

## Appendix 4 Vitamins and minerals required by dairy cows

### Vitamins required by dairy cows

#### Vitamin A

Vitamin A (retinol) is a component of the visual pigments in the eye. It is also involved in the formation of tissue and bone and is required for growth, milk production and reproduction. Excess vitamin A is stored in the liver for up to three to four months.

Vitamin A is formed from dietary carotene in the intestinal wall. Most of the vitamin A requirement is met by the consumption of grasses. Deficiencies of vitamin A are uncommon in forage-fed cattle but can occur in cattle fed diets high in cereals or cereal straws or in calves fed low fat milk replacers low in vitamin A.

#### Vitamin D

Vitamin D is closely involved with calcium (Ca) and phosphorus (P) metabolism as it is required for Ca and P absorption and deposition within bone. It also stimulates the absorption of calcium from the small intestine. If Ca and P levels are adequate in the diet, the need for vitamin D is small.

Vitamin D is also required for the growth and maintenance of teeth and bone. Vitamin D is used in the prevention of milk fever. However, the effectiveness of vitamin D in treating milk fever is reduced when dietary calcium is too low or too high. The best results are achieved when calcium intakes are in the order of 50 to 70 g calcium/d.

Vitamin D is formed in the skin following exposure to sunlight and is stored in the liver. Deficiencies are rare; however, vitamin D toxicity has been observed in cows given excessive doses of vitamin D during the treatment of milk fever. Vitamin D toxicity results in the calcification of the body's soft tissues (especially the aorta in the heart).

#### Vitamin E/Selenium

A deficiency of either vitamin E or selenium (Se) leads to muscular dystrophy (white muscle disease) which produces stiffness, uncoordinated movement and in severe cases, death from heart failure. Vitamin E prevents damage to cell membranes.

Both vitamin E and Se have anti-oxidant properties that protect biological systems from degradation and may be important in maintaining reproductive health. Research has found that Se accumulates in body tissues important to reproductive health. There is some suggestion that Se deficiency may cause early embryonic loss. Animals deficient in Se and vitamin E may have suppressed defences against infectious diseases.

Cows supplemented with vitamin E and Se have demonstrated improved conception rate, sperm transport, increased uterine contractions moving towards the oviduct, more robust immune systems (leading to reduced incidence of metritis) and reduced cases of retained foetal membranes and cystic ovaries.

Selenium and vitamin E supplementation is of value in areas deficient in Se when such deficiencies are limiting reproductive performance.