Feeding laying hens the diets with supplemental chelated trace minerals improves immune response, shell quality and tibia breaking strength

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INTRODUCTION

Feeding highly bio available forms of trace minerals can support essential physiological functions necessary to animal health and structural integrity. Birds fed HMTBa-chelated Zn, Cu and Mn exhibit better bone strength, skin integrity, and immune response. Evidence these trace minerals play a key role in egg shell formation suggest supplementing hens with HMTBa-chelates of Zn, Cu and Mn will support the production of quality eggs across the laying period.

MATERIALS AND METHODS

A 56 wk (24 to 80 wk of age) study was conducted to determine the long term effects of feeding CTM (MINTREX®, metal methionine hydroxy analogue chelates of Zn, Mn or Cu, Novus International Inc) vs. ITMs (inorganic trace minerals) in layers on performance, egg shell quality, tibia breaking strength, and immune response.

A total of 216 Hy-Line W-36 laying hens were assigned to 6 treatments with 36 pens/treatment and 1 hen/cage.
The study was carried out under randomized complete block design. The data were analyzed using both 1-way ANOVA (including all 6 treatments) and 2x2 factorial design with 2 sources (CTM vs. ITMs) and 2 levels (20-5-20 vs. 40-10-40ppm of Zn-Cu-Mn) of supplemental minerals.

The treatments consisted of: 0-0-0ppm supplemental Zn-Cu-Mn, T1; 20-5-20ppm Zn-Cu-Mn as sulphates, T2; 20-5-20ppm Zn-Cu-Mn as chelates, T3; 40-10-40ppm Zn-Cu-Mn as sulphates, T4, 40-10-40ppm Zn-Cu-Mn as chelates, T5; 80-10-80ppm Zn-Cu-Mn as sulphates, T6 (table 1).

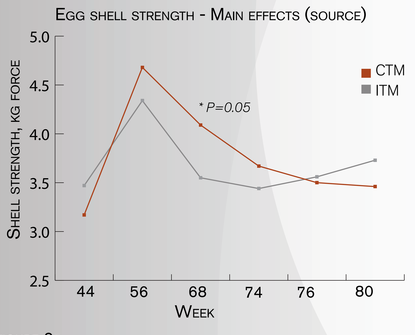
Table 1:
Experimental design

Treatment (T)	Zn	Cu	Mn	(ppm)
1.	0	0	0	
2.	20	5	20	(ITMs)
3.	20	5	20	(CTM)
4.	40	10	40	(ITMs)
5.	40	10	40	(CTM)
6.	80	20	80	(ITMs)

ITMs, inorganic trace minerals as sulfates; CTM, chelated trace minerals (HMTBa-chelates of Zn, Cu and Mn).

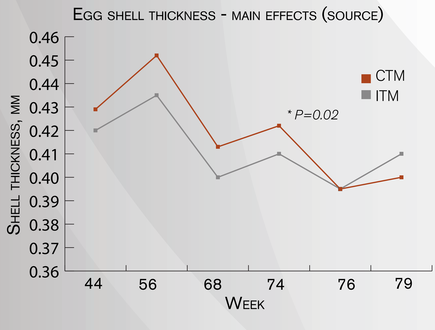
RESULTS

figure 1:
CTM fed hens had significant increase in shell breaking strength compared to hens fed ITMs especially at week 68 sampling (Source effect; P<0.05).



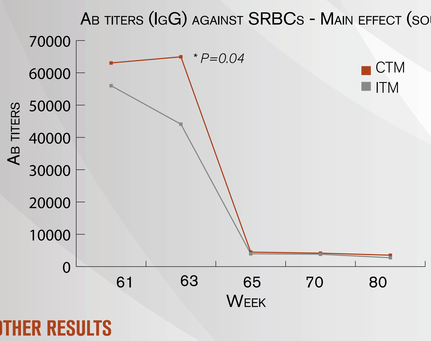
	Wk44	Wk56	Wk68	Wk74	Wk76	Wk80
SOURCE	0.06	0.18	0.05	0.22	0.81	0.27
LEVEL	0.91	0.55	0.37	0.07	0.28	0.44
SOURCE * LEVEL	0.33	0.29	0.66	0.21	0.47	0.87

figure 2:
CTM fed hens had better shell thickness compared to eggs from ITMs fed hens. The numbers are consistently higher for all the sampling periods from week 44 to 74, and statistically significant (p<0.05) improvement is noticed at week 74.



	Wk44	Wk56	Wk68	Wk74	Wk76	Wk79
LEVEL	0.53	0.08	1	0.92	0.11	0.86
SOURCE	0.37	0.3	0.08	0.02	0.8	0.53
SOURCE * LEVEL	0.06	0.23	0.58	0.41	0.57	0.51

figure 3:
CTM fed hens had significantly better AB titer values compared to hens fed ITMs at week 63. The main effects for source was significant for IgG (P=0.04) at 2 weeks after secondary injection of SRBCs.



	Wk 61 IgG	Wk 63 IgG	Wk 65 IgG	Wk 70 IgG	Wk 80 IgG
CV	102	55	104	75	90
SOURCE	0.72	0.04	0.71	0.73	0.40
LEVEL	0.63	0.84	0.85	0.37	0.47
SOURCE*LEVEL	0.42	0.49	0.10	0.66	0.97

OTHER RESULTS

The increase in minerals levels increased tibia breaking strength (P=0.07). CTMs supplementation increased tibia breaking strength numerically compared to ITMs (P=0.19)

CONCLUSIONS

Supplementing trace minerals as CTM vs. inorganic sources to layer diets resulted in improved shell breaking strength (P<0.05; wk 68), improved shell thickness (P<0.05; wk 74) and improved immune response (P<0.05; wk 63).
These results were obtained despite of using the same or lower levels of Zn, Cu and Mn than in the ITM treatments, thus suggesting a higher bio availability of HMTBa -chelates than inorganic sources in laying hens

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