THE EFFECT OF A ZINC, COBALT AND SELENIUM BOLUS ON RAM SEMEN QUALITY AND TRACE ELEMENT STATUS.

N.R. Kendall, A. Green, S. McMullen and R.G. Rodway
Centre for Animal Sciences, Leeds Institute of Biotechnology and Agriculture, School of Biology, University of Leeds, Leeds LS2 9JT, United Kingdom.

Thirty-three ram lambs at pasture with access to quality grass silage and a barley/pea concentrate were split into two groups by restricted randomisation of liveweight. On day 0, one group (n=17) was bolused with a zinc, cobalt and selenium soluble glass bolus (Zincosel®, Telsol Ltd) with the other group unbolused as controls (n=16). The rams were blood sampled on days 0, 23, 44, 65 and 86. Plasma zinc concentrations (PlZn) and erythrocyte glutathione peroxidase activities (eGSHPx) were analysed (Kendall et al, 1999). Collection of semen samples by natural mount and diversion into an artificial vagina were attempted from all rams on days 44, 52, 58, 65, 73, 79 and 86. Semen samples were assessed for ejaculate volume (Vol.), spermatocrit (Sc.), total sperm count (Count), motility (Mot), proportion of live sperm (Live) (negrosin-eosin stain) and abnormalities (total, coiled tail, no tail, two tail, tail droplets and others). The functional integrity of the sperm's plasma membrane was assessed using the hypo-osmotic swelling test (HOS) (Correa *et al*., 1997). Seminal plasma zinc concentration (spZinc) and glutathione peroxidase activity (spGSHPx) were analysed using the same assays as for the blood. Statistical analysis was carried out by ANOVA using GLM on MINITAB 11 (blood parameters used day 0 as a covariate, proportionality data (Sc., Live, HOS, Mot) used the arcsine transformation and abnormality data used the square root transformation with zero value adjustment.

Fig 1: eGSHpx
Table 1: Semen quality parameters

Seven of the control and five of the bolused rams failed to produce a valid semen sample on any of the seven semen collections. Figure 1 illustrates that the bolused rams had significantly higher erythrocyte glutathione peroxidase activities than the control rams throughout the post bolusing period ($p<0.001$). The groups did not have significant differences in plasma zinc concentrations. MOT (d 44,73), HOS (d 73) and Live (d 73,79) were all significantly higher for the bolus group. Count (d 65) and spZinc (d 73) were significantly higher ($p<0.05$) for the control group. There were no significant differences in Sc, Vol., spGSHPx, total abnormalities or any of the individual abnormalities.

The selenium status was significantly increased in the bolused rams, however, all rams remained adequate (>40 U/ml PCV) throughout. Apart from day 0, PlZn was maintained above 7 µM for both groups. The increased Mot, Live and HOS were probably due to the increased spGSHPx, which although not significant was consistently higher for the bolused group (6 of 7 samplings), this is in agreement with findings of Vézina *et al* (1996) in humans.

In conclusion, the bolus significantly increased the selenium status of the rams resulting in increased sperm motility, % live sperm and sperm responding to the hypo-osmotic swelling test.

References

Correa, J. R., Pace, M. M., and Zavos, P. M., 1997, Relationships among frozen-thawed sperm characteristics assessed via the routine semen analysis, sperm functional tests and fertility of bulls in an artificial insemination, *Theriogenology* **48:**721-731

Kendall, N. R., Middlemas, C., Maxwell, H., Birch, F., Illingworth, D.V., Jackson, D.W., and Telfer, S.B., 1999, A comparison of the efficacy of proprietary products in the treatment of molybdenum induced copper deficiency. *Proceedings of TEMA-10, in press*

Vézina, D., Mauffette, F., Roberts, K. D., and Bleau, G., 1996, Selenium-vitamin E supplementation in infertile men - effects on semen parameters and micronutrient levels and distribution, *Biological Trace Element Research*, **53:**65-83

	Live (%)		MOT (%)		HOS (% swelling)		spZinc (µM)		spGSHPx (U/ml)		Count (millions/ml)	
Day	Con.	Bolus	Con.	Bolus	Con.	Bolus	Con.	Bolus	Con.	Bolus	Con.	Bolus
44	57 *2*	63 *2*	46 *3*	60 *2*	26 *3*	33 *2*	65 *6*	55 *5*	2.2 *.7*	3.7 *.5*	43 *8*	52 *6*
52	68 *2*	71 *2*	44 *5*	56 *5*	36 *3*	42 *3*	51 *5*	48 *5*	2.5 *.6*	3.1 *.6*	56 *6*	66 *6*
58	64 *3*	66 *2*	41 *5*	51 *5*	44 *4*	41 *4*	48 *11*	51 *9*	2.5 *.5*	2.6 *.4*	67 *9*	65 *9*
65	75 *2*	75 *2*	46 *6*	44 *5*	50 *4*	49 *4*	41 *6*	50 *6*	2.3 *.6*	2.8 *.5*	99[a] *5*	66[b] *5*
73	70[a] *2*	76[b] *1*	42[a] *4*	54[b] *3*	38[a] *3*	50[c] *3*	56[a] *5*	41[b] *4*	2.4 *.5*	1.9 *.4*	56 *10*	58 *7*
79	69[a] *2*	78[c] *2*	51 *3*	48 *2*	38 *5*	41 *4*	40 *6*	44 *5*	1.6 *.4*	1.9 *.4*	67 *12*	77 *9*
86	71 *2*	75 *2*	46 *4*	54 *3*	45 *4*	45 *3*	38 *5*	39 *4*	2.0 *.5*	2.1 *.4*	54 *7*	52 *6*

Table 1: Semen quality parameters. Means and *SE*. Significance indicated by [a,b] ($p<0.05$) and [a,c] ($p<0.01$)