# The use of a soluble glass copper, cobalt and selenium bolus to supply selenium to sheep

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**Introduction** Many sheep may require supplementation with cobalt or selenium, whilst many also require copper for the prevention of swayback. Often more than one are in short supply and blanket supplementation is often the answer, but this could result in problems of toxicity especially with copper in sheep. This trial was carried out on a flock known to be copper sufficient to investigate the supplementation of extra copper in the form of a sintered soluble glass bolus being used to supply selenium and cobalt to the flock.

**Materials and Methods** Two batches of Lleyn sheep were selected, the first were forty ewe lambs, whilst the second set were thirty gimmers. The ewe lambs were randomly split into two groups one being given a copper, cobalt and selenium bolus (Cosecure®, Telsol Ltd) with the other group remaining untreated as controls. The gimmers were randomly split into a group of twenty which were given the bolus with the other ten being left unbolused as controls. The sheep were all blood sampled by jugular veni-puncture immediately prior to bolusing (day 0) and after 85 and 147 days. The samples were analysed for copper status (serum caeruloplasmin activity (CP), serum amine oxidase activity (Amox), plasma copper concentration (PlCu), T.C.A. copper concentration (TCA), erythrocyte superoxide dismutase activity (SOD) and the ratio between the CP and PlCu (CP/PlCu)), cobalt status (serum vitamin B12 concentration (B12)) and selenium status (erythrocyte glutathione peroxidase activity (GSHPx)) using the methods of Mackenzie *et al.* (1997). Statistical analysis was carried out by ANOVA with day 0 as a covariate using GLM on MINITAB 11.

**Results** In the ewe lamb trial there were no statistically significant differences in copper or cobalt status on day 85 and only an increased SOD ($p<0.05$) on day 147. However, the selenium status as indicated by the GSHPx was significantly higher on both day 85 and 147 ($p<0.01$).

| | | day 0 | | day 85 | | | | day 147 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mean | *S.E.* | control | | bolused | | control | | bolused | |
| Amox | U/ml | 90.3 | *20.9* | 92.9 | *5.5* | 100.2 | *5.1* | 62.6 | *3.7* | 64.4 | *3.4* |
| CP | mg/dl | 34.8 | *11.3* | 35.4 | *21.6* | 31.6 | *2.0* | 30.6 | *2.4* | 27.6 | *2.3* |
| PlCu | µM | 16.3 | *5.2* | 17.3 | *0.8* | 16.0 | *0.7* | 12.1 | *0.5* | 11.4 | *0.5* |
| TCA | µM | 16.9 | *5.8* | 16.8 | *1.1* | 16.5 | *1.0* | 11.9 | *0.7* | 11.2 | *0.7* |
| CP/PlCu | | 2.16 | *0.41* | 2.27 | *0.19* | 2.27 | *0.18* | 2.49 | *0.10* | 2.37 | *0.10* |
| SOD | U/ g Hb | 3593 | *567* | 2628 | *111* | 2657 | *104* | $2455^{a}$ | *93* | $2733^{b}$ | *88* |
| GSHPx | U/mlPCV | 158.4 | *45.7* | $132.9^{a}$ | *10.6* | $174.1^{c}$ | *10.0* | $107.4^{a}$ | *9.6* | $148.1^{c}$ | *9.1* |
| B12 | pg/ml | 228 | *114* | 851 | *73* | 894 | *70* | 621 | *52* | 674 | *51* |

**Table 1:** Effect of the bolus on blood parameters for the ewe lambs. Significant differences indicated by different letters in superscript. (a-b indicate $p<0.05$, a-c indicates $p<0.01$, a-d indicates $p<0.001$)

In the gimmer trial, the copper and cobalt status was not significantly different on either day 85 or day 147. The selenium status was statistically significantly different on both day 85 and 147 ($p<0.001$).

| | | day 0 | | day 85 | | | | day 147 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mean | *S.E.* | control | | bolused | | control | | bolused | |
| Amox | U/ml | 105.5 | *17.6* | 78.8 | *6.3* | 84.6 | *4.6* | 80.3 | *4.4* | 84.3 | *3.2* |
| CP | mg/dl | 32.5 | *9.2* | 31.8 | *3.1* | 34.0 | *2.2* | 33.6 | *1.7* | 35.6 | *1.2* |
| PlCu | µM | 16.8 | *4.0* | 12.7 | *0.9* | 13.94 | *0.6* | 13.0 | *0.7* | 13.9 | *0.5* |
| TCA | µM | 16.7 | *3.9* | 13.4 | *1.0* | 14.6 | *0.7* | 13.3 | *0.7* | 14.8 | *0.5* |
| CP/PlCu | | 1.94 | *0.31* | 2.56 | *0.23* | 2.49 | *0.17* | 2.61 | *0.14* | 2.57 | *0.10* |
| SOD | U/ g Hb | 3451 | *843* | 2733 | *94* | 2816 | *68* | 2626 | *83* | 2688 | *61* |
| GSHPx | U/mlPCV | 146.1 | *35.3* | $148.7^{a}$ | *13.1* | $232.7^{d}$ | *9.5* | $64.8^{a}$ | *8.5* | $133.8^{d}$ | *6.2* |
| B12 | pg/ml | 323 | *116* | 869 | *58* | 1013 | *42* | 1538 | *185* | 1476 | *134* |

**Table 2:** Effect of the bolus on blood parameters for the gimmers. Significant differences indicated by different letters in superscript. (a-b indicate $p<0.05$, a-c indicates $p<0.01$, a-d indicates $p<0.001$)

**Conclusions** The bolus was able to supply the selenium requirement of the sheep. The bolus did not put the sheep at risk of copper toxicity even though the bolus was supplying copper to already copper adequate animals. The sheep had an adequate cobalt status throughout.

**References** Mackenzie, A.M., Illingworth, D.V., Jackson, D.W. and Telfer, S.B. (1997). A comparison of methods of assessing copper status in cattle. In: *Trace Elements in Man and Animal -9: Proceedings of the Ninth International Symposium on Trace Elements in Man and Animals.* (Edited by P.W.F. Fischer, M.R. L'Abbé, K.A. Cockell and R.S. Gibson). NRC Research Press, Ottawa, Canada. pp. 301-302.