**Protein Quality:** Indicated by biological value (BV). High BV protein is more expensive.

**Major Amino Acids:**
- Arginine: Growth and urea production.
- Branched chain amino acids (BCAA): Synthesis of muscle proteins
- Histidine: Structural protein
- Lysine: Synthesis of all proteins
- Methionine and cysteine: Hair protein, keratin
- Phenylalanine and Tyrosine: Thyroid and adrenal gland function, hair pigmentation
- Taurine: Healthy eyesight, healthy heart, natural antioxidant
- Threonine: Energy production
- Tryptophan: Hormone production

**Lipids:** Provide twice as much energy as proteins and carbohydrates. Monoglycerides and diglycerides are great for immediate energy. Triglycerides take more time to break down, and consist of one glycerol molecule and three fatty acid chains. Unsaturated fats have a double bond in the carbolic acid chain. Omega-3 & -6.

**Lipid Digestion:** Stomach- gastric lipase breaks down part of fat to FA and glycerol. Small intestine- pancreatic lipase & bile. Absorption through intestinal wall- Chylomicron formation (lipoprotein) transports lipids from intestine to adipose, cardiac, and skeletal muscle. Transport to mitochondrion under influence of L-carnitine.

**Minerals:** Inorganic nutrients. They are catalysts in enzyme and hormone systems. Typically 'crude ash’ in feed. Around 18 mineral elements found in foodstuffs. Macro minerals are required in large amounts (6 essentials: Calcium, phosphorus, potassium, sodium, magnesium, chloride). Micro minerals needed in small amounts (6 essentials: Iron, zinc, manganese, copper, molybdenum, selenium).

**Vitamins:** Organic compounds. There are fat soluble, water soluble, and vitamin like substances.

**Energy:** BW = Metabolic body weight.
- RER= Resting energy requirement (293kj x BW0.75). DER= daily energy requirement.
- Gross energy (GE)= total amount of energy.
- Metabolisable energy (ME)= Net energy usually only 40% available after faeces, urine, gas & heat subtracted.

**Rationing:**
Amount to feed= DER (kJ/d) / ME (kJ/100g) X 100g