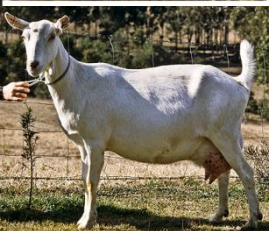


The power of nature with the reliability of science.



# Goat Nutrition

## Dr Julian Waters

### Consultant Nutritionist



**NUTRITECH**  
SOLUTIONS IN ANIMAL NUTRITION



# Agenda

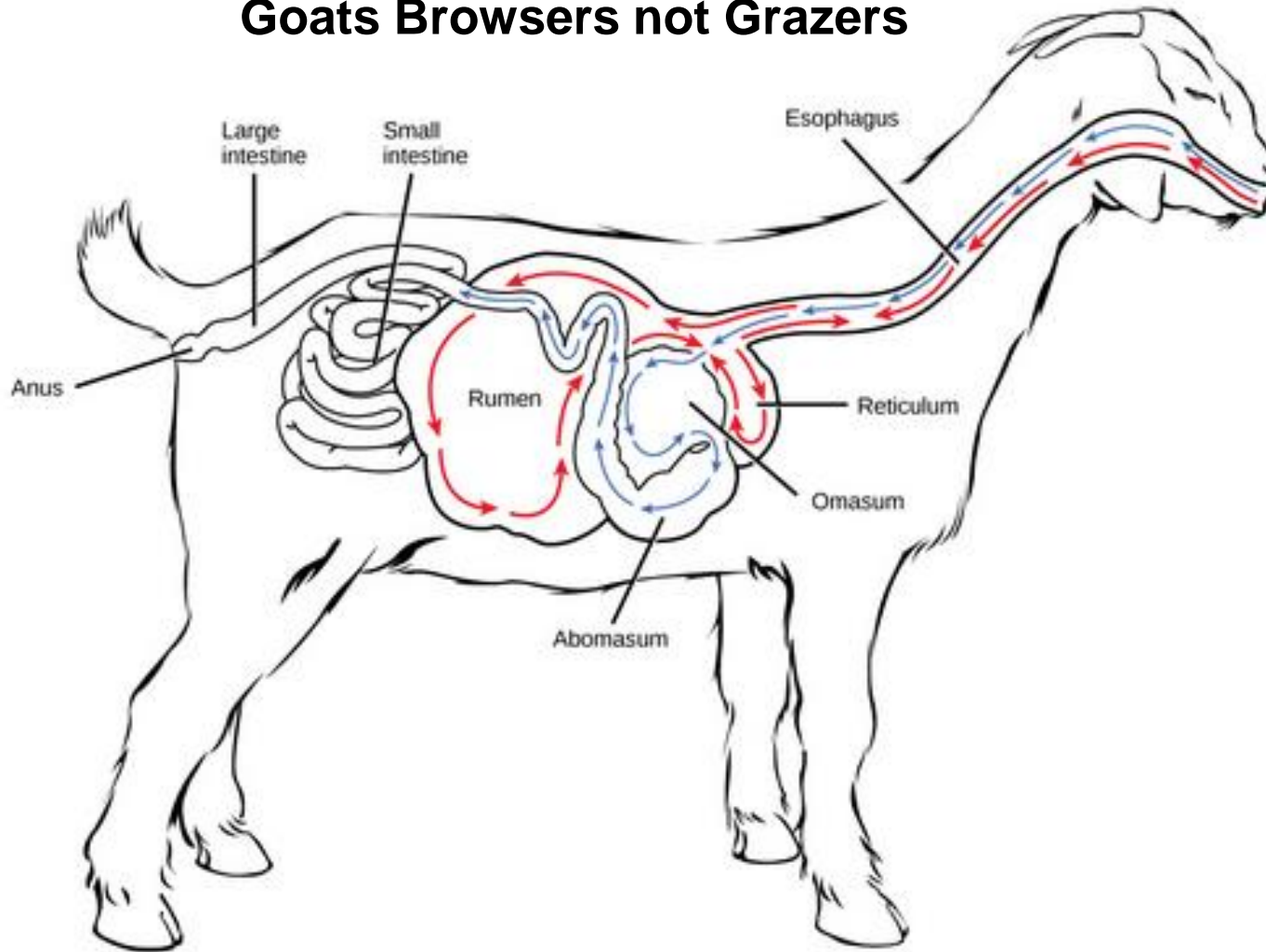
- Ruminant Digestive Systems
- Basic Nutrition
  - Energy & Protein
  - Other Nutrients
- Rearing Kids
- Does
  - Pregnancy
  - Lactation
- Bucks
- Minerals & Issues





# Ruminant Digestive System

Goats Browsers not Grazers



The power of nature with the reliability of science.



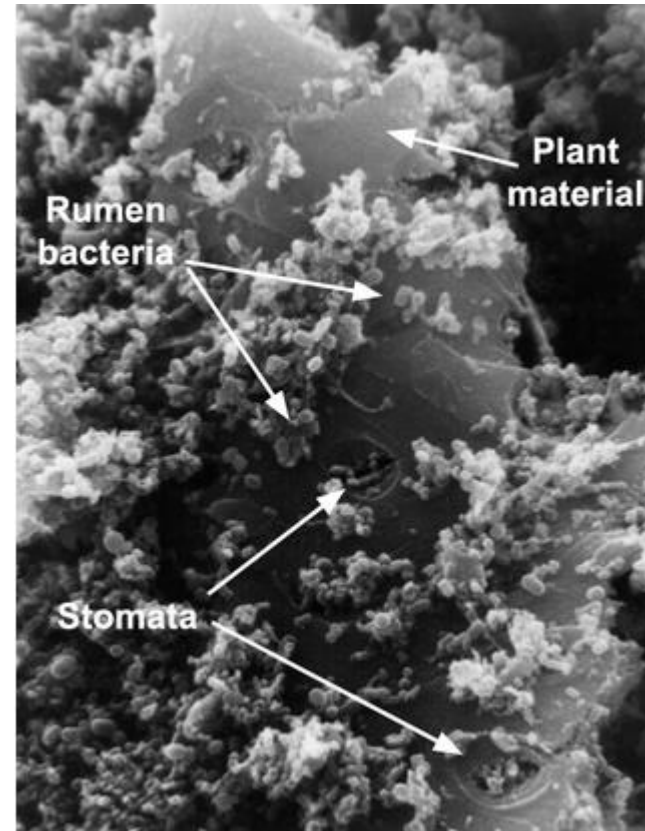
**NUTRITECH**  
SOLUTIONS IN ANIMAL NUTRITION





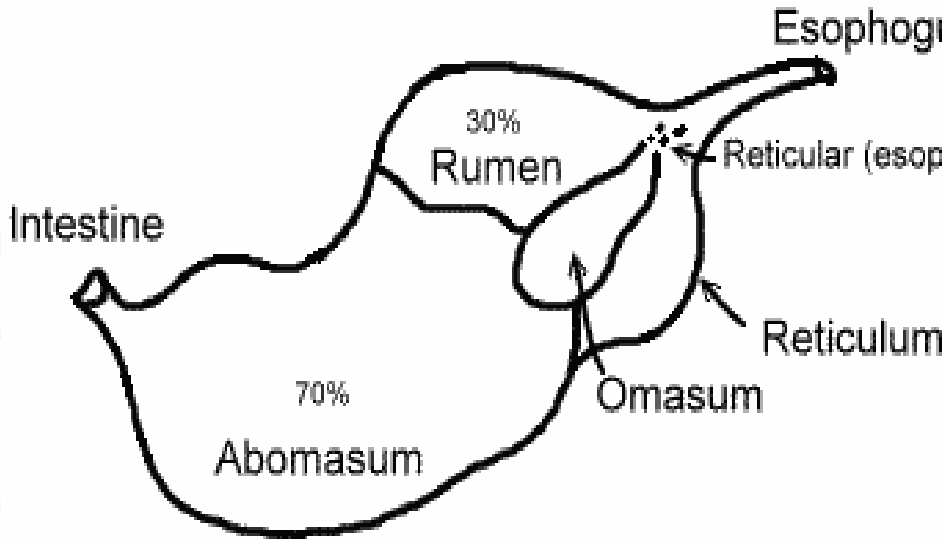
# Rumen Microbes

- **Bacteria** (10 billion/ml)
  - Sugar, Starch, Fibre Degraders
- **Protozoa** (1 million/ml)
  - Engulf Starch
- **Fungi** (1,000/ml)

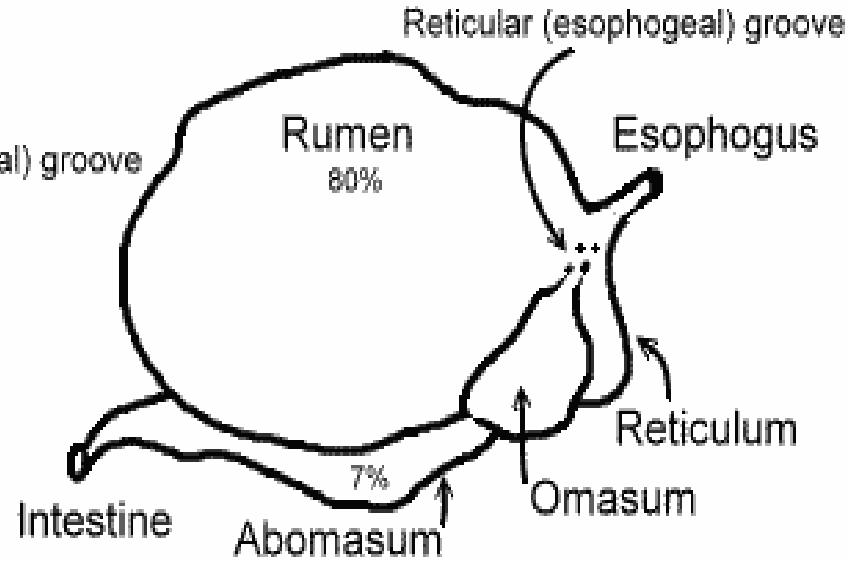




# Pre-Ruminant vs. Ruminant



Kid Goat

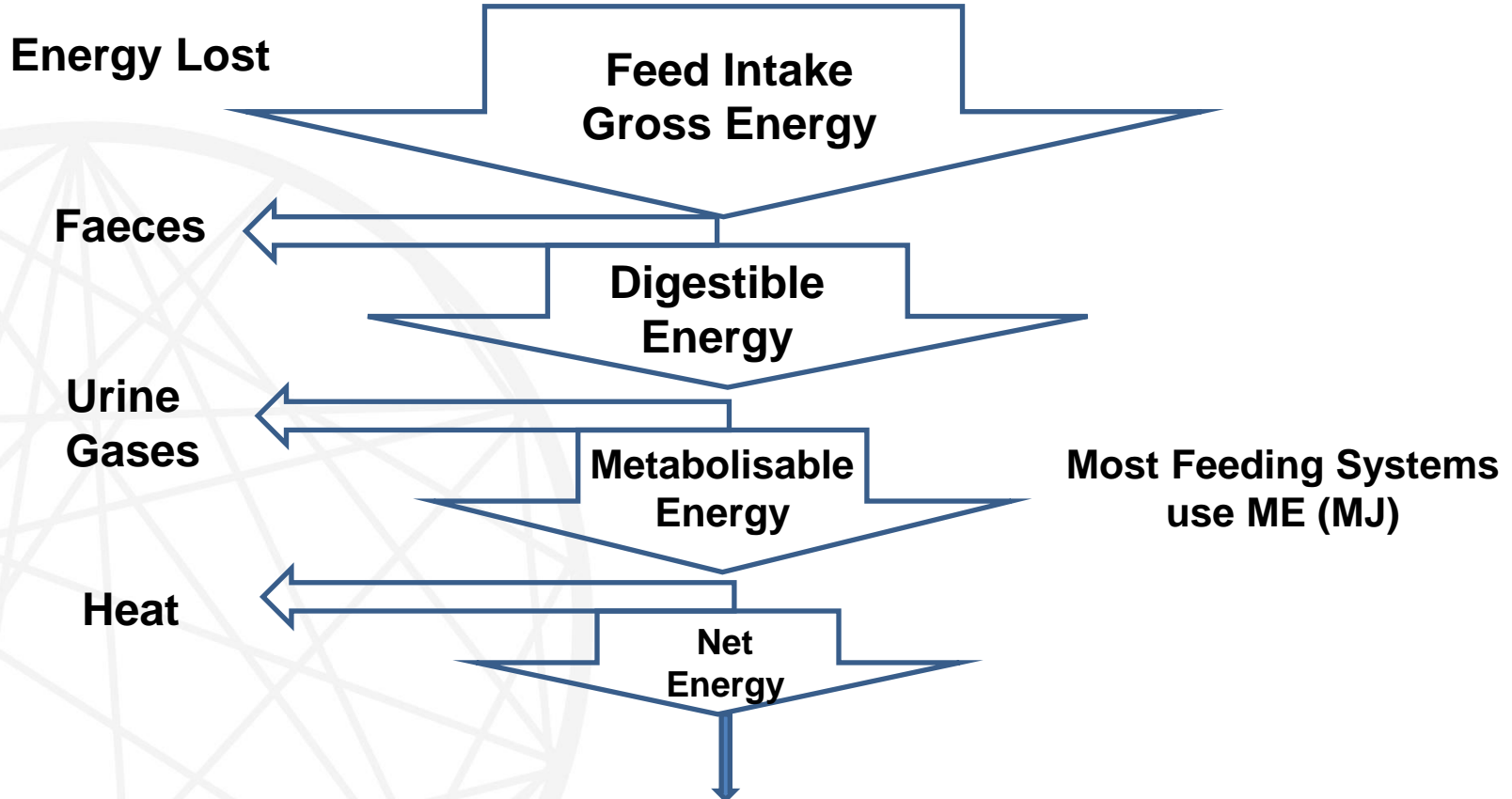


Adult Goat





# Energy

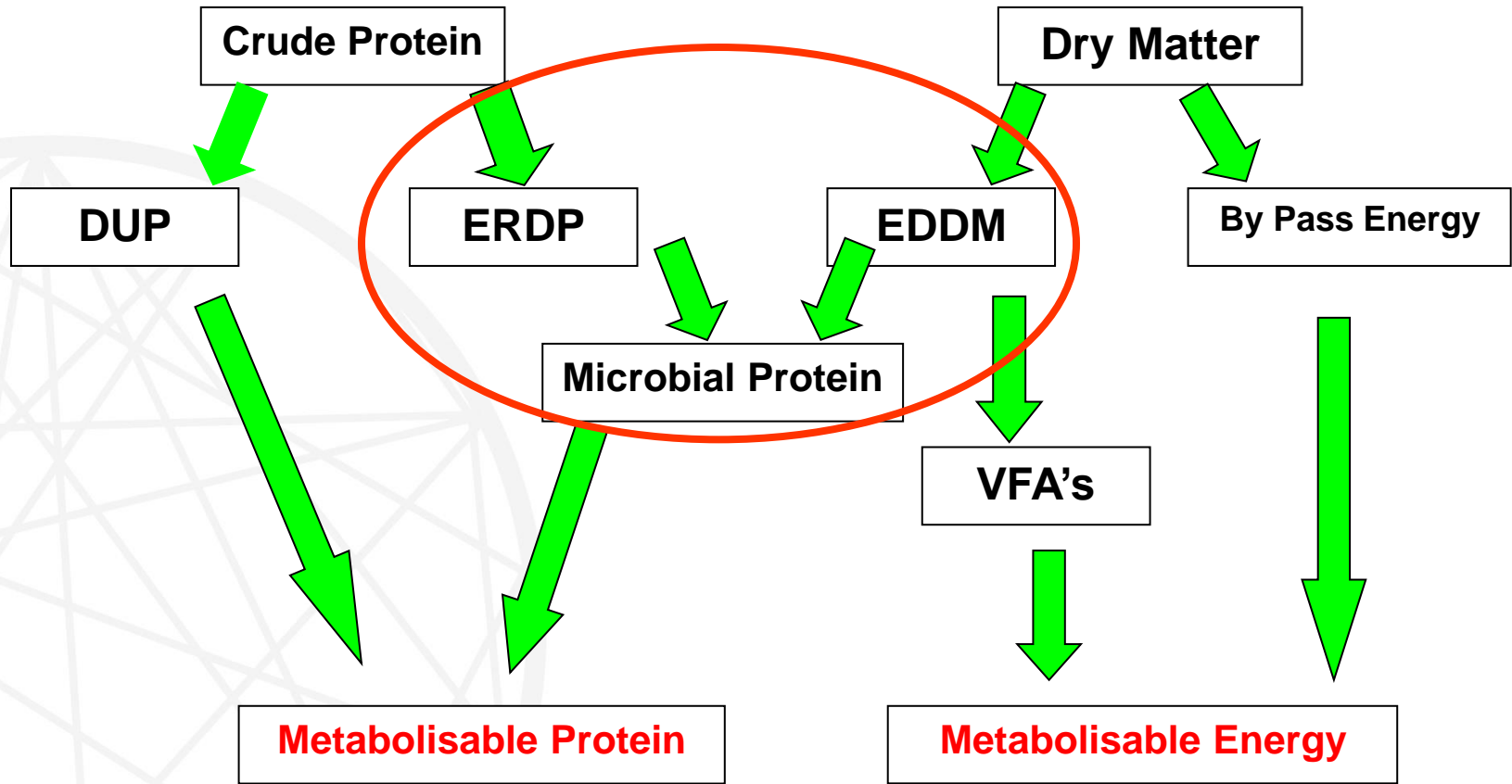


**Maintenance Growth Condition Reproduction Production Work Health**





# Metabolisable Protein & ME

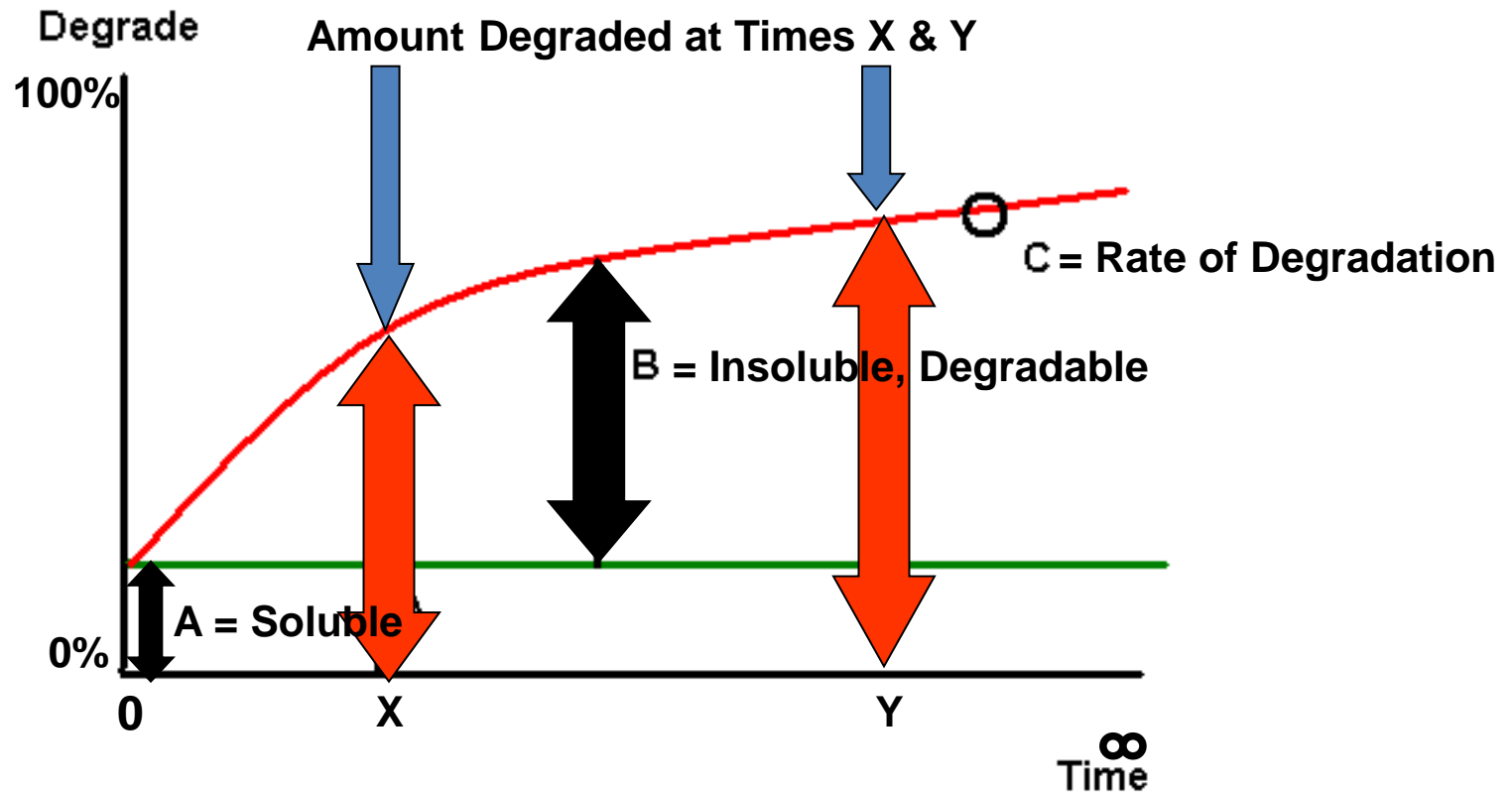


**ME & MP = Energy & Protein Available to Goat**





# Rumen Degradation







# Feed Analysis Predict ME & MP?

- **ME & MP Feeds not fixed**
- **Energy & Protein Predicted**
  - **ME**
    - NIRS Calibration of *In vitro* or *In vivo*
    - Book Values
  - **MP**
    - Crude Protein + NIRS Calibration of Degradability (not NZ)
    - Require Feed Rationing Program





# Energy Yielding Nutrients

- **Carbohydrates (CHO)**
  - Fibre, Starches, Sugars, Pectin
- **Fats**
- **Nitrogen Compounds**
  - Proteins, Peptides, Amino Acids
- **Volatile Fatty Acids**
  - Acetate, Propionate, Butyrate
- **Lactate, Monopropylene Glycol**





# Other Nutrients

- **Nitrogenous**
  - Urea, Essential & Non-Essential Amino Acids, Peptides, Proteins
- **Minerals (Ash)**
  - Major (g/d)
  - Trace (Organic, Inorganic) (mg/d)
- **Vitamins**
  - Fat Soluble
    - A D E K
  - Water Soluble
    - C B-Vitamins
- **Water?**





# Roles of Minerals

## Key Components in Body, Functions & Digestion

- Energy & Protein Utilisation      Cr Mn Zn
- Metabolism      Ca P Co I Cu Mn Zn Mo Se
- Bones      Ca P Mg Cu Mn Zn
- Tissue/Fluids      K Mg Na Cl HCO<sub>3</sub> Zn
- Nerve Impulses      Na K Cl Ca Mg
- Horn/Hair      Zn Cu S
- Immune/Reproduction      P Zn I Cr Cu Se Mn
- Milk      Ca P





# Vitamins (Fat Soluble)

- **Vitamin A**
  - Vision, Growth, Reproduction, Immunity
  - Rich in Green Plants
- **Vitamin D**
  - Vital in Ca & P Metabolism
    - Skeleton, Ca Storage & Mobilisation
    - Sunlight Required to Synthesise
- **Vitamin E**
  - Antioxidant
    - Protects Cell Membranes from Free Radicals







# Vitamins (Water Soluble)

- **Rumen Microbes Synthesise B Vitamins**
  - **Should Not be Deficient with**
    - **Fully Functional Rumen**
  - **B1 (Thiamine)**
    - **Thiaminases**
    - **(Polioencephalomalacia PEM, Cerebrocortical necrosis CCN, polio)**
      - **Plants: Bracken**
      - **Rumen Microbes (Acidosis?)**
  - **B12 (cobalamin)**
    - **Co**
    - **Rumen Function?**





# Rearing Kids

- **Caprine Arthritis Encephalitis (CAE)**
  - **Lentivirus infects hosts for life**
    - **Decrease lifetime productivity**
    - **Transmitted through colostrum & milk**
  - **Snatch Weaning**
    - **Cow Colostrum**
    - **Colostrum Products**
    - **Milk Replacers (+/- M&V, Coccidiostat etc.)**
    - **Cow Milk (+/- M&V, Coccidiostat etc.)**
      - **Similar Fat & Protein %**
    - **Pre-, Pro-Biotics, Egg Protein Technology**





# Milk Replacers Feeding Guidelines

- **Milk Replacer (~160 g/l)**

| Age      | Quantity (ml/d) |
|----------|-----------------|
| Day 1-2  | ~600 Colostrum  |
| Day 3-7  | <750            |
| Week 2   | <1,000          |
| Week 3-6 | <1,500          |
| Week 7   | <1,000          |
| Week 8   | <500            |

- **Forage & Water available**
- **Wean > 12 kg LW + >200 g Meal / day**





# Rearing Kids

## CAE Free

- **Colostrum**
  - 150-200 ml 1<sup>st</sup> 2 hours
  - 600 ml in 24 hours
    - Immunoglobulins (Ig's)
    - Gut starts closure to Ig's after 1<sup>st</sup> feed
    - No natural immunity at birth
- **Mother's Milk**
- **Milk Replacer & Weaning**
  - As previous slide





# Goat Meals

- **Specially Formulated Meals?**
  - **Some feed companies (Takanini Feeds)**
  - **Specifications very similar for Ruminants**
  - **Calf & Dairy & Sheep Meals possible**
    - **Check Minerals, Coccidiostats etc.**
      - **Dairy Meals High Copper & Zinc**
      - **Sheep Meals No Copper**
  - **Mineral Requirements Goats**
    - **Not Well Defined**
      - **Often based on Sheep Data**







# Growing Kids

- **Birth Weight (Breeds)**
  - 2-3.5 kg Singles > Twins > Triplets, Males > Females
- **Growth Targets**
  - Daily (100-250 g/d)
  - Weight by age(s)
    - Puberty 5-8 months
    - Breed 7-12 months (60-75% mature weight)
    - Gestation (145-155 d, 5 months)
    - Mature Weight (60-90 kg)





# Feed Guidelines - Kids

- Young Kids > Quality Feeds Older Kids

| LW (kg) | LWG (g/d) | DMI (kg) | DMI (%BW) | MEI (MJ/d) | CP (% DM) |
|---------|-----------|----------|-----------|------------|-----------|
| 10      | 100-200   | 0.4-0.6  | 4.0-5.6   | 5.3-7.6    | 16-18     |
| 20      | 100-250   | 0.7-0.8  | 3.6-4.0   | 7.4-10.8   | 15-17     |
| 30      | 100-300   | 0.9-1.1  | 3.0-3.5   | 9.2-13.8   | 14-16     |
| 40      | 100-300   | 1.5-1.6  | 3.0-3.5   | 10.8-15.4  | 13-14     |





# Feed Guidelines - Pregnancy

- **Early (1-2 m)**
  - Similar to Maintenance
- **Mid (3-4 m)**
  - Foetal Growth Rate Accelerating
  - Requirements Triplets > Twins > Singles
- **Late (5 m)**
  - ME Requirement 2 x Maintenance
  - Pregnancy Toxaemia
    - Energy Deficiency





# Feeding Guidelines - Lactation

- Requirements
  - LW, Milk Yield, Fat Mobilisation, Activity
  - Feed Quality

| 60 kg LW<br>4.7F 3.6P | Month 1     |               | Month 2-3   |               | Month 4-9   |               |
|-----------------------|-------------|---------------|-------------|---------------|-------------|---------------|
| Milk<br>(kg/d)        | DMI<br>(kg) | MEI<br>(MJ/d) | DMI<br>(kg) | MEI<br>(MJ/d) | DMI<br>(kg) | MEI<br>(MJ/d) |
| 2                     | 1.8         | 20.4          | 2.1         | 22.6          | 2.2         | 24.5          |
| 3                     | 2.3         | 26.4          | 2.6         | 28.6          | 2.8         | 30.5          |
| 4                     | 2.8         | 32.4          | 3.2         | 34.7          |             |               |
| 5                     | 3.4         | 38.6          | 3.7         | 40.9          |             |               |
| 6                     | 4.0         | 44.9          | 4.3         | 47.2          |             |               |

- Milk Fever (Ca)





# Bucks

- **Maintenance Diet**
  - Feed for Condition
- **Increase Feed & Energy Pre-mating**
  - Protein no change
- **Urinary Calculi (Water Belly)**
  - Ca : P 2-1.5:1







# Mineral Guidelines (NRC 2007)

| Kids<br>kg LW | Ca<br>g/d | P<br>g/d | Mg<br>g/d | Na<br>g/d | Co<br>mg/kg<br>DM | Cu<br>mg/kg<br>DM | I<br>mg/kg<br>DM | Mn<br>mg/kg<br>DM | Se*<br>mg/d | Zn<br>Eq |
|---------------|-----------|----------|-----------|-----------|-------------------|-------------------|------------------|-------------------|-------------|----------|
| 10            | 3.5-6     | 1.6-3    | 0.4-0.6   | 0.4-0.6   | 0.11              | 8-10              | 0.5              | 0.7               | 0.4-0.6     | 0.9      |
| 20            | 4-8       | 2-3.5    | 0.6-0.9   | 0.6-0.9   | 0.11              | 8-10              | 0.5              | 0.7               | 0.5-0.7     | 3.0      |
| 30            | 4-9.5     | 2.5-4.5  | 0.7-1.1   | 0.8-1.2   | 0.11              | 8-10              | 0.5              | 0.7               | 0.5-0.8     | 4.5      |
| 40            | 5-10      | 3-5      | 0.9-1.3   | 1-1.4     | 0.11              | 8-10              | 0.5              | 0.7               | 0.5-0.8     | 9.0      |
| Does          |           |          |           |           |                   |                   |                  |                   |             |          |
| Maint         | 2-3       | 1.5-2.5  | 0.9-1.4   | 0.9-1.5   | 0.11              | 8-10              | 0.5              | 0.002             | 0.4         | 15-24    |
| Prg TwLP      | 6.5-9     | 3.5-6    | 0.9-1.4   | 1-1.7     | 0.11              | 8-10              | 0.5              | 0.025             | 0.5         | 23-40    |
| Lact          | 17-20     | 10-13    | 2.3-5.6   | 2-4.5     | 0.11              | 10-25             | 0.8              | 0.03              | 1-2         | 89-244   |
| Bucks M       | 2.5-4     | 2-3      | 1.4       | 1.5       | 0.11              | 8-10              | 0.5              | 0.002             | 0.4         | 24       |
| Bucks Br      | 2.5-5.5   | 2-5      | 1.4       | 1.5       | 0.11              | 8-10              | 0.5              | 0.002             | 0.4         | 24       |

**Guidelines only, as vary by LW, Stage Pregnancy, Lamb No, MY etc.**





# Other Issues?

- **Seasonal Variation?**
- **Worms, Disease, Parasites**
  - Increase requirements as divert resources
- **Scours**
  - As above
  - Disease, Diet Imbalance?
    - Treat + Electrolytes
- **Others?**

