

## DIAGNOSIS OF DISMINERALOSES IN CATTLE BY DETERMINATION OF SOME MINERALS IN HAIR. METHODS AND REFERENCES VALUES

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### *Abstract*

*In order to elaborate the work technology and establish reference values of some minerals in hair, 50 hair samples were drawn from cows in two farms with best production and reproduction parameters and good sanitary veterinary state. The following parameters were determined in hair: ash, calcium, phosphorus, magnesium, iron, copper, manganese, zinc. Analyses were performed by colorimetric and complexometric methods. Zinc was determined by spectrophotometry in atomic absorption. The following reference values for minerals in cattle hair were established: ash 1000-2600 mg/100g; calcium 100-230 mg/100g; phosphorus 13-19 mg/100g; magnesium 40-85 mg/100g; iron 30-107 ppm; copper 10-18 ppm; manganese 6-40 ppm; zinc 92-120 ppm. The values of mineral in cattle hair were compared and analyzed with those in blood serum (serum mineral profile).*

**Key words:** *dismineraloses, cattle, hair analyses*

### *Introduction*

Diagnosis of dismineraloses in cattle can be realized by complex methods (4, 7). An important method is determination of the minerals in hair (1, 2, 3, 5, 6, 8, 9, 10). The hair is able to reflect real content of the minerals transported by the plasma. Anke and al. (1) pointed out the correlation between the content of some minerals in fodder and animal's hair, respectively, they also evidenced higher values of hair's minerals during winter's months; the authors proposed hair test to be used in order to diagnosis mineral deficiency in cattle.

Several factors, among breed, sex, age, colour of the hair, period of drawing of the samples can influence the concentration of the minerals in hair (8, 10). Agreements between magnesium and copper in hair and the concentration of these minerals in the blood serum and cows fodder respectively were established (5). The copper deficiency was established in the cattle by determination of copper concentration in the hair (6). Toxic action of same chemical pollutants, especially heavy metals, could be noticed by hair analyses of the cattle (3, 4, 9).

This paperwork was intended to pointed out main methods for mineral determination in cattle's hair and also established reference values for analyzed minerals.

### *Materials and methods*

Methods for samples drawing, preparation and processing were pointed out using 50 cows from two standard farms with optimum production and reproduction parameters and good sanitary veterinary statement. Using also dry or wet mineralization methods, different laboratory technique were used according to the characteristics of the minerals in hair and the degree of technical endowment of the laboratory.

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Eight parameters were analyzed using the following methods:

- total minerals (ash) – calcinations method;
- calcium – complexometric method;
- phosphorus – colorimetric method with ammonium molibdovanadat;
- magnesium – colorimetric method with titan gelb;
- iron – colorimetric method with ammonium sulphocyanide;
- copper – colorimetric method with sodium diethyldityocarbamat;
- manganese – colorimetric method with ammonium persulphate;
- zinc – spectrophotometry in atomic absorbition.

Some methods were compared and analyzed using different techniques, colorimetries or spectrophotometry in atomic absorbition respectively.

Results of some mineral determination in the cattles' hair were also compared with those recorded in the blood serum using a semiautomatically biochemical analyzer of some parameters and cows.

### ***Results and discussions***

The investigations were performed in two cattle farms with optimum production and reproduction parameters having a properly breeding, feeding and housing conditions.

The morbidity and mortality recorded in the farms were in technological limits; no infectocontagious diseases were recorded during the investigation period.

Comparative results of the mineral determinations in the cattle's hair also by colorimetric method and by spectrophotometry in atomic absorbition are centralized in table 1.

Table 1

Mineral concentrations in the cattle's hair by colorimetry and spectrophotometry in atomic absorbition ( $\bar{X} \pm S$ )

Parameter	UM	N	Colorimetric method	SAA** method	Student test
Calcium*	mg/100g	10	187.25 ± 56.55	148.75 ± 57.97	p>0.1 (NS)
Magnesium	mg/100g	10	13.22 ± 6.70	15.13 ± 6.18	p>0.2 (NS)
Iron	ppm	10	72.78 ± 20.31	70.10 ± 14.52	p>0.5 (NS)
Copper	ppm	10	16.06 ± 1.87	16.39 ± 2.28	p>0.5 (NS)
manganes	ppm	10	7.56 ± 1.22	6.37 ± 1.90	p>0.1 (NS)

\* complexometric method

\*\* spectrophotometry in atomic absorbition

NS insignificant

According to the table 1, the differences recorded by comparison in the two methods were nonsignificant. This establishment can indicate the accuracy of colorimetric and complexometric methods for determination of some minerals in cattle's hair; these methods are accesibles, economic and efficient for the laboratories with medium technical endowment.

In order to establish reference values in the two farms epidemiological, clinical and anamnetical investigations were performed. Hair and blood samples were drawn from the cows. These cows were clinically healthy with optimum production and reproduction parameters and good sanitary veterinary statement.

Results recorded at the light mineral parameters, in the cattle's hair are centralized in table 2, as variation intervals (minimum and maximum limit).

Table 2

Reference values of some minerals in the cattle's hair

Parameter	UM	Limits
Ash	mg/100g	1000-2600
Calcium	mg/100g	100-230
Phosphorus	mg/100g	13-19
Magnesium	mg/100g	40-85
Iron	ppm	30-107
Copper	ppm	10-18
Manganese	ppm	6-40
Zinc	ppm	92-120

Supposing that the results of the analyzed samples are joined in the reference values interval that reflects a normal mineral statement. These reference values are generally comparable with those noticed by others authors in the cattle's hair (1, 2, 5, 6, 10).

The results of the biochemical exams accomplished to the blood serum samples drawn from the same animals and in the same period as the hair's drawing were recorded and centralized in table 3.

Table 3

Mineral blood serum concentrations recorded at the cows ( $\bar{X} \pm S$ )

Parameter	UM	Recorded values
Calcium	mg/100g	8.03 $\pm$ 0.76
Phosphorus	mg/100g	6.64 $\pm$ 0.75
Magnesium	mg/100g	2.33 $\pm$ 0.33
Iron	ppm	178.5 $\pm$ 23.20
Copper	ppm	63.35 $\pm$ 9.35
Zinc	ppm	125.53 $\pm$ 58.52

Recorded values of the analyzed blood serum samples are joined in the reference values for the cows (7). Decreasing of the recorded values of the hair samples under minimum references limit indicated the evolution of the deficiency statement for the analyzed parameter; increasing of the values over maximum reference limit can be explained as a dismineralose by excess. Certainly the interpretation of the recorded data by comparison with the reference values has to be made prudently; it is necessary to analyse different others complexes data: anamneticals, epidemiologicals, pathophysiologicals, pathomorphologicals, terapeuticals, nutritional (quantitatives and qualitatives) and, of course, the results of the blood serum biochemical determinations.

The metods of analyzing the cattle's hair mineral had proved to be useful for the diagnosis of dismineraloses due to several considetrations: the hair samples are

easy to drawing (noninvasive method); the samples are easy to be stored and transported to the laboratory; the processing is relatively easy and colorimetric, and complexometric indicated methods are accessibles, economic and can be reproduced.

### ***Conclusions***

1. The methods for minerals determination in the cattle's hair were pointed out and reference values were established as variation intervals.

2. Main analyzed parameters were: ash, calcium, phosphorus, magnesium, iron, copper, manganese, zinc.

3. Following reference values were established: ash 1000-2600 mg/100g; calcium 100-230 mg/100g; phosphorus 13-19 mg/100g; magnesium 40-85 mg/100g; iron 30-107 ppm; copper 10-18 ppm; manganese 6-40 ppm; zinc 92-120 ppm.

4. The norms of interpretation of the analyzed parameters versus reference values were indicated.

5. The colorimetric and complexometric indicated methods for mineral determination in the cattle's hair were proved to comparable to those recorded by spectrophotometry in atomic absorption; in addition, these methods are economic, accessible and can be reproduced.

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