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Trace element deficiencies related to production or health disorders in Belgian cattle herds

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Objectives: trace elements (TE) deficiencies impair health status of cattle herds and are described to be widely spread in Belgium. TE supplementation during winter is rarely accurately measured. During pasture, TE supplementation is not systematically performed, especially for beef breeds or pregnant animals and heifers. The objective of this study was to bring out the TE status of dairy and beef herds visited for production, reproduction, mastitis or neonatal troubles, regardless TE supplementation. . Furthermore, a comparison of the severity of TE deficiencies between years, seasons, speculations and agricultural regions was made.

Materials and Methods: From February 2014 to October 2015, blood sampling (heparin and plain tubes) were made in 110 cattle herds investigated for health or production disorders in Wallonia. In each farm, 7-10 clinically healthy animals, belonging to a specific and homogeneous group (production, heifers, pregnant), were sampled. Blood was centrifuged to harvest plasma and serum. Hemolyzed plasma/sera were discarded.. To rule out the influence of an inflammatory process, the total proteins (TP) in both serum and plasma were measured using an electronic refractometer (EUROMEX®) and the fibrinogen concentration was so estimated. If suspicion of inflammation was present (difference between plasma TP and serum TP >6 g/L), the sample was also rejected. In order to limit costs of analysis, serum/plasma were pooled within a group/farm, so only one serum/plasma sample per group/farm was assayed Determination of selenium (Se), zinc (Zn), Copper (Cu), iodine (I), vitamins (Vit) (A, E, B12) and haptoglobin concentration in plasma/serum was made in the laboratory (Collard-Synlab). Statistical evaluation, using average, standard deviation, proportion of deficient herds and t-Test, allowed the comparison of groups of production, speculation, year, season and agricultural regions regarding TE status.

Results: Se deficiency was the most represented as only 16% of herds were tested with an adequate Se status. The average Se concentration was $61 \pm 20 \mu\text{g/L}$ (mean \pm SD). In average, the blood Cu, Zn, and vitamin A/E/B12 concentrations were adequate. However, 22, 33 and

52% of the herds showed respectively an inadequate Cu, Vit B12 and Zn status. For Se status, there was a significant ($P<0.05$) difference regarding the type of speculation with a higher level for the dairy compared to beef herds (Blood Se concentration of 64.0 ± 17.6 vs 55.4 ± 24.3 $\mu\text{g/L}$ and 17 vs 11% of herds with a good status). For Cu, the difference was also significant ($P<0.05$) in favor of the dairy herds. Samples from cows in production (dairy and beef) had a significantly ($P<0.05$) higher Se concentration than the non-productive animals (heifers and pregnant cows) (66 vs $51 \pm \dots$ $\mu\text{g/L}$). In 2014, the global Se status was worse than in 2015 (57 ± 21 vs 66 ± 20 $\mu\text{g/L}$, $P<0.05$) while Cu ($P<0.01$), Zn ($P<0.05$), I ($P<0.05$), VitB12 ("trend" $P=0.06$) and Vit A ($P<0.05$) blood concentrations were lower in 2015 compared to 2014. Vit B12 deficiency was startling because normally ruminant is not subject to vit B deficiencies, however, in 2015 42% of the herds were deficient regardless of speculation and production. As vitamin B12 is related to rumen health and its bacterial activity, the hypothesis of better quality roughage ingested in 2014 was raised. Finally, a better selenium status ($P<0.05$) was found during spring compared to autumn, probably due to the better distribution of mineral supplements during the winter period.

Conclusions: Despite massive information to farmers regarding TE importance and previous studies, it appears that Se deficiency remains quite important. Moreover, pregnant cows and heifers are more susceptible to these deficiencies. These results may be explained by insufficient TE recommendations for highly performant cattle such as Holstein or Belgian Blue cows, TE content allowed in mineral formulations, and the difficult economic situation in agriculture. TE status still need to be investigated in herds with production, reproduction or health problems, whatever the mineral supplementation occurring in the farm.