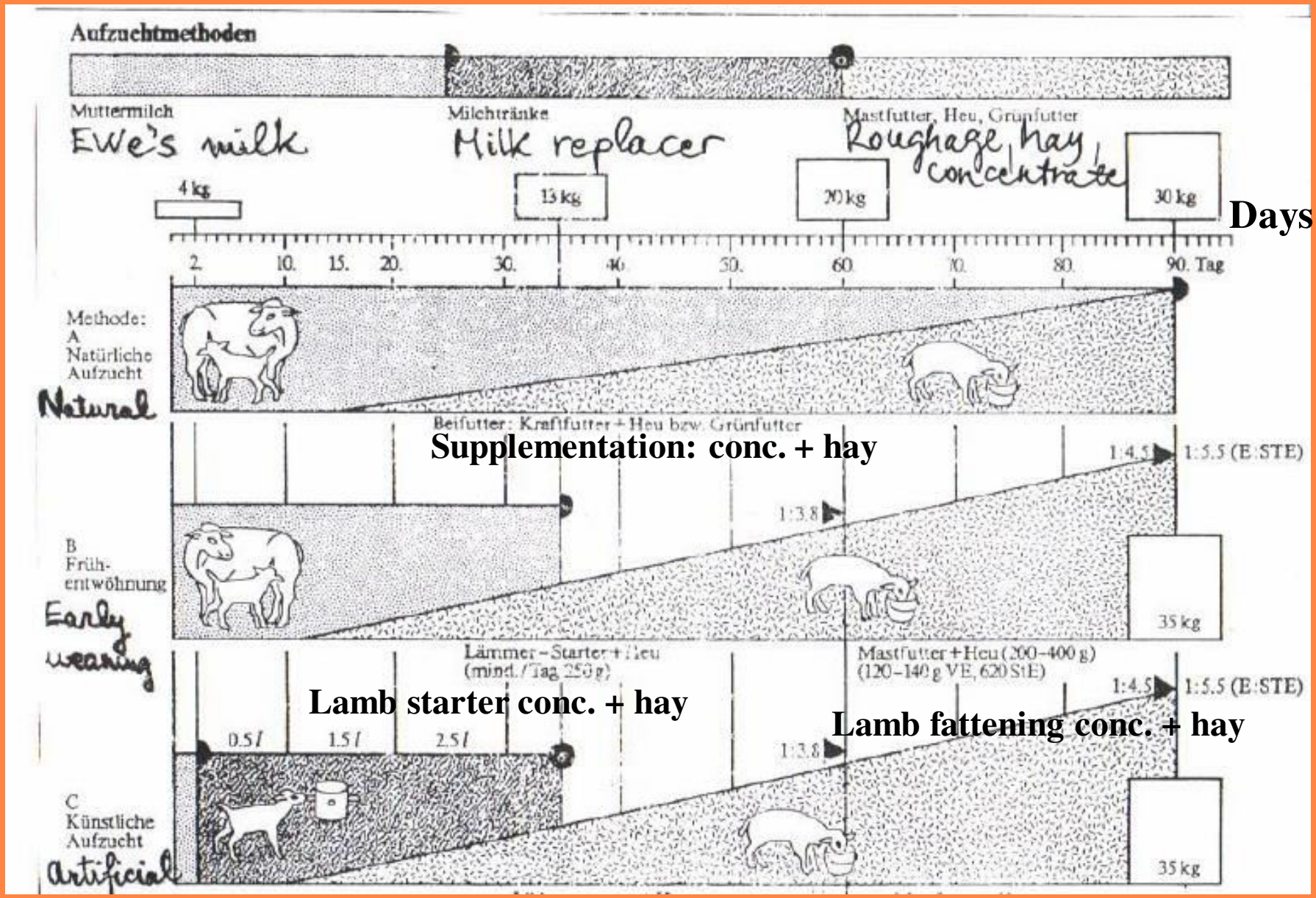
supplementation of Se and vitamin E: Na-selenite.

Feeding of suckling lambs

- 2. Artificial lamb rearing
- In breeds of high reproduction rate (Romanov, Boroola):
- In the case of 2 to 3 lambs or in infant lambs.

Principles:

- only consumption of *colostrum*,
- drinking of homogenized milk *ad libitum*,
- usage of milk replacers.



Lamb raising technologies

Lamb fattening technologies

1. Fattening of suckling lambs:
Until the age of week 8-9
(14-18 kg body weight);
Ewe milk + granulated lamb concentrate.

2. Fattening of express broiler lambs:
Weaning: 35-42 days (body weight: 10-13 kg);
0.4 kg concentrate
by 120-130 days: 28-35 kg BW,
Monodietetic feeding with granulated lamb feed
(2-3% urea, supplementation of Ca with $CaCO_3$, Ca:P = 2:1),
Daily weight gain: 200-350 g.

Lamb fattening technologies

3. Growing lambs of high body weight:

- high level of roughages

(feeding of pasture grass),

+ hay, concentrate

(no lambs concentrate!),

(15-20% crude fiber)

- 40-50 kg of body weight,

- weaning at 3 months of age.

Rearing of breeding lambs

1. Nutrition of growing ewes:

Goal: 40-50 kg of BW until December,

They can be kept until 70-80 days with express broiler lambs,

- 20 kg BW: less concentrate, grazing,
- 100 g BW gain/day.

2. Feeding of growing rams:

Goal: 150 g BW gain/day,

- roughage +concentrate

Feedstuffs used in sheep nutrition

1. Green forages;
2. Ensiled roughages;
3. Hays;
4. Hay meals;
5. By-products of cereals during harvest;
6. Beets and potatoe;
7. Seeds;
8. Concentrates;
9. Supplementations.

Green forages

1. Pastures:

   sheep are not „demanding”;

   deep grazing („shaving”);

   selection of toxic plants (Na-supplementation);

   6 to 8 hours of grazing per day;

   leguminous plants (danger of blowing!);

2. Whole sugar beet
3. Cabbage

Silages

1. „Short term control”
   (20-25% DM, high C2-level);
2. Contaminated silages:
   by fungi of *Clostridia*, *Listeria sp*..

Recommendation:

- 3-4% of BW daily;

grass silage, sudangrass silage, alfalfa silage;
combinations with corn stalk and whole sugar beet
stalk of pea for mothers (protein, Ca).

Hays, hay meals

Alfalfa meal (20-30% in concentrates for lambs)

Straws, by-products of cereals

1. Straws (wheat, barley, oat)
2. Corn stalk
3. Straw of pea (danger of mold!)

Beets and potatoes

Classical diet for not pregnant ewes:

1 kg beet

1 kg straw

1 kg hay

Carrots: for mothers

(to decrease the danger of abortion!)

By-products

1. Wheat bran
2. Soybean meal (for lambs)
3. Sunflower meal and rapeseed meal (for breeding animals)
4. Wet breweries
5. Sugar beet pulp (wet)
6. Tomatoe pomace

Additives

1. Urea (46%),
2. Feed salt (NaCl)
3. P-supplements
4. Na-selenite („white muscle disease”)

Common diet for non-pregnant ewes:

1.5 kg silage or sugar beet pulp (dehydrated)

1 kg legume straw or low quality hay

1 kg cereal straw

- **Before mating:** 0.2-0.3 kg rye or wheat
- **For ewes in good body condition:** no extra need
- **Pregnancy:** in month 4: + 30% of energy (NE_m)
  in month 5: + 50% of energy (NE_m)

Dietary requirements of milking ewes

- Nutrient requirement should be covered by feeds;
- Moisturous feedstuffs;
- Good quality hays;
- Cereal grain (or concentrate): 0.20-0.30 kg/day

Daily rations for sheep

Breeding rams:

1 kg moisturous feed

1 kg hay

1 kg pea straw

0.50 kg concentrate or rye

Weaned lambs (for breeding)**:**

0.50 kg moisturous feed

0.50 kg hay

0.50 kg pea straw

+ 0.2-0.3 kg concentrate for lambs

Metabolic disorders and nutritive deficiencies of sheep

1. **Rumen flatulence**

   Causes:

   - most often by eating legumes rich of protein (green alfalfa);
   - animals are not accustomed to them.

2. Deficiency of vitamin E and selenium

Syndrome: pregnant ewes fed with a diet, which is poor of vitamin E and/or selenium often have lambs suffering of **„white muscle disease";**

lambs: thin, pulse and ECG are irregular, cause of death is waxy mucsle distrophy in sceletal and heart muscles.

Treatment: supplement of selenium (Na-selenite per os and subcutan) and vitamin E for ewes and one-day old lambs

3. White liver disease of lambs

- nutritional origin, mainly arises in spring;
- morbidity of 40%, mortality of 15%;
- acute form: 7-10 days; cronic form: 4 to 6 weeks;

Causes: deficiency of cobalt, that induces the deficiency of vitamin $B_{12;}$

In cronic case: propionate metabolism in liver is disturbed resulting accumulation of propionate;

- it might be accompanied by mycotoxin production.

3. **White liver disease of lambs** (cont.)

Acute form: inflammation of eyelids and lips

originated in liver caused by secondary photosensibility;

Cronic form: aneaemia,

high weight loss, *lesion*s on the ears, decrease of albumin, cobalt and vitamin B_{12} of plasma.

- activity of AST, GGT and SDH significantly increase;
- degenerative fatty liver, necrosis of hepatocytes;
- enlargment of spleen.

4. **Thiamin deficiency of growing sheep**

Syndrome: opisthotonus;

in the background: polyencephalomalatia (PEM) and cerebrocortical necrosis (CCN).

Occurance: generally in the age of 3 to 4 months.

Causes: high level of concentrate, no transisiton time (importance of preliminary feeding!);

In winter: hay containing antimetabolite of thiamine may induce it, number of thiamine-synthesizing bacteria is reduced in rumen.

4. Thiamin deficiency of growing sheep (cont.)

Symptoms: in the first 2 to 5 days, excited behaviour, animals lay down and hold their head straight upwards („stargaizing”);

With no treatment: death in comatose status.

Similar symptoms: in listeriosis, ataxia caused by copper deficiency, scrapie.

Treatment:

- first dose of thiamin: 0.5-2.0 g/animal /day

(50% intravenous, 50% subcutan);

- recovery dose: 0.1-0.5 g thiamin/animal

5. Enterotoxemia of fattening lambs

Other names: „overeating disease”, „pulpy kidney disease”

Occurance:

- suckling lambs;
- lambs fed with milk replacers;
- fattening lambs on high-concentrate diet;
- high-lactating and pregnant ewes.

Symptoms:

- pulpy kidneys;
- toxins in rumen fluid.

5. Enterotoxemy of fattening lambs (cont.)

Results:

- sudden death caused by toxin of type D (or sometimes C) produced by *Cl.perfringens* (normal inhabitant);
- in the case of feeding a diet rich in starch and sugar (contentrate, milk, fresh grass) *Cl.* proliferates.

Prevention: vaccine containing toxoids.

Pregnant ewes: passive immunity for suckling lambs for 4-6 weeks; later: antiserum for lambs.

6. Acute lactic acid toxicity

Causes: high-concentrate diet with no preliminary feeding.

Results:

- concentration of lactic acid increases up to 2% in rumen fluid (normal: 50 mg%);
- pH in rumen: 4-4.2 (normal: pH 6-7);
- protozoa die in acid conditions in the rumen;
- high osmotic pressure develops (saliva, blood plasma);
- *collapsus* (preacute form), death.

6. Acute lactic acid toxicity (cont.)

In **acute** and **semi-acute forms**: metabolic acidosis;

increase of numbers of *Lactobacilli*, *Coli* and *Proteus* bacteria.

Symptoms: in the nervous system, small quanity of yellowish-green faeces, anuria, flatulence, breath smells very acidic.

Treatment: 20-50 ml of 5% NaOH solution intraruminally, reduction of inflammation, supply of thiamin.

Prevention: preliminary feeding of high-concentrate diet, feeding hay or straw before grazing.

7. Urolithiasis

Development of disease: split of U.B membrane; urin flows into the abdominal cavity; „water belly"; death.

Occurance: castrated rams, fattening lambs on high-concentrate diet; increase of intake of Ca, P, Mg, K;

Grazing sheep:

Symptoms: sedimentation of minerals in urinary tract,

painful and slow urinating; phosphate content of urine increases.

Prevention: decrease of P-intake (Ca:P = 2:1);

Acidification of urine (0.5% NH_4Cl in concentrate),

Drench of 7-14 g NH_4Cl for 3-5 days; in grazing sheep: 3-4% NaCl in diet, water: *ad libitum*.

8. Urea toxicosis

Background: feeding of NPN-compounds to fattening lambs with no preliminary feeding;

Toxic level of urea: 0.4 g per kg body weight.

Treatment: drinking of 500 ml vinegar (20%) diluted 10-20 times;

Intravenous injection of maleic acid containing glucose (0.5ml per kg body weight).

9. Pregnancy toxicosis in ewes (sheep ketosis)

Occurance: late-pregnant ewes.

Background: insufficient quantity of concentrate in diet; transitional glucose deficiency, energy eventually supplied from fat depots; pregnancy toxicosis (ketosis); long period of *hypoglucaemia* may cause damages in brain tissues.

Symptoms: unstable movement of late-pregnant ewes (faltering steps); comatose condition before death.

Necroctomy shows: healthy foetus(es) died before the ewe's death; yellow liver with rounded edges.

10. Milk fever in ewes

a. Classical (Ca ↑)
b. Not typical (P ↑)

Syndrome: see in dairy cow


Goat Nutrition

Classes of Nutrients

- Water
- Protein energy
- Carbohydrates, simple and complex energy
- Fats energy
- Minerals
- Vitamins

Water

- Essential for life
- Dry doe 1.0 gallon per day
- Lactating doe 2.5 gallons per day
- Fresh green grass contributes water
- Clean water
- Factor in prevention or urinary calculi

Carbohydrates

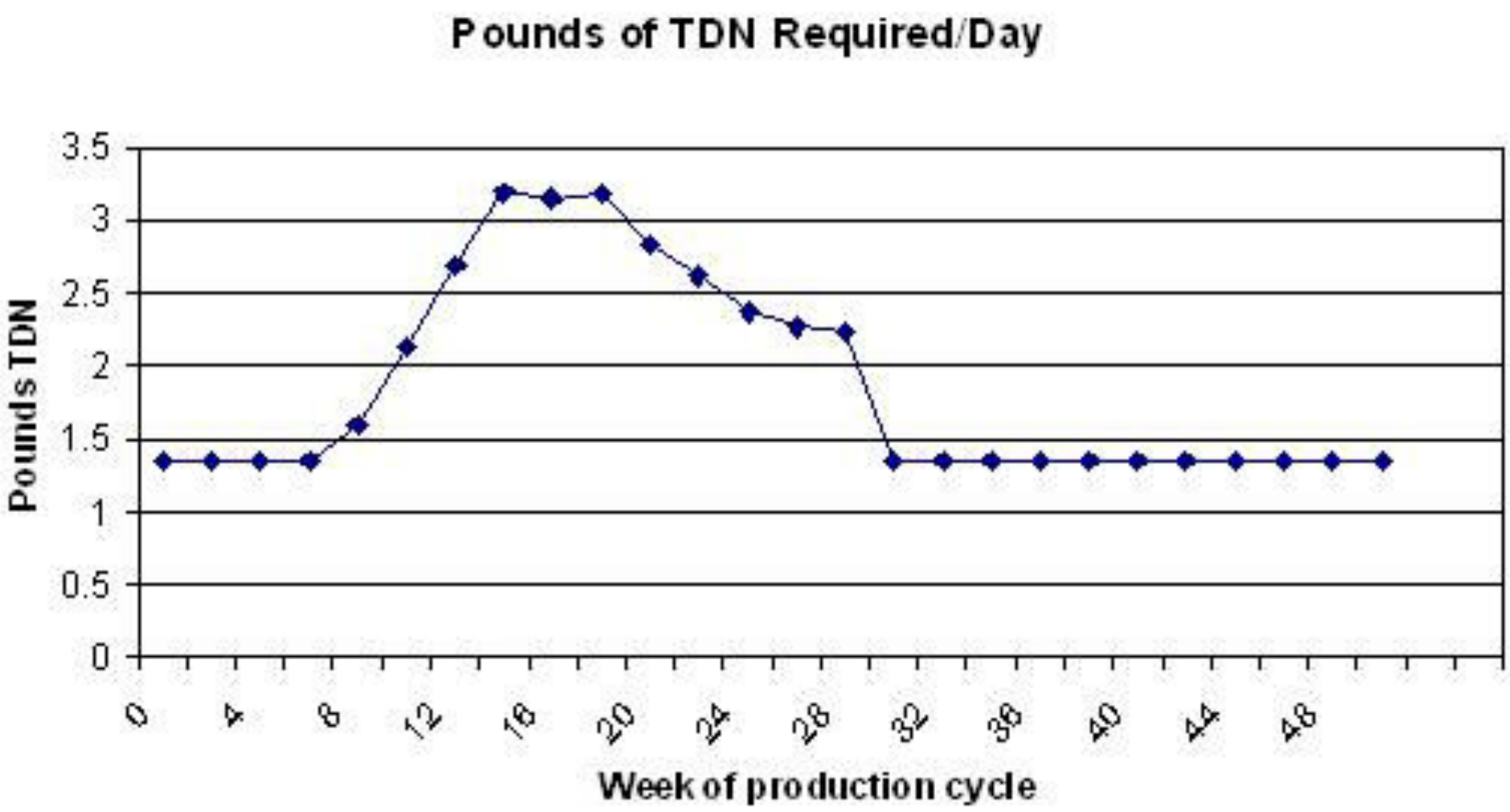
- Sugars
- Complex
- Starch in grains
- Cellulose (fiber)
- Cellulose highly digestible in young plants
- Fiber necessary for rumen health

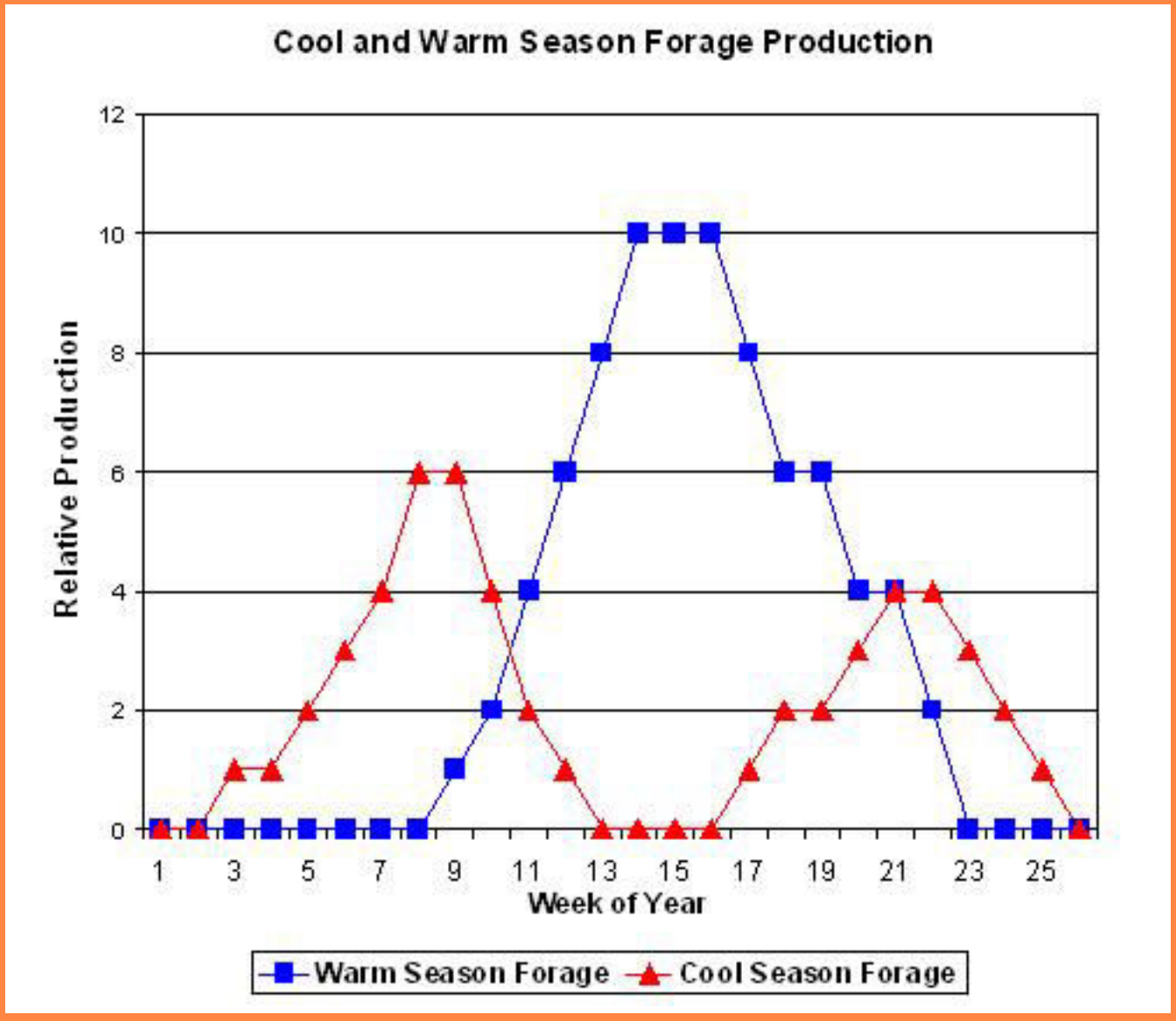
Fats

- High energy content
- Forages low in fat
- Much fat in diet is wax and poorly digested

Providing Energy

- Energy is costliest item for a goat
- Pasture
- Stockpiled pasture
- Hay
- Byproduct feeds
- Commercial feed


Pounds of TDN Required/Day
Pounds TDN
3.5
3
2.5
2
1.5
1
0.5
0
0
4
8
12
16
20
24
28
32
36
40
44
48
Week of production cycle


Cool and Warm Season Forage Production
Relative Production
0
2
4
6
8
10
12
1
3
5
7
9
11
13
15
17
19
21
23
25
Week of Year
Warm Season Forage
Cool Season Forage

Protein

- Composed of amino acids
- Goat is efficient at using dietary protein
- Low quality forages require protein supplementation
- Goats are more subject to urea toxicity from non-protein nitrogen

Providing Protein

- Protein on vegetative pasture often adequate
- Poor pasture, protein is deficient
- Winter feeding concerns about protein level
- Hay
- Protein supplement
- Prepared feed

B Vitamins

- Water soluble
- Synthesized by rumen microbes
- Deficiency of thiamin
- Polioencephalomalacia
- Coccidiostat Corid
- High concentrate diets

Vitamins

- Fat soluble A,D,E,K
- Vit A deficient in bleached or weathered hay or stockpiled forage
- Vitamin D sunshine vitamin
- Vitamin E linked to Selenium

General Recommended Vitamin Levels

- Vitamin A 5,000 IU/lb
- Vitamin D 2,000 IU/lb
- Vitamin E 80 IU/lb

Providing for Vitamin Requirements

- Green grass/browse and sunshine
- Liver stores of vitamins
- Green leafy hay
- Mineral supplements
- Commercial feeds
- Injections
- Read labels

Macro minerals

- Calcium
- Phosphorus
- Sodium
- Potassium
- Chloride
- Sulfur
- Magnesium

Calcium Level .4%

- Functions in bone, muscle and nerve contractions
- Deficiency causes rickets, bowed limbs, lameness
- Vitamin D necessary for calcium absorption
- Most forages are deficient in calcium

Phosphorus Level .3%

- Function in soft tissues and bone growth, body pH
- Deficiency reduces growth, pica, depraved appetite
- Expensive feed ingredient
- May be close to adequate if poultry manure has been applied

Magnesium Level .18-.4%

- Functions as a component of bones and function of nervous and muscle system
- Major deficiency symptom is grass tetany on lush cool-season pastures
- Excitability, staggering, convulsions loss of appetite
- Feed palatable mineral with high level of magnesium

Potassium, Sodium, Chloride .8-2.0%

- Electrolytes in body
- Minerals lost in diarrhea
- Deficiency causes reduced growth, pica-depraved appetite, stiffness
- Salt is sodium chloride
- Potassium seldom deficient

Sulfur Level .2-.32%

- Functions in protein synthesis, milk and hair production
- Deficiency causes poor performance, hair loss, excessive saliva and tears
- Feeds with natural protein sources provide sufficient sulfur

Providing for Macromineral Requirements

- Helps to know hay and grass analysis
- Many protein supplements contain macro and trace minerals and vitamins
- Mineral supplement with min 12% calcium, 12% phosphorus ?
- Read the label

Urinary Calculi Prevention

- No supplemental P
- Add Ca to 2.0-2.5 Ca:P ratio
- No milking ration
- Plenty of clean/warm water
- Salt
- Ammonium chloride .5%
- Biochlor 4.0 oz./day

Problems With Goat Trace Mineral Nutrition

- Mineral requirements for goats are not well known
- May be breed differences in requirements
- Stress increases mineral requirements?
- Poor and variable intake of mineral supplements by goats

Problems With Goat Trace Mineral Nutrition

- Differences in forage mineral content
- Major affect by geology
- Soil pH affects mineral availability
- Plant species, stage of maturity and environment
- Goats consume a variety of plants

Problems With Goat Trace Mineral Nutrition

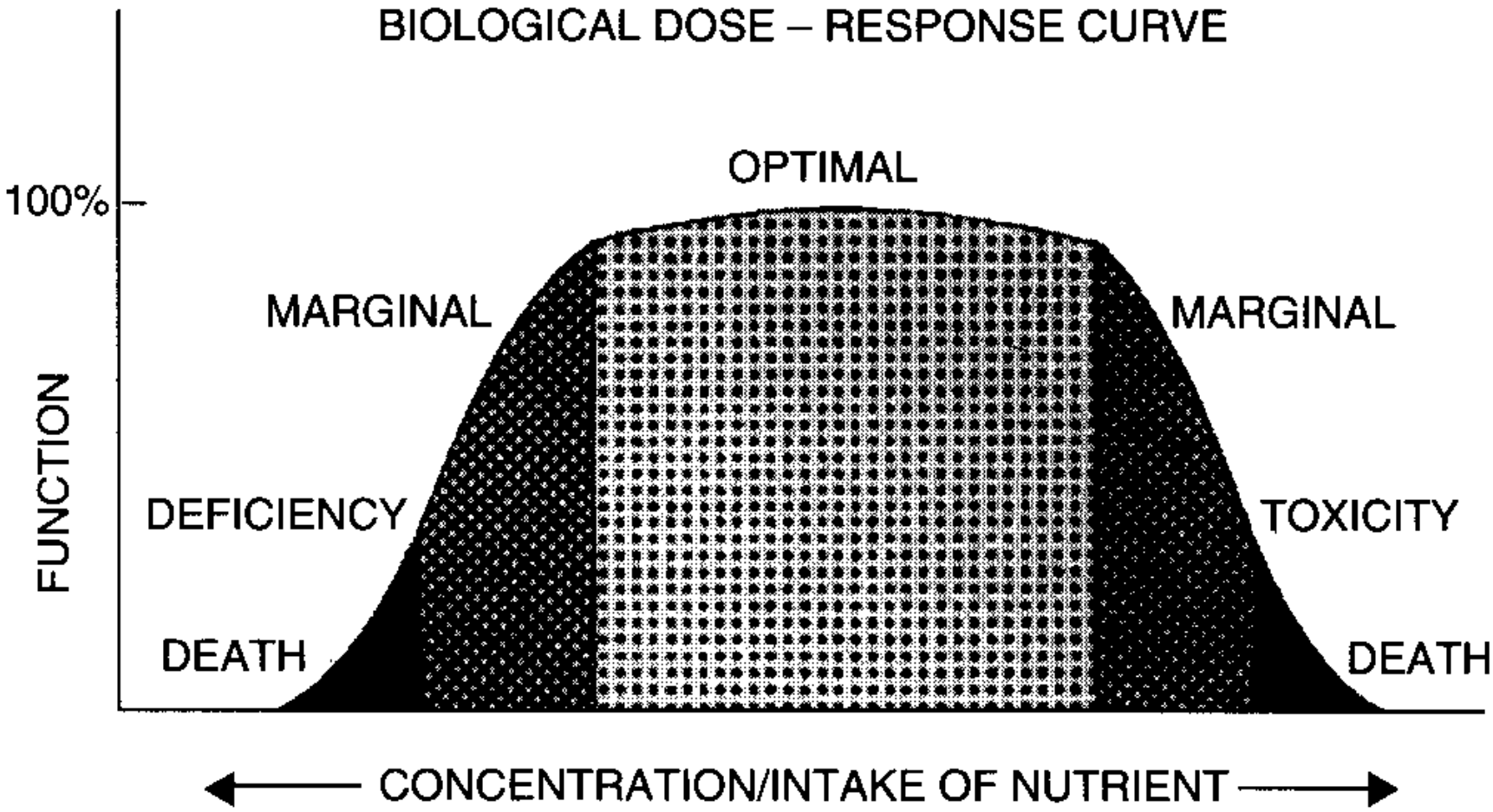
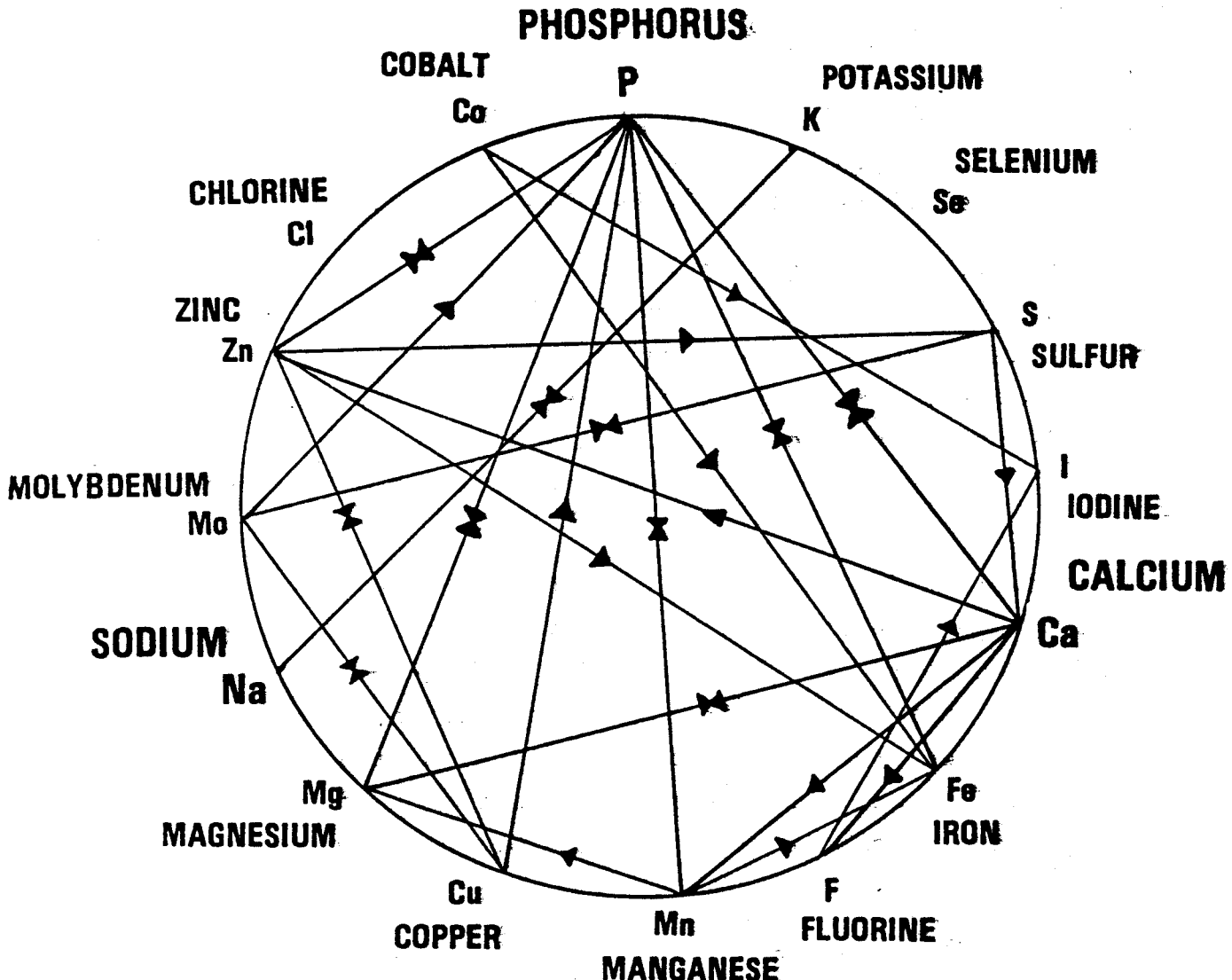


Figure 5: Dependence of animal function on intake of an essential nutrient [Courtesy of W. Mertz, U.S. Department of Agriculture, Beltsville, Maryland].

MINERAL INTERRELATIONSHIPS



Trace minerals

- Iron, Iodine, Copper, Zinc, Molybdenum Manganese, Selenium, Cobalt
- Regional dependent Selenium, Iodine, Copper
- Beef cattle recommendations
- Plant analysis
- Blood/liver analysis
- Custom mineral formulation

Iron Level 50-1,000ppm

- Component of hemoglobin in blood
- Deficiency results in anemia
- Iron is stored in liver, spleen and bone marrow

Copper Level 10-80 ppm

- Formation of hemoglobin, enzyme function
- Deficiency anemia, rough bleached hair coat, diarrhea
- Goat requirements are similar to cattle

Cobalt Level .1-10.0 ppm

- Component of Vitamin B-12
- Deficiency anemia, loss of appetite, weakness
- Seldom deficient in the US

Zinc Level 40-500 ppm

- Functions in immune system, skin integrity and reproduction and hooves
- Deficiency dermatitis, thick dry patches of skin, hair loss
- Often used to treat skin problems

Manganese Level 40-1,000 ppm

- Function in bone production and reproduction
- Deficiency reluctance to walk, foreleg deformity, poor reproduction, low birth weight

Iodine Level 1.0-50. ppm

- Functions as a part of thyroid hormone and reproduction
- Deficiency causes goiter-enlarged thyroid gland-do not confuse with thymus gland in goats
- Deficiency reproduction problems, late abortions, hairless fetus, dumb kids that have no desire to nurse

Molybdenum Level .1-3.0 ppm

- Function in enzyme xanthine oxidase
- Deficiency is very rare
- Depresses copper absorption
- Need four times copper level as molybdenum

Selenium Level .2 – 3.0 ppm

- Function in reproduction and membrane integrity
- Deficiency causes white muscle disease, poor reproduction and retained placenta
- Narrowest range of supplementation safety
- Interacts with vitamin E

Copper Toxicity

- Angora goats more sensitive
- Meat and dairy goats tolerate as much as beef cattle do
- Don’t use sheep/goat mineral
- Goats need more Cu than sheep
- Breed and individual differences

Providing for Mineral Requirements

- Present in browse/forage consumed
- Some body stores, but usually limited
- Hay
- Mineral supplements
- Commercial feeds

How Are We Doing?

- Body condition scoring
- Animal reproduction
- Animal health

Co-species Grazing

- Minimal dietary overlap

  Cattle consume grass, lesser amounts of forbs and browse: Sheep consume grass, considerable more forbs, less browse and sedges: Goats browse, grass and some forbs.
- Complimentary grazing relationship

Pasture Stocking Rate

Start with a small group of goats, let them multiply and sell goats when they run out of brush or weeds

Two goats/solid acre of brush?

Six goats to replace one cow?

Add .5 to 1.0 goats per cow?

Conclusion

- Remember the nutrients that your goats needs
- Think about cheap ways to provide those nutrients
- Use Langston Interactive Calculator when supplementation is needed
- Follow animal body condition to see how your nutrition program is working

Goat nutrition

- 600-740 million goats as farm animals in the world;
- Dairy stocks: cap. 300 goats
- Ways of utilization

Goat breeds

European:
Saanen, **White Alpine**,

Others:
Anglo Nubian, **Angora**,

Biological specialities of goats

- adaptive character
- „picking”(selecting) type
- relative volume of rumen is higher
- retention time is longer
- urea content of saliva is the highest among the ruminants
- „economical” animal

„Standard” goat

- 60 kg body weight (BW)
- 1000 kg milk per lactation
- 4 kg milk, 3.5% fat

Reproduction cycle of dairy goats

1. Production + reproduction cycle : 1 year;
2. Drying-off: 3.5 months;
3. Lactation: 8.5 months;
4. Reproduction: seasonality:

a. mating: in autumn (Sept.-Oct.) (without syncronization);
b. Lactation: +1.5 months after mating;
c. Drying-off;
d. Pregnancy: 153 days;
e. Kidding: Febr.-March.

„Standard" goat (cont.)

Dry matte intake: 1.5-5% of BW
Grass consumption: 2.56 kg DM

Energy requirement

1. UFL (unité fourragére lait = net energy for milk production; (UFL per kg milk= 2.65 for dairy goats), (INRA, (France, 1988);

2. ME (AFRC, United Kingdom);

3. NE_l (NRC, USA).

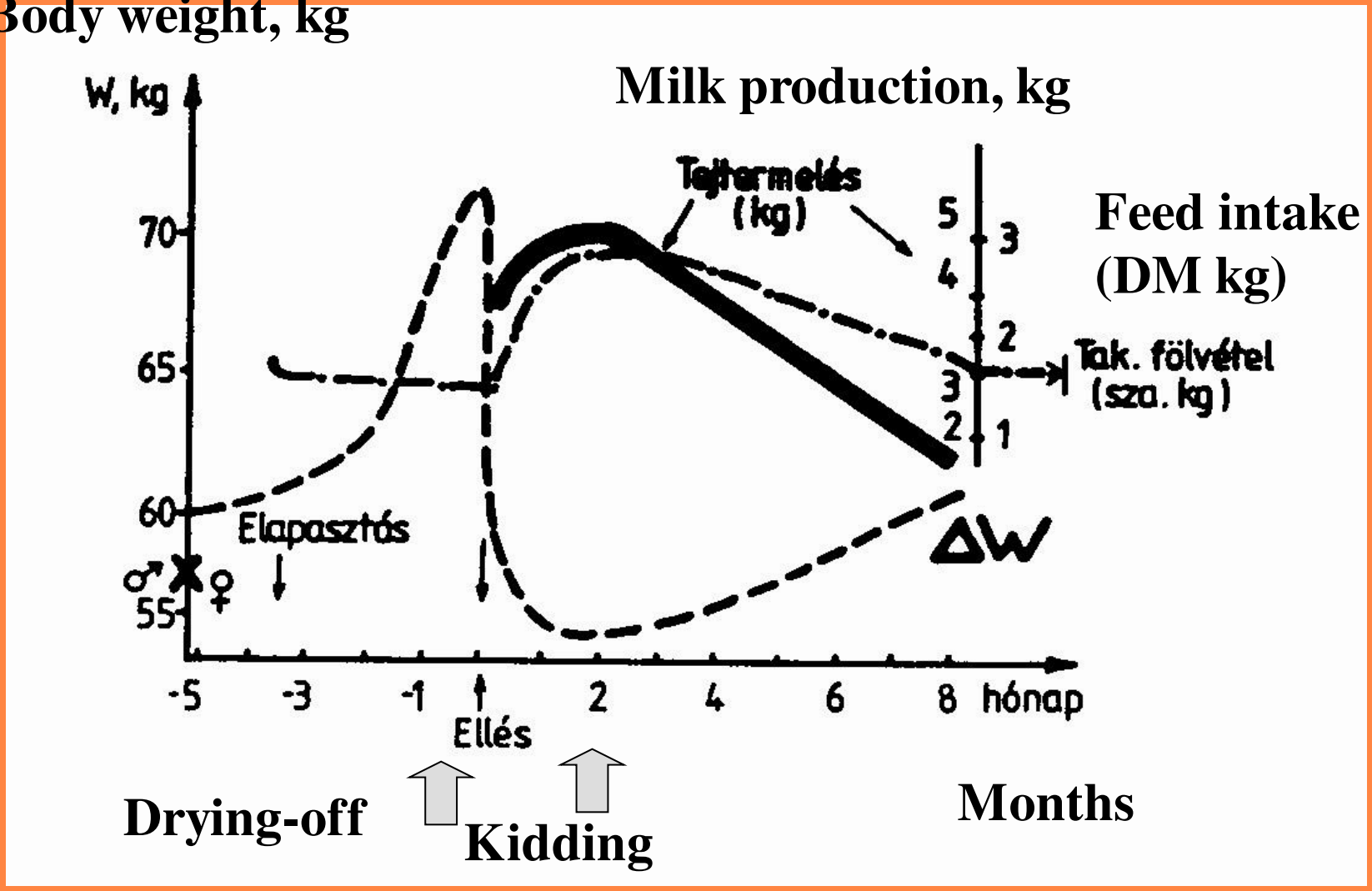
Nutrient requirement

ARC, U.K. (1998): ME, MP

INRA, France (1988): UFL, PDI

(amino acids absorbed in small intestine; see: MPE, MPN)

NRC, U.S.A. (1881): NE_l, crude protein



Correlations of lactation curve, dry matter intake and body condition of dairy goats

Nutrition of dairy goats

Pregnancy:

a. in the first 3 months: low requirement level;

b. in the last 2 months: + 20-25%, higher DM intake (no danger of fattening);

Lactation: 3-4 × of maintenance requirement

(+ 25-70% for grazing activity);

Drying-off: last 2 months before kidding:

slightly lower DM intake

Nutrient requirements of pregnant goats
(INRA, 1988)

Periods	Dry matter, kg	UEL	UFL	PDI, g	Ca, g	P, g
Maintenance	1.33	1.72	0.79	50	4.0	3.0
Month 4 of pregnancy	1.33	1.72	0.90	79	7.0	3.8
Month 5 of pregnancy	1.21	1.61	1.10	107	10.0	4.6

Nutrient requirement (cont.)

Breeding bocks:

In general: diet covering maintenance requirement.

1 month before and after **mating** period:

(in Europe: September till December);

+ **50%** of energy of maintenance level.

Kids

Bocks:

slaughtered in age
of 1-2 months,
Feed: milk or milk replacer;

Females:

rearing for milk production,
50-55% of the final body
weight (30-35 kg) should be
reached by autumn.

Feeding systems

1. Grazing
2. Based on hay
3. Based on silage
4. Based on fresh grass

Traditional goat diets

For a dairy goat of 60 kg BW;

daily milk production: 4 kg, 3.5% milk fat.

Based on hay:

1.3 kg hay

5.5 kg sugar beet slices (wet)

0.2 kg oat or barley

0.3 kg soybean or sunflower solvent

Traditional goat diets (cont.)

2. Total mixed ration based on silage

5.0 kg silomaize silage

0.5 kg alfalfa hay

0.6 kg sugar beet slices (dried)

0.3 kg soybean or sunflower solvent

3. Based on green grass

13.0 kg green grass

0.45 kg maize grain

0.15 kg field peas or sweet lupine

Metabolic diseases and nutritive disorders

1. **Abortion**

a. Stress abortion:

- glucose level decreases;
- days 90 to 110 of pregnancy,

Reason: steroid production of kid(s) has still oestrogenous effect; foetus is alive.

b. Habitual abortion:

Reason: hormonal inbalance; foetus is dead.

Metabolic diseases and nutritive disorders

2. Acute enterotoxemy:
   caused by *Clostridium perfringens*,
   rumen pH: 4.8; lactic acid toxicosis;
3. Ketosis: high NEFA-level, Na-propionate;
4. Parturient paresis: like in dairy cows but not so often;
5. Posthitis: urea content of urine increases, *Corinebact. renale* causes inflammation in praeputium

Metabolic diseases and nutritive disorders

6. Toxic plants: goats are usually resistant,

tolerance against tannin;

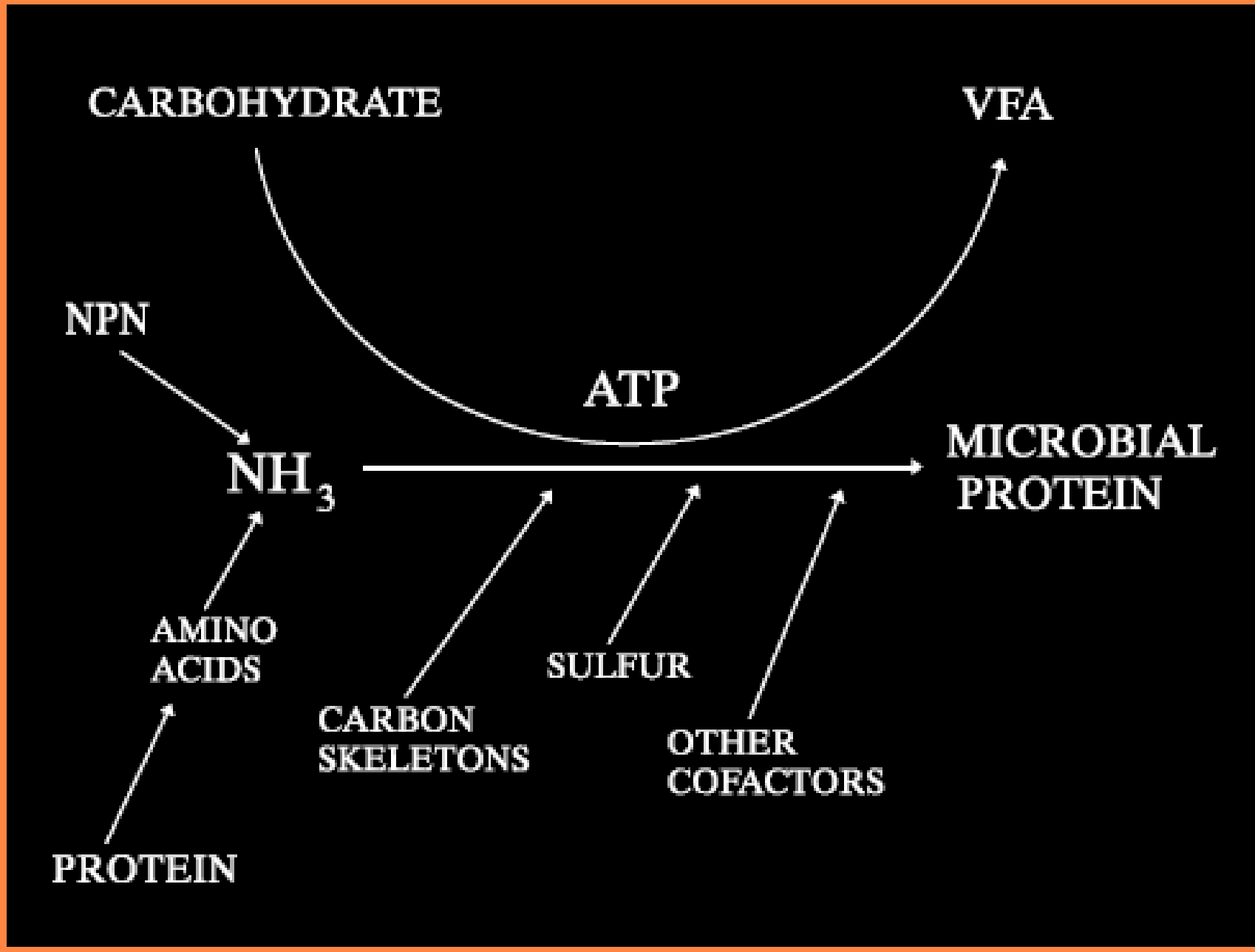
7. Urea toxicity:

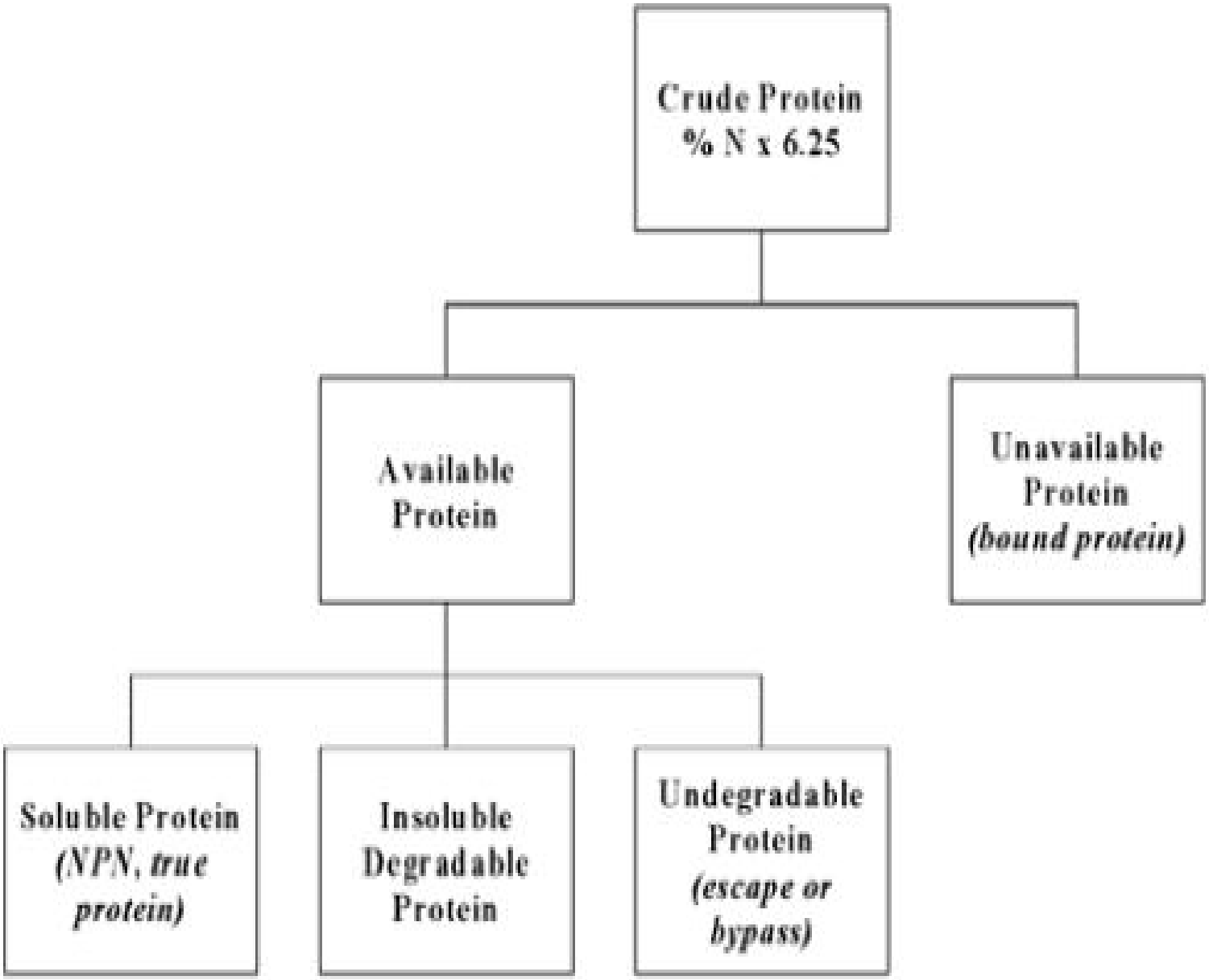
lethal dose: 0.44 g per body weight (kg)

8. Urolithiasis:

especially in bocks; high level of P and low level of Ca and K in the diet;

treatment: ammonium-chloride, potassium-chloride mixed in feed to acidify urine.


CARBOHYDRATE
VFA
NPN
ATP
NH_3
MICROBIAL PROTEIN
AMINO ACIDS
CARBON SKELETONS
SULFUR
OTHER COFACTORS
PROTEIN


Crude Protein
% N x 6.25
Available Protein
Unavailable Protein
(bound protein)
Soluble Protein
(NPN, true protein)
Insoluble Degradable Protein
Undegradable Protein
(escape or bypass)