IODINE STATUS OF EWES IN PAPUA NEW GUINEA

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ABSTRACT

Serum thyroxine concentrations were determined in 296 ewes from 10 locations in Papua New Guinea. Normal values were found at all locations except Mt. Hagen and Menifo. At Mt. Hagen, iodine deficiency was present in 49% of the flock and at Menifo serum thyroxine levels were considered marginal. The possibility that iodised salt may be masking an environmental deficiency is considered.

INTRODUCTION

Iodine deficiency is a widespread disease of man and grazing animals and has been documented in all continents (Underwood 1966). A high incidence of still births and weak newborn animals are the most common symptoms of this deficiency. Partial or complete hair loss together with a markedly enlarged thyroid gland are other symptoms, and in animals of breeding age iodine deficiency may severely reduce reproductivity. Adult sheep in iodine deficient areas may show thyroid enlargement but are otherwise clinically normal. Iodine is concentrated in the thyroid gland where it is incorporated into the hormone thyroxine. Serum thyroxine levels are therefore a good indication of the iodine status of the animal.

Human endemic goitre was once common in both the eastern and western part of the New Guinea Island (Choufoer *et al.* 1965; Buttfield and Hetzel 1966) and iodine deficient goitre has been described in lambs at Mt. Hagen (Walton and Humphrey 1979). This survey was undertaken to determine, by measuring serum thyroxine concentrations, the iodine status of sheep flocks at various locations in Papua New Guinea.

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MATERIALS AND METHODS

The survey involved 296 ewes at ten locations *(Figure 1)*, bled during the period 13th September, 1977 to 4th October, 1978. All Highland sheep and those at Erap were progeny of animals imported from New Zealand in 1975 and held in quarantine at Menifo (21 km south east of Goroka). Sheep at Kila Kila, Bisianumu and Vudal were progeny of ewes which have been in the country for many years.

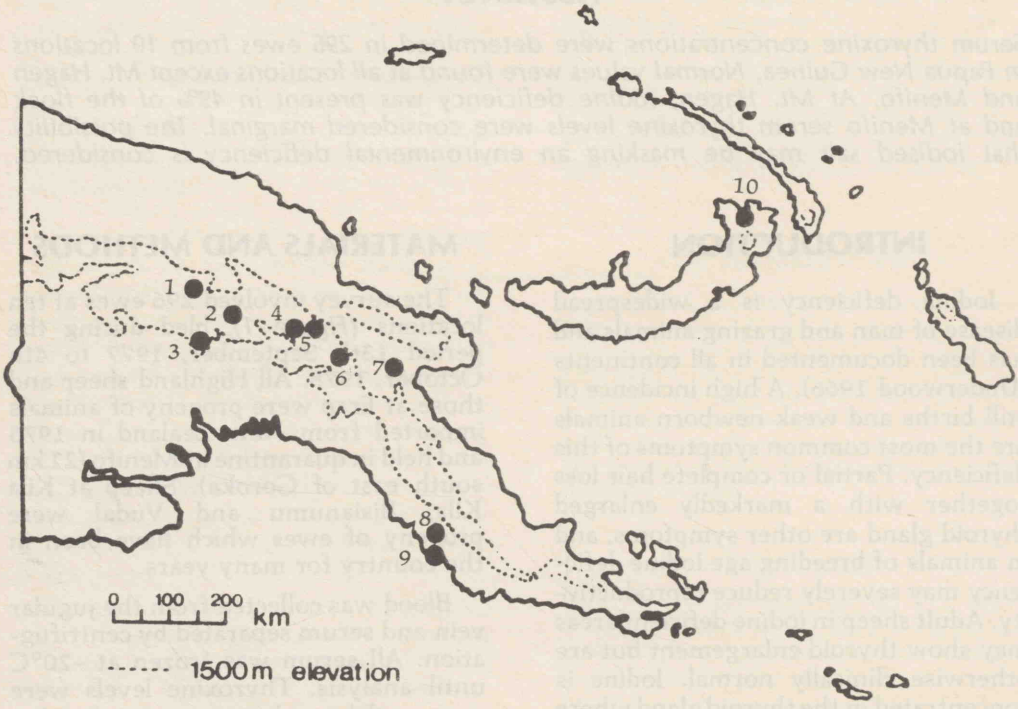
Blood was collected from the jugular vein and serum separated by centrifugation. All serum was frozen at -20°C until analysis. Thyroxine levels were measured by radioimmunoassay using 50 µl of serum and 300 mg of 8-anilino-1-napthalene sulphonic acid per tube to displace thyroxine from thyroxine binding proteins present in serum. Antiserum was prepared in sheep, and polythylene glycol was the separating agent.

RESULTS

Serum thyroxine levels found in flocks of sheep at ten locations throughout the country are given in *Table 1.*

The results of analyses of sheep serum from Mt. Hagen are shown in *Figure 2.* Although the mean thyroxine level of the flock was 65 nmol/L, 49% of the animals had serum thyroxine levels below 50 nmol/L and 45% had levels above 80 nmol/L.

Figure 1. — Locations where ewes were bled for measurement of serum thyroxine concentrations



1. Yogos
2. Mt. Hagen
3. Muli
4. Menifo
5. Bena Bena
6. Aiyura
7. Erap
8. Bisianumu
9. Kila Kila
10. Vudal

In other flocks, with the exception of Menifo, there were occasional individual animals with serum concentrations below 50 nmol/L, but levels in the flock were generally well above this level. At Menifo, however, 42% of the flock had levels below 50 nmol/L and 16% were below 40 nmol/L.

DISCUSSION

In a survey of lactating ewes in Australia, Wallace *et al.* (1978) found a mean plasma thyroxine concentration of 62 nmol/L and regarded properties carrying sheep with mean levels below 50 nmol/L as possibly iodine deficient.

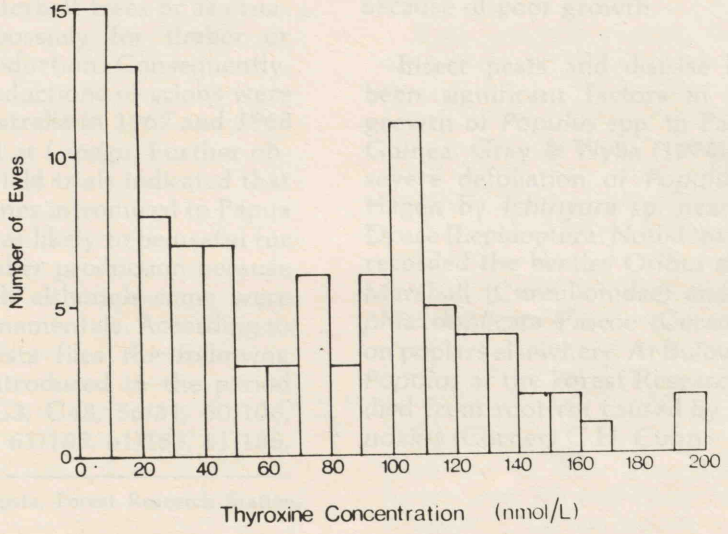
Some ewes in the Mt. Hagen flock had received an iodised oil injection (Lipiodol, May and Baker) prior to the survey. Most serum thyroxine concentrations at Mt. Hagen can be assigned to one of two groups as a result of the iodised oil injection. Although no record was kept of which animals were injected *Figure 2* clearly demonstrates that the iodine status of some animals was very poor whereas other ewes had adequate iodine levels.

Excluding the Mt. Hagen results, the survey indicated that in the areas investigated, iodine intake was sufficient except at Menifo where thyroxine levels were marginal.

Table 1. — Serum thyroxine concentrations of ewes at ten locations throughout Papua New Guinea

Location	Province	Age	Preg./Lact. Status	n	Thyroxine (nmol/L) Mean ±S.D.
Menifo	Eastern Highlands	5-6 yrs	Non Preg.	19	55.1 ±16.1
Bena Bena	Eastern Highlands	6 mths	Non Preg.	14	90.7 ± 22.0
Aiyura	Eastern Highlands	12 mths	Non Preg.	17	93.6 ± 19.6
Mt. Hagen	Western Highlands	2-3 yrs	Non Preg. & Preg.	102	64.8 ± 49.9
Muli	Southern Highlands	2 yrs	Lactating	42	86.0 ± 36.3
Yogos	Enga	2 yrs	Lactating	31	107.2 ± 34.6
Erap	Morobe	2-4 yrs	Lactating	20	96.3 ± 24.2
Erap	Morobe	1½-8 yrs	Pregnant	25	86.2 ± 24.2
Vudal	East New Britain	2-6 yrs	Pregnant	11	68.8 ± 27.5
Kila Kila	Central	3yrs	Non Preg.	2	72.5 ± 26.2
Kila Kila	Central	6-9 mths	Non Preg.	4	71.5 ± 10.7
Kila Kila	Central	3 yrs	Lactating	6	72.0 ± 16.1
Bisianumu	Central	1-2 yrs	Lactating	3	113.3 ± 18.2

Figure 2. — Serum thyroxine concentrations of ewes at Mt. Hagen



At the time of bleeding, iodised salt licks were available at all locations except Kila Kila. Such licks may maintain satisfactory dietary iodine levels and conceal environmental deficiencies. Highland areas of Papua New Guinea are likely to be deficient in iodine because high annual rainfall causes leaching of iodine from the soil and distance from the sea precludes replenishment with oceanic iodine (Blood and Henderson 1968).

Low thyroxine levels found in individual animals in flocks where the mean thyroxine level is satisfactory may indicate that individual animals vary considerably in the amount of iodised salt they choose to consume.

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REFERENCES

BLOOD, D.C. and HENDERSON, J.A. (1968). *Veterinary Medicine*, 3rd edit. Bailliere, Tindall and Casell, London.

BUTTFIELD, I.H. and HETZEL, B.S. (1966). The aetiology and control of endemic goitre in eastern New Guinea. *Papua New Guinea Med. J.*, 9: 119-126.

CHOUFOER, J.C., VAN RHIJN, M. and QUERIDO, A. (1965). Endemic goitre in western New Guinea. II. Clinical picture incidence and pathogenesis of endemic cretinism. *J. Clin. Endocr.*, 25: 385-402.

UNDERWOOD, E.J. (1966). *The Mineral Nutrition of Livestock*. Commonwealth Agricultural Bureaux.

WALLACE, A.L.C., GLEESON, A.R., HOPKINS, P.S., MASON, R.W. and WHITE, R.R. (1978). Plasma thyroxine concentrations of grazing sheep in several areas of Australia. *Aust. J. Biol. Sci.*, 31: 39-47.

WALTON, E.A. and HUMPHREY, J.D. (1979). Endemic goitre of sheep in the highlands of Papua New Guinea. *Aust. vet. J.*, 55 (1): 43-44.

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