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# Relationship of Herd Trace Mineral Status to the Occurrence of Tuberculosis in Cattle

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## Introduction

Copper, selenium and iodine are essential trace minerals. All are involved in the bovine immune system and deficiencies in any or all of the above minerals are likely to impair the animal's defence against infection. It has been postulated that the occurrence of tuberculosis in cattle may be related to their mineral status.

## Materials and Methods

A total of 1,985 cattle herds were investigated. Of these 1,327 were assessed for copper, iodine and selenium status; selenium status was assessed as erythrocyte glutathione peroxidase (GPx) levels while the plasma copper and iodine status was determined by direct measurement. In addition, the copper status of 511 herds, the selenium status of 499 herds were also assessed.

The mineral status of each herd was determined as the mean of ten blood samples randomly obtained from different animals within the herd.

The tuberculosis status of each herd was assessed on the basis of the tuberculin testing history of the herd over a four-year period, viz. the year in which the mineral status of the herd was determined together with the three preceding years. The total number of tuberculin reactors disclosed over this period was used as the index of tuberculosis within the herd.

Herds whose mineral status was determined in the period, November to April were designated as Indoor Herds, and all other herds were designated as Outdoor Herds.

## Results

The results are presented in Tables 1 to 6. There was no association between individual herd mineral levels and the number of tuberculin reactors disclosed, irrespective of whether the animals were indoors or outdoors at the time of sampling for blood mineral status.

**Table 1. Relationship of copper level to tuberculosis index of herd. Indoor Herds.**

	Plasma copper levels ( $\mu\text{mol/l}$ )			
	< 10	10 to 11.4	11.5 to 12.9	> 13
No. of herds	143	338	414	207
Mean Copper	8.64	10.84	12.16	13.93
Mean herd size	122	129	130	133
% of herds with				
0 reactors	62	64	60	62
1 reactor	12	11	13	12
2 to 4 reactors	10	13	12	15
5 to 9 reactors	8	5	8	6
10 or over reactors	8	7	7	5

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**Table 2. Relationship of copper level to herd reactor status. Outdoor herds.**

	Plasma copper levels ( $\mu\text{mol/l}$ )			
	< 10	10 to 11.4	11.5 to 12.9	> 13
No. of herds	138	279	237	79
Mean Copper	8.47	10.84	12.16	13.93
Mean herd size	150	122	138	132
% of herds with				
0 reactors	58	59	59	57
1 reactor	11	12	11	10
2 to 4 reactors	16	11	16	21
5 to 9 reactors	6	11	8	4
10 or over reactors	8	7	6	8

**Table 3. Relationship of erythrocyte glutathione peroxidase level to herd reactor status. Indoor herds.**

	GPx levels (iu/g Hb)			
	< 30	30 to 49.9	50 to 69.9	> 70
No. of herds	180	389	329	194
Mean Selenium	24.1	39.6	58.9	87.7
Mean herd size	115	119	134	155
% of herds with				
0 reactors	62	66	64	51
1 reactor	11	17	11	12
2 to 4 reactors	16	10	12	17
5 to 9 reactors	5	5	6	10
10 or over reactors	6	7	7	10

**Table 4. Relationship of erythrocyte glutathione peroxidase level to herd reactor status. Outdoor herds.**

	GPx levels (iu/g Hb)			
	< 30	30 to 49.9	50 to 69.9	> 70
No. of herds	115	262	204	144
Mean Selenium	23.8	39.6	59.3	87.2
Mean herd size	132	127	138	135
% of herds with				
0 reactors	53	59	61	59
1 reactor	13	11	9	14
2 to 4 reactors	12	16	14	15
5 to 9 reactors	10	8	9	6
10 or over reactors	12	6	7	6

**Table 5. Relationship of Iodine level to herd reactor status. Outdoor herds.**

	Plasma inorganic iodine levels ( $\mu\text{g}/\text{l}$ )			
	< 15	15 to 44.9	50 to 74.9	> 75
No. of herds	181	249	143	297
Mean Iodine	8	28	58	160.2
Mean herd size	125	137	126	145
% of herds with				
0 reactors	62	61	56	55
1 reactor	9	12	12	15
2 to 4 reactors	15	12	17	15
5 to 9 reactors	8	8	4	7
10 or over reactors	6	7	11	8

**Table 6. Relationship of inorganic Iodine level to herd reactor status. Outdoor herds.**

	Plasma inorganic iodine levels( $\mu\text{g/l}$ )			
	< 15	15 to 44.9	45 to 74.9	> 75
No. of herds	122	232	71	76
Mean Iodine	9	27.7	58.8	131.4
Mean herd size	148	131	154	152
% of herds with				
0 reactors	54	57	54	50
1 reactor	13	9	14	14
2 to 4 reactors	15	16	23	10
5 to 9 reactors	11	9	5	18
10 or over reactors	7	9	4	8

**Conclusion**

There was no apparent correlation between the tuberculosis status of these herds, as determined by tuberculin test results and expressed as the number of tuberculin reactors disclosed over a four-year period, and their mineral status. The mean herd values recorded for copper, iodine and erythrocyte glutathione peroxidase (as an indicator of selenium status) were representative of herds in the country. It is possible, however, that the susceptibility of individual animals to infection with *Mycobacterium bovis* may be increased by a continued deficiency of specific nutrients over a period.