Reference intervals for concentrations of trace elements in serum of dry cows

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Aims of the study
• Investigate (variation in) serum concentrations of copper, zinc, selenium, and iodine in dry cows
• Assess dry cow reference intervals for trace element concentrations in serum.

Background
• Trace elements are required by all animals in minute amounts and play essential roles in the body, usually as part of functional organic molecules such as enzymes.
• Serum concentrations of trace elements in cows are used in the field to monitor (short term) uptake of these elements from the ration.
• Reference intervals and cut-off values are, however, usually based on serum results from lactating cows and specific dry cow reference values are often lacking.

Materials and Methods
• From September 2014 to April 2015, serum samples of 625 dry cows from 40 Dutch dairy herds were collected during two farm visits (three-month interval).
• At each farm visit, all dry cows present were sampled. The number of cows sampled per farm ranged from 2 to 32.
• Samples were analysed for copper, zinc, selenium and iodine using inductively coupled plasma mass spectrometry (ICP-MS). Only samples of cows with complete data records were analysed.
• Descriptive statistics were performed on serum results (n=535) using Statistix. Linear regression was used to indicate time trends in trace element concentrations towards parturition. Reference intervals for concentrations of trace elements for dry cows were calculated using the Reference Value Advisor (Geffre et al., 2011).

Results
• Descriptive statistics are shown in Table 1.
• Zinc, iodine, copper en selenium concentrations are plotted against day relative to calving in Figure 1.
• Serum zinc concentrations were significantly lower in cows with fewer days towards partition (P<0.05); no such trend was present for the other elements (P>0.05).
• Iodine concentrations were often low in dry cows (22% of cows had a serum concentration below the commonly used cut-off value of <0.4 µmol/L).
• Serum copper concentrations were also low, but this may be due to loss of copper-containing proteins during the clotting process of the sample (Laven and Livesey, 2006), which limits the diagnostic value.

Conclusions
• Considerable variation exists in serum concentrations of trace elements in dry cows.
• The iodine status of dry cows may need extra attention to optimize cow health and calf vitality.
• Reference intervals for dry cows were calculated.

Table 1  Descriptive statistics for concentrations of zinc, copper, selenium and iodine in serum of 535 dry cows from 60 to 0 days to parturition from 40 Dutch dairy herds (including linear trend lines).

Table 1  Descriptive statistics for concentrations of zinc, copper, selenium and iodine in serum of 535 dry cows from 60 to 0 days to parturition from 40 Dutch dairy herds and corresponding reference intervals for the dry period.

<table>
<thead>
<tr>
<th>Trace mineral (µmol/L)</th>
<th>Mean (± SD)</th>
<th>Median</th>
<th>Min - Max</th>
<th>25th – 75th perc.</th>
<th>Reference interval1</th>
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<tbody>
<tr>
<td>Zinc 14 (± 2.8) 14 3 – 28 12 – 16 9 - 20</td>
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<tr>
<td>Iodine 0.5 (± 0.20) 0.5 0.2 – 1.7 0.4 – 0.7 0.3 – 1.1</td>
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<td>Copper 11 (± 2.4) 11 3 – 21 10 – 13 8 - 17</td>
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<tr>
<td>Selenium 0.7 (± 0.18) 0.7 0.2 – 1.4 0.6 – 0.8 0.3 – 1.0</td>
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<td>1  Calculated with Reference Value Advisor (Geffre et al., 2011)</td>
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References

Acknowledgements
The authors thank all dairy farmers that participated in the study.