

EFFECTS OF SUPPLEMENTARY IRON ON TISSUE TRACE
ELEMENTS AND PLASMA FOLATE AND VITAMIN B₁₂ IN YOUNG SHEEP

Z.S.WANG and D.G.MASTERS*

Iron concentrations of pasture at a farm in northern China ranged from 789 to 4592 µg/g (Yu et al. 1988). Growth was reduced when sheep were fed rations containing more than 200 µg Fe/g dm (Lawlor et al. 1965). We investigated the effects of excess Fe: on tissue Cu, Zn and Fe status; on folate and vitamin B₁₂ concentrations in plasma; and on growth in young sheep.

Sixteen Merino wethers weighing 25.0 - 37.5 kg were allocated to 4 groups of 4 sheep, according to liveweight, and housed in individual pens. For six weeks the sheep were fed, ad libitum, an oaten hay/lupin(80:20) diet containing 53 µg Fe/g plus 0, 150, 450 or 1950 µg Fe/g added as FeCl₃. Folate and vitamin B₁₂ in plasma were measured by simultaneous radioassay; trace elements were analysed by atomic absorption spectrophotometry.

Dietary Fe (µg/g dm):		53	203	503	2003
Liveweight gain, g/d		86 ± 9 ^a	92 ± 8 ^a	66 ± 16 ^{ab}	42 ± 14 ^b
Feed intake, g/d		883±69	912±51	851±75	763±76
Plasma folate, ng/ml		1.08±0.22 ^a	1.18±0.38 ^{ab}	0.53±0.16 ^{ab}	0.43±0.16 ^b
Plasma vitamin B ₁₂ , pg/ml		1190±97	1155±96	1190±156	970±101
Rumen filtrate S ²⁻ , µg/ml		1.9±0.14 ^a	3.9±0.28 ^b	2.8±0.38 ^{ab}	2.9±0.53 ^{ab}
<u>Tissue trace elements, µg/g wet weight</u>					
Liver	Zn	112±7 ^a	174±14 ^b	100±5 ^a	96±1 ^a
	Cu	396±32 ^a	246±15 ^b	253±11 ^b	241±22 ^b
	Fe	330±7 ^a	471±30 ^a	529±37 ^a	2500±287 ^b
Kidney	Zn	138±7.7	136±4.5	131±1.2	154±5.4
	Cu	16.6±0.09	17.0±0.45	17.5±0.26	18.3±0.63
	Fe	1433±333	2324±392	1772±191	2632±609
Spleen	Zn	105±3.9	108±1.6	108±2.1	94±2.9
	Cu	4.5±0.05 ^a	4.3±0.04 ^a	4.7±0.07 ^a	3.8±0.12 ^b
	Fe	529±16 ^a	2140±180 ^{bc}	1946±203 ^b	3076±110 ^c

Mean ± sem, means with different superscripts are significantly different P<0.05. Comparisons made using Duncans Multiple Range Test; for plasma folate, the pre-treatment concentration was used as a covariate; for Fe in tissues, a log transformation of the data was used.

High concentrations of dietary iron reduced liveweight gain and the concentration of Cu in spleen and liver. The concentrations of Fe in liver and spleen and S as sulphide in the rumen filtrate were increased by high Fe intakes. Plasma folate declined when sheep consumed the diet containing 2003 µg Fe/g. This study indicates that high Fe intake can reduce growth and interfere with the storage of other trace elements in tissues; more information is needed on the effect of excess Fe on the utilisation of B vitamins.

LAWLOR, M.J., SMITH, W.H. and BEESON, W.M. (1965). *J. Anim. Sci.* 24:742.
YU, S.X., MASTERS, D.G., SU, Q., WANG, Z.S., DUANG, Y.Q. and PURSER, D.B. (1988). In 'Trace Elements in Man and Animals-6', pl71, eds L.S. Hurley, C.L. Keen, B. Lonnerdal and R.B. Rucker. (Plenum Press, New York).

School of Agriculture, University of Western Australia, Nedlands, W.A. 6009
* CSIRO Division of Animal Production, Private Bag, P.O. Wembley, WA 6014