

Survey of Mineral Status of Cattle in the Adamaoua Region of Cameroon.

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Summary

Serum and liver samples were collected from Zebu Gudali and Zebu Banyo cattle freshly slaughtered in abattoirs at eight different locations in each of the five administrative divisions of the Adamaoua region of Cameroon during the wet season (September to October, 1983) and the dry season (February to March, 1984).

Liver samples were analysed for iron, copper and manganese while serum samples were analysed for calcium, magnesium and copper. Most of the animals were adequate in calcium, magnesium, iron and manganese. Copper was deficient in liver and sera of most of the animals.

There is a need to intensify research on the mineral status of cattle in the Adamaoua region of Cameroon. Copper sulphate is recommended in salt licks for cattle in this region.

Résumé

Des échantillons de sang et de foie de bovins Zebu Gudali et Zebu Banyo ont été prélevés dans les abattoirs sur huit sites dans chacune des cinq unités administratives de la province de l'Adamaoua du Cameroun en saison des pluies (de septembre à octobre 1983) et en saison sèche (de février à mars 1984).

Les échantillons de foie furent analysés pour leur teneur en fer, cuivre et manganèse tandis que les sangs furent analysés pour leur teneur en calcium, magnésium et cuivre.

La plupart des teneurs observées étaient adéquates en calcium, magnésium, fer et manganèse. Le cuivre était déficient dans le foie et le sérum d'une majorité de bovins. Il est nécessaire d'intensifier la recherche en minéraux chez les bovins de la région de l'Adamaoua au Cameroun. La présence de sulfate du cuivre dans les pierres à lécher est recommandée pour les bovins dans cette région.

Introduction

Chemical composition of body tissue reflect the dietary status of the animal. Thus, chemical analysis can be used in detecting and defining a range of mineral deficiencies in livestock. Most often, the blood, liver and bone are sampled for mineral analysis. The objective of the present study was to verify the adequacy of cattle diets on the Adamaoua plateau through the analysis of calcium, magnesium and copper in serum and iron, copper and manganese in liver samples.

Material and Methods

A sample of blood and liver was collected from a freshly

slaughtered Banyo or Gudali Zebu in the local abattoir at each of 8 sites in each of the five administrative divisions of the Adamaoua region of Cameroon (Table 1) during the wet season (September to October, 1983) and the dry season (February to March, 1984).

Liver samples were obtained from the caudate lobe, and placed in a plastic bag and immediately stored in an ice cooler containing ice blocks to avoid deterioration during transportation to the laboratory. All liver samples were dried at 70 degrees centigrade in a forced air oven, ground through a 1 mm sieve and further conserved in plastic bags for analysis. One gram of dry liver sample was digested in a kjeldahl flask containing 25 ml of digestion solution (5 percent perchloric acid plus 20 percent concentrated nitric acid plus 50 percent sulphuric acid). After digestion, the digest was diluted to 100 ml and 5 ml aliquots were taken for analysis of iron, copper and manganese using the Perkin Elmer atomic absorption spectrophotometer according to the procedures of Pinta (9).

Blood was obtained as the animal was bleeding after the throat was cut. It was collected in a flask with stopper that had been washed, rinsed with deionised water and dried at 70 degrees centigrade in a forced air oven. The blood was allowed to coagulate after which the clot was easily separated. The serum was poured into clean analytical test tubes, stoppered and conserved in an ice cooler. At the laboratory the samples were preserved in a deep freezer until the time of analysis.

TABLE 1
Sites of collection of serum and liver samples in the Adamaoua region of Cameroon.

Division	Sampling sites
Vina	Ngaoundere, Belel, Dan, MOUNGEL, Tello, Nyambaka, Dibi, Wassande.
Mbere	Meiganga, Madougou, Lokoit, Kalaldi, Doua, Badogo, Kombolaka, Djohong.
Djere	Tibati, Meidjama, Mbakoua, Tongo, Djombi, Ngaoundal 1, Ngaoundal 11, Ngaoundal 111.
Faro Deo	Tignere, Faro, Doualayel, Galim, Lompto, Minim, Martap, Gadjwa.
Mayo Banyo	Banyo, Allat, Sambo Laka, Mayo Kalele, Ribao, Mayo Darle, Mbambti, Mba.

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TABLE 2
Mean levels of minerals (mg/kg dry matter) in liver of cattle in Adamaoua region of Cameroon (n=8).

Division		Copper		Manganese		Iron	
		wet season	dry season	wet season	dry season	wet season	dry season
Vina	mean±sd	84±21	108±32	9±1	11±1	275±42	280±38
	range	20-165	17-250	5-13	7-13	150-430	152-440
Mbere	mean±sd	90±20	149±32	9±1	10±1	257±36	266±40
	range	37-180	20-295	7-10	7-11	170-490	180-480
Djerem	mean±sd	82±20	160±31	14±2	14±2	253±42	264±51
	range	20-200	75-350	5-15	6-14	92-490	130-520
Faro Deo	mean±sd	85±17	146±13	10±1	11±2	245±47	249±44
	range	80-170	90-195	5-15	6-14	150-560	152-558
Mayo	mean±sd	121±26	129±27	11±2	12±2	235±40	238±45
	range	47-260	40-250	5-17	6-17	75-380	140-412
Overall mean		97	135	11	12	255	259
% samples below critical level		44	28	11	10	22	15

NB: Critical level of minerals in cattle liver suggested by McDowell et al (5) are as follows:
 Fe = 180 mg/kg dry matter Cu = 75 mg/kg dry matter Mn = 6 mg/kg dry matter

Ten millilitres of serum was digested with 25 ml of digestion solution as already described for liver samples. The digest was diluted to 100 cc and aliquots of 5 ml were taken for analysis of calcium, magnesium and copper using the Perkin Elmer atomic absorption spectrophotometer.

The concentration of various mineral elements in liver and serum samples were compared with values reported by McDowell et al (5) to determine adequacy or inadequacy of elements. These authors reported critical levels of Fe, Cu and Mn in the liver to be 180, 75 and 6 mg/kg dry matter, while those of Ca and Mg in serum were 8 and 2 mg/100 ml respectively, and that of Cu was 65 microgrammes/100 ml.

Results

The concentration of various mineral elements in the liver of cattle in the Adamaoua region are indicated in Table 2. Most of the liver samples of cattle assessed were adequate in iron. Twenty two and 15 percent of wet and dry samples, res-

pectively, were below the adequacy limit of 180 mg Fe/kg dry matter of liver tissue. Copper deficiency was also observed in some of the cattle. In the wet season 17 out of 39 sites sampled were deficient in copper. In the dry season 28 percent of the locations investigated were deficient in the element. Most of the copper deficiencies in the wet season were localised in the Vina, Mbere and Djerem divisions. In these divisions more than 50 percent of the cattle assessed were deficient in copper. Dry season copper deficiency was less acute but more rampant in the Vina and Mbere divisions. Manganese level in the liver during the wet and dry season was generally adequate.

The concentration of calcium, magnesium and copper in serum samples from cattle in the Adamaoua region are indicated in Table 3. During the wet and dry season, most animals were adequate in calcium and magnesium. There was a high incidence of copper deficiency in most cattle sampled. From 40 serum samples analysed both in the wet and dry seasons, 92.5 and 67.5 percent respectively were defi-

TABLE 3
Mean levels of minerals in serum of cattle in the Adamaoua region of Cameroon (n=8)

Division		Calcium		Magnesium		Copper	
		wet season	dry season	wet season	dry season	wet season	dry season
Vina	mean±sd	10.1±0.6	10.2±0.5	2.6±0.2	2.4±0.2	33±3	75±10
	range	7-12	7-13	2-3	2-3	20-50	50-100
Mbere	mean±sd	9.0±2.0	9.3±0.8	2.5±0.3	2.3±0.3	31±1	56±6
	range	8-13	7-13	2-3	2-3	30-40	50-100
Djerem	mean±sd	12.4±1.7	12.6±1.1	2.7±0.3	2.6±0.3	29±4	50±1
	range	9-13	9-14	2-4	2-4	20-40	50-55
Faro Deo	mean±sd	11.9±1.2	12.2±1.0	2.5±0.2	2.3±0.3	43±4	88±8
	range	8-12	7-13	1-3	1-3	30-60	50-100
Mayo	mean±sd	11.9±1.2	12.2±1.1	2.3±0.3	2.3±0.3	43±7	63±8
	range	8-12	8-13	2-4	2-4	30-80	50-100
Overall mean		11.3	11.3	2.5	2.4	36	66
% samples below critical level		7.5	7.8	2.0	2.5	92.5	67.5

NB: Critical levels of minerals in serum suggested by McDowell et al (5) are as follows:
 Ca = 8 mg/100 ml Mg = 2 mg/100 ml Cu = 65 µg/100 ml

cient in copper. Most of the copper deficient samples in the dry season originated from Mbere and Djerem divisions.

Discussion

The deficiency of copper observed in the liver of cattle in the Adamaoua region has also been reported by Abu Damir et al (1) with cattle in the Eastern Sudan. Underwood (11) has indicated that the liver is the main storage organ of body copper such that concentrations would be expected to provide a useful index of the copper status of the animal. It is however indicated that although liver copper levels reflect the dietary status, it should be interpreted with caution since they are influenced by factors such as dietary proportions of molybdenum and sulphur; high intake of Zn and Ca carbonates, and other compounds (7).

The high incidence of copper deficiency observed of cattle

in the present study has also been reported from analysis of cattle sera in Sudan by Tartour (10) and in Ethiopia by Fayet et al (3). Copper levels in sera of cattle sampled at the end of the wet season were lower than those collected in the dry season. Similar results have been reported in Ethiopia (3) and El Salvador (2). This is attributed to the higher copper content of straws eaten in the dry season when compared to fresh forage usually available at the end of the wet season. The levels of calcium and magnesium in sera of cattle were similar to those reported by McDowell et al (6) in Bolivia, Salih et al (8) in Florida and Abu Damir et al (1) in Sudan.

Copper appears to be a nutritional problem in the Adamaoua region particularly as it was deficient in serum and liver samples. Addition of copper sulphate is recommended in salt licks for cattle in that region.

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ADDENDUM ET CORRIGENDUM

Coopération internationale : Le Centre Sahel
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L'adresse mentionnée au bas de la page 159 y a été reportée par erreur. Il conviendrait de la remplacer par :

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