CRC for Premium Quality Wool

Factors That Influence the Supply of Nutrients to the Follicle

Produced for the CRC for Premium Quality Wool undergraduate program by;
Dr. Janelle Hocking Edwards & Ms. Rachel Smith, The University of Western Australia and Prof. Phil Hynd, The University of Adelaide.

The amount of nutrient available to the cell is a function of ...

- blood flow to the cell
- concentration of nutrient in the blood
- transport from capillary to cell i.e. uptake
- efficiency of use of absorbed nutrients

CRC for Premium Quality Wool

Phil Hynd

1. Skin blood flow is highly variable

- Thermoregulation relies on peripheral vasoconstriction and dilation
  - controlled by noradrenaline from sympathetic nerve endings
  - blood flow to the skin is variable
- Nutritive versus non-nutritive blood flow

CRC for Premium Quality Wool

Janelle Hocking Edwards & Rachel Smith

2. Concentration of nutrient in the blood

depends on the supply to, and utilisation of, nutrients by ruminants

Rumen — microbial synthesis bypass protein

↓

Small intestine — amount quality (essential AA)

↓

Liver — deamination transamination propionate formation

→ amino acids to circulation

partitioning

- → Wool
- → Other tissues

Phil Hynd

CRC for Premium Quality Wool

Concentration of nutrients in plasma of fed sheep

Substrate	Concentration m moles/l	Substrate	Concentration m moles/l
Glucose	2.2 - 3.3	Ketone bodies	0.23 - 0.57
Acetate	1.0 - 2.0	Triglyceride	0.1 - 0.5
Lactate	0.25 - 0.50	Glycerol	0.03 - 0.04
N.E. Fatty Acids	0.8 - 1.1	Amino acids	2.0 - 3.0

N.E. Fatty acids = non esterified fatty acids

CRC for Premium Quality Wool

Janelle Hocking Edwards & Rachel Smith

Source: Black and Reis, (1979)

3. Supply of nutrients from the plasma to the follicle

- Nutrients must cross
  - capillary endothelium
  - fluid spaces/ECM surrounding the follicle
  - tight junctions
  - cell membranes

CRC for Premium Quality Wool

Phil Hynd

Transport into cell

- glucose
  - facilitated by glucose transport proteins (Gluts)
- amino acids
  - actively via various amino acid transport systems
- fatty acids
  - simple diffusion through lipid membranes

Janelle Hocking Edwards & Rachel Smith

4. Use of absorbed nutrients

- GLUCOSE is metabolised to ATP
- AMINO ACIDS maybe metabolised either to ATP or used for protein formation
- FATTY ACIDS are metabolised to ATP and used for membrane formation

CRC for Premium Quality Wool

Janelle Hocking Edwards & Rachel Smith