# 7. Iodine

Adequate iodine intake by pregnant animals is essential to enable their offspring to produce sufficient thyroid hormone for development and growth, and to survive after birth. Extreme iodine deficiency results in decreased thyroid hormone production by the thyroid gland which responds by increasing in size to produce goitre. Sheep and cattle require a diet containing 0.5 mg iodine/kg DM. Diets containing less than 0.2 mg/kg DM produce goitre in lambs (Mason 1976). The few Victorian pasture samples analysed for iodine have ranged from 0.1 to 0.5 mg/kg DM.

Goitrogens in plants affect the iodine requirements of livestock by interfering with iodine up-take by the thyroid gland or inhibiting synthesis of thyroxine. The most common goitrogen is thiocyanate, derived from both the cyanide in white clover and the glucosinolates in brassica fodder crops.

Iodine is not required for plant growth.

## *7.1 Occurrence of iodine deficiency in Victoria*

Much of the hill country in Victoria, particularly where there is high rainfall, was once noted as a goitre area for humans, until adequate iodine was included in the diet (Clements 1960).

For many years, sporadic outbreaks of goitre have occurred in kids, lambs, foals and calves (figure 7.2) on or adjoining the Dividing Range (Caple *et al*. 1980).

A marked seasonal variation in the iodine nutrition of grazing livestock in Victoria has been demonstrated by monitoring milk iodine concentrations in cows and ewes (see figure 7.1). Milk iodine concentration is directly related to iodine intake in cows and sheep (Mason 1976). The iodine intake of grazing livestock in Victoria in-creases during November, reaches a maximum during the summer months and declines very rapidly within days after the autumn rains. It decreases further during winter and early spring. In Victoria, only lambs born between August and October are generally susceptible to iodine deficiency (Caple *et al*. 1982).

Seasonal conditions favoring the development of iodine deficiency include early autumn rains with good pasture growth in May and June, and rainfall during the months of May, June and July in excess of 80 mm per month.

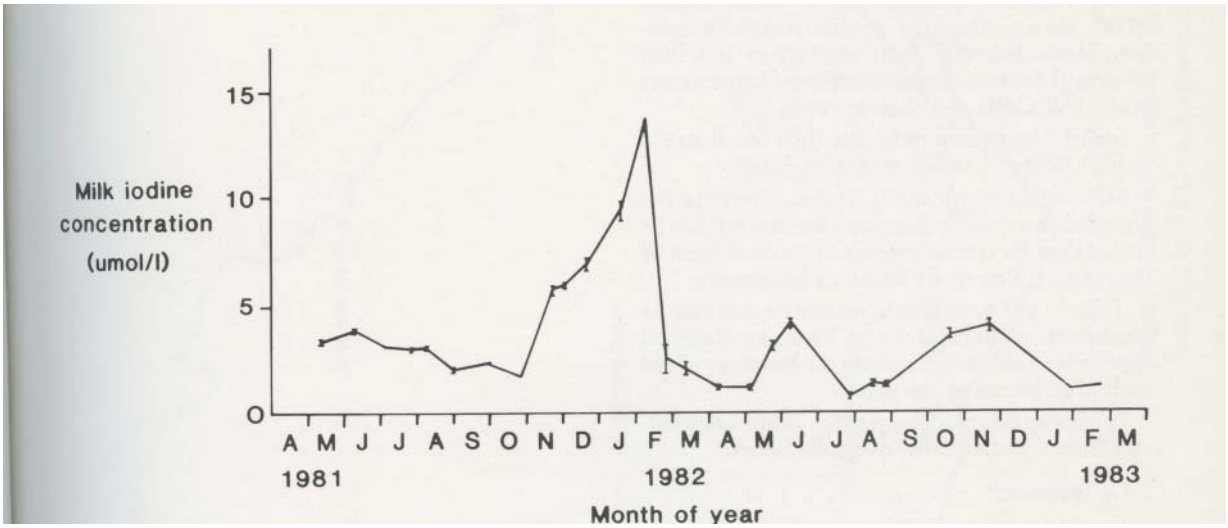


**Figure 7.1: Milk iodine concentrations from grazing ewes at Attwood VRL (Melbourne) (Azuolas and Caple 1984).**

Of grazing animals, goats are the most susceptible to iodine deficiency in Victoria. Factors contributing to this high susceptibility include their breeding season and grazing behavior (Caple *et al*. 1983). Foetal goats undergo most rapid development during winter and spring when iodine intake by does is lowest. In addition, goats do not like grazing short pastures, and so have a lower soil iodine intake than other animals.

## *7.2 Signs of iodine deficiency*

The presence of enlarged thyroid glands in new-born animals, particularly in association with very high mortalities, provides an indication of iodine deficiency. Deficient lambs lack vigor and are very susceptible to cold stress and may have less than normal wool covering. Very often the thyroid enlargement is difficult to detect without detailed examination and is easily overlooked.

### 7.3 Diagnostic methods

Detection of an enlarged thyroid gland, and a ratio of thyroid weight to body weight greater than 0.4 g/kg, provides an indication of goitre in lambs and kids. Microscopic study of the thyroid is used to confirm the type of goitre present.

Iodine concentrations in doe milk less than 0.8 umol/l indicate inadequate iodine intake, and have been associated with goitre in kids on properties in Victoria (Caple *et al*. 1983). Newborn kids with adequate iodine nutrition have serum thyroxine concentrations greater than 200 nmol/l. Kids aged up to three weeks should have serum thyroxine concentrations greater than their does (Caple *et al*. 1983).

Iodine concentrations in ewe milk less than 0.6 umol/l indicate inadequate iodine intake (Mason 1976). Serum thyroxine concentrations in new-born lambs less than their mothers or less than 50 umol/l indicate hypothyroidism (Andrewartha et al. 1980, Caple and Nugent 1982).

Iodine concentrations in cow milk less than 0.2 umol/l indicate inadequate iodine intake.

Milk iodine assays and thyroxine assays are not provided as a routine diagnostic service, but can be undertaken for special investigations conducted by the Attwood Veterinary Research Laboratory.

Thyroid and body weight measurements may be conducted in the field, or at Victorian Regional Veterinary Laboratories where the histology of the thyroid gland can be assessed.

Pasture and fodder analyses for iodine are available from the State Chemistry Laboratory.

### 7.4 Treatment

Affected lambs and kids may be treated with thyroxine preparations or thyroid tablets, drenched with 20 mg of potassium iodide, or injected with 1 ml of an iodised oil preparation (Lipiodol).


**Figure 7.2: The location of recorded outbreaks of goitre in lambs (0), kids (r), calves (*)** and **foals (❑) in Victoria (Caple *et al*. 1980).**

**Sheep**—Only flocks lambing between August and October in the high rainfall areas where goitre has occurred require iodine supplementation in Victoria.

Iodine deficiency can usually be prevented by drenching ewes once during the third and fourth month of pregnancy with 280 mg of potassium iodide per ewe, or by providing salt licks containing 25 g potassium iodate/100 kg of salt. Routine preventive measures are warranted only in flocks experiencing regular outbreaks of goitre and when seasonal conditions such as a good autumn break and high rainfall in May, June and July favor iodine deficiency.

**Goats**—Goats are more susceptible than sheep to iodine deficiency (Caple *et al*. 1980, 1983) and as a general recommendation all breeding goats in low iodine areas in Victoria should be provided with supplemental iodine, for example, strategic iodine drenching and iodine salt-licks, to prevent goitre and heavy mortalities in newborn kids. In severely deficient areas, iodised oil injections (1 ml) should be given to pregnant does each year.

**Cattle and horses**—Iodised salt licks should be provided for breeding animals in recognised low iodine areas.

### *7.5 Iodine in milk*

Food Standards Regulations in Victoria stipulate that iodine concentrations in milk from dairy cows must not exceed 500 ug/l (3.9 µmol/1).

The main concern with iodine nutrition of dairy cows is the high concentration of iodine in milk which can occur through excessive use of iodophors in dairy sanitation and mastitis prevention, and after intrauterine treatments of cows with iodine preparations (McCaughan *et al*. 1984). Little attention has been given to the nature of any seasonal variations in the iodine intake of grazing cows. If these were marked, then the use of these treatments at particular times would be contraindicated since milk iodine concentrations could exceed 500 µg/l.

A similar seasonal pattern of changes in milk iodine concentrations in sheep (figure 7.2) has been found in dairy cows (Hubble 1981). It is assumed that this seasonal pattern simply reflects the movement of iodine in soil, and the concentrations of iodine in soil and pasture ingested by the cow.

On the basis of these observations farmers, veterinarians, dairy supervisors and dairy husbandry officers are advised to avoid unnecessary iodine treatments of cows or use of iodophors during the period between November and the first autumn rains, since the intake of iodine from pastures is normally highest during this period.

### *References*


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Goitre: note the enlarged thyroid gland in the neck, characteristic of iodine deficiency.

Goats appear particularly sensitive to iodine deficiency in the southern and mountain districts of Victoria.

Phosphorus deficiency is the major limitation to pasture growth on newly cleared land in Victoria. Trace elements are an additional limitation on some soils. Superphosphate was omitted from the central plot on this uniform sown newly cleared site in Gippsland.

More than one element may be limiting: lucerne on deep sandy soils of the Little Desert benefited from a mixture of copper, molybdenum, cobalt and zinc in addition to superphosphate.