

## Animal Nutrition – Teacher’s Outline

### Functions of Feed

- 1) Maintenance – maintaining the constant state of the body – breathing, heartbeat, body temp, digestion, etc.
  - A. Basal Maintenance requirement – amount of energy required for maintenance
- 2) Growth/Production – Adding weight/size (muscle, bone, fat) – where producers make their money
- 3) Reproduction – Animals need extra energy to reproduce – ovulation, sperm production, copulation, gestation, parturition, lactation
  - A. Poor nutrition can cause: low sperm count, no ovulation, miscarriage, low birth weight, underdeveloped fetus, little or no lactation
- 4) Work – expend extra energy during work – gaming or draft horses

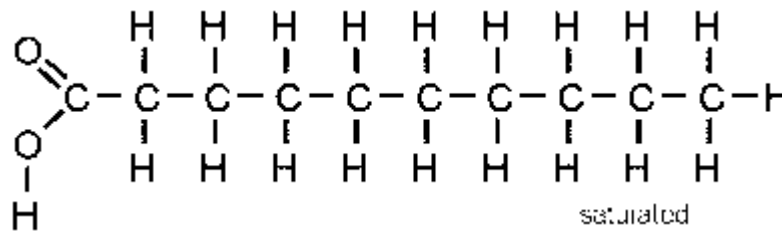
### Categories of Feed

- 1) Feed is what animals eat
  - A. Feedstuff is an ingredient in feed – can improve nutrient value, flavor, color, texture
  - B. Palatability – how well an animal likes the feed
- 2) Roughages – contain more than 18% Crude Fiber – plant leaves and stems – silages and hay
  - A. Legumes – Fixes its own N from the air – alfalfa, clover, lespedeza
  - B. Grasses – non-legumes – don’t fix N – lower in protein – corn, silage, fodders, grasses – fescue, timothy, orchard grass
- 3) Concentrates – Have less than 18% Crude Fiber but high in starches and protein
  - A. High energy concentrate – less than 20% protein – lots of starch or sugar – corn oats, sorghum, barley, rye, wheat
  - B. High protein concentrate – contains more than 20 % protein – soybean meal, cottonseed meal, sunflower meal
- 4) Supplements – high in 1 or 2 nutrients to improve feed nutrition
  - A. Protein supplements
    1. animal proteins – 47% protein
      - a. tankage – leftover tissue, blood, bone that has been cooked, dried, and ground
      - b. bone meal, blood meal, fish meal, etc.
    2. vegetable proteins – less than 47% protein – soy oil, peanut oil, etc.
  - B. Mineral Supplements – add salt or other minerals to the feed – like a daily vitamin
  - C. Medicinal Supplements – to prevent or treat health problems – cattle feed is medicated

### Nutrients

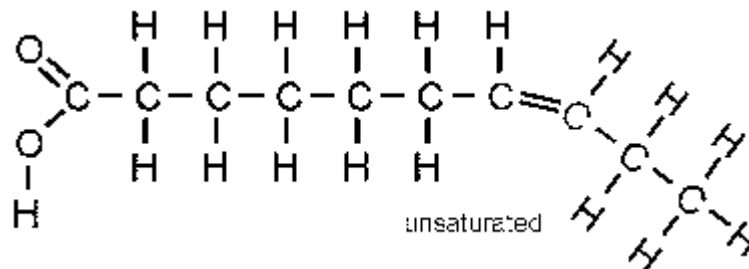
- 1) Water – most important nutrient – digestion, cell growth, nerve impulses, etc. – water quality
- 2) Carbohydrates – C, H, O
  - A. Sugars - ready energy - little digestion required

1. Simple sugars –  $C_6H_{12}O_6$ 
  - a. glucose, fructose, galactose
2. Complex sugars – 2 simple sugars linked together’
  - a. sucrose, maltose, lactose
- B. Starches – chain of sugars (usually glucose) that are easily digested – excess carbohydrates are stored in the body as fat – found in grains
- C. Fiber – Cellulose – composed of very long chains of sugars – found in the cell walls of plants – Soluble fiber is digestible in mono-gastric animals; Crude fiber is not digestible in mono-gastric animals – broken down by microbes in ruminant animals
- 3) Protein – Major component of muscle and tissue – our bodies look like they do because of protein – hair, muscle, skin, pigment, etc. – Contain N
  - A. Amino acids are the building blocks of proteins – mono-gastric animals have essential amino acids; ruminants can synthesize their own amino acids from any proteins they eat.
  - B. Peptidase is the enzyme that breaks proteins into amino acids that the body can use.
  - C. Protein builds muscle and tissue and provides energy in the animal’s diet.
- 4) Lipids – Composed of fatty acids – long hydrocarbon chains that have a carboxyl group on the end – even number of C
  - A. Saturated fats
    1. Hard at room temp
    2. all Carbons in the chain are filled with Hydrogens
    3. Fatty meats, dairy, palm and coconut oil
    - 4.



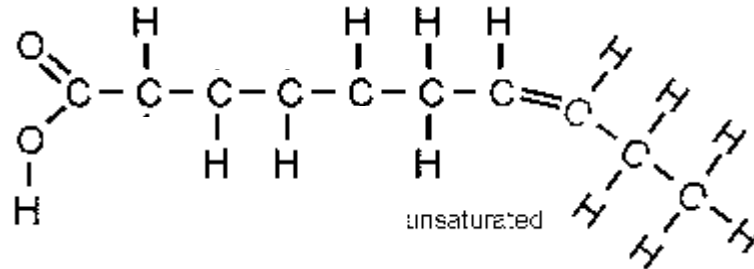
B. Monounsaturated

1. liquid at room temp, but turns to a solid when refrigerated
2. missing 2 Hydrogens because of a double bond at the end of the chain.
3. Canola, olive, almond, peanut oils



### C. Polyunsaturated

1. Liquid all the time
2. missing several Hydrogens because of the double bonded Carbons
3. Corn, soybean, safflower, and sunflower oils



### D. Trans Fats

1. do not occur naturally – created by breaking double bonds of an unsaturated fat and adding hydrogen
2. Makes a liquid fat a solid
3. Created a substance that can be a carcinogen
4. “Partially hydrogenated” oil

## 5) Minerals

### A. Macro-minerals

1. Ca – bone development
2. P – in a ratio of 2:1 with Ca for bone development
3. Na, Cl, K – electrolytes – transmit nerve impulses
4. S – amino acids and vitamin absorption
5. Mg – bone development and enzymes

### B. Micro-minerals

1. Fe – allows RBC to carry Oxygen to the cells
2. Cu – RBC formation – toxic to goats and llamas
3. Zn – immune system
4. Mn – bone development
5. Co – vitamin B<sub>12</sub> absorption
6. Mo – toxic in excess in Ruminants
7. I – thyroid
8. F – tooth enamel – toxic in excess
9. Se – Reproduction and antioxidant

## 6) Vitamins

### A. Fat soluble

1. A – vision – carotene – yellow vegetables
2. D – utilize Ca and P – sunshine
3. E – antioxidant – leafy greens
4. K – blood clotting – asparagus, leafy vegetables, liver

### B. Water soluble

1. C – antioxidant – citrus

2. B1 – thiamine – nervous system – chick peas, beans, oranges
3. B2 – Riboflavin – releasing food energy – bananas, eggs, tuna
4. B3 – Niacin – create enzymes – liver, soybeans, peanuts
5. B6 – Pyridoxine – metabolism – avocados, bananas, shrimp
6. B12 – Carbamamine – DNA creation – meat, fish, dairy
7. Folic acid – pregnancy – asparagus, cabbage, beans
8. Cholene – brain & nerve function – cabbage, cauliflower, oatmeal
9. Biotin – skin and nail development – beans, oatmeal, egg yolks
10. Panothenic Acid – metabolism – meats, peanuts, broccoli

### Food Utilization

- 1) Food is not 100 % digested and absorbed
  - A. TDN – total digestible nutrients – what the animal can digest and use from the food
  - B. ME – metabolizable energy – what the animal actually metabolizes or uses from the feed stuff
  - C. NE – Net energy – the amount of energy the animal is receiving from that feedstuff – Kcal/lb
    1. Protein – 75% digestible
    2. Carbohydrates – 85% digestible
    3. Crude Fiber – 20% digestible
    4. Fat – 85% digestible

\*\*Pg 279 – Farm animal book

### Feeding Systems

- 1) Free-access or Free-Choice – feed is available at all times for the animals to eat as they want it
  - A. Works well with mineral supplements and hay because it is very hard to over eat these feedstuffs
  - B. Works with some animals like pigs because they don't over eat
  - C. Does not work well with cattle or horses because they over eat and founder
  - D. Grazing
- 2) Scheduled feeding – giving a ration at certain times of the day
  - A. Ration – a calculated, balanced portion of feed
  - B. Give at regular times and often enough to satisfy animals

### Calculating Rations

- 1) Must be able to balance a ration for the desired amount of protein and Kcal to sustain the animal.
- 2) Must know the nutrient requirements for the animal – some science and some experimenting.
- 3) Must know the nutrient values of feedstuffs – testing and averages

### Average Nutrient Requirements of Livestock

Species	Weight	Status	% CP	Lbs TDN	Lbs feed
Sheep	110 lbs	Maintenance	9.5	1.2	2.5
Sheep	66 lbs	lambs	14.5	2.1	3
Sheep	110 lbs	Lactating	14.5	3.4	4.75
Cattle	1000 lbs	last trimester	16.5	11.7	30
Cattle	1100 lbs	Lactating	10	12.5	26
Cattle	770 lbs	Finishing Steer	11	14.14	20
Swine		Lactating	13	5.25	10.5
Swine	48-110 lbs	Finishing	15	2.9	4.5
Horse	880 lbs	Maintenance	10	6.7	14
Horse	880 lbs	Lactating	14	11.45	17
Horse	583 lbs	yearling	14	7.8	11