



SWINE SOLUTIONS

Evaluating trace mineral fortification in swine diets

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Pigs depend on their daily feed to supply not only protein and energy but also their needed mineral requirements. Typically, trace mineral supplementation has been based on dated National Research Council (NRC) recommendations. Yet, swine nutritionists often formulate to mineral levels that far exceed NRC guidelines as an inexpensive safety measure. However, this practice potentially results in excess mineral in the pig's diet and, as a result, excess mineral in the manure.

Efficiency of swine mineral absorption depends on several factors, including the concentration of minerals in the diet, mineral source and availability, and mineral to mineral interactions in the diet. [Alltech's Bioplex® minerals](#), part of [Hubbard's Blueprint® program](#), are organic trace minerals bound to amino acids and short chain peptides. They are easily absorbed and readily metabolized, optimizing animal performance. Bioplex trace minerals (zinc, manganese, copper, iron and cobalt) are co-factors in enzymes critical to the animal's defense system, growth and reproduction.

In order to evaluate both trace mineral source and levels, Hubbard Feeds has conducted two trials at the Leavenworth Livestock Research Center (LLRC). The first trial included 1,715 pigs with an average starting weight of 50.9 lbs. for a 117-day feeding period. They were fed to an average market weight of 276 lbs. NRC and current industry standard levels of inorganic trace minerals were compared to fortification using Bioplex at 66% and 100% of NRC recommendations.

Results of this trial found no significant differences in growth performance between pigs fed inorganic trace minerals at standard industry levels or at NRC recommendations, and pigs fed Bioplex at 100% and 66% of NRC recommendations. Mineral inclusion in experimental diets and cumulative results are shown in Tables 1 and 2 below.

Table 1. Trial 1 - Bioplex Grow Finish

Mineral (ppm)	Industry Inorganic	100% NRC Inorganic	66% NRC Bioplex	100% NRC Bioplex
Cu	10	4	2.6	4
Fe	100	60	40	60
Zn	120	60	40	60
Mn	40	2	1.3	2
Iodine (EDDI)	1.0	1.0	1.0	1.0
Se	0.30 (Sodium Selenite)	0.30 (Sodium Selenite)	0.30 (Sel-Plex®)	0.30 (Sel-Plex®)

Table 2. Trial 1 - Bioplex Grow Finish

Treatment	Industry standards for Inorganic	100% NRC standards for Inorganic	66% NRC as Bioplex	100% NRC as Bioplex	P-value
ADG	2.05	2.04	2.04	2.05	0.13
ADFI	5.17	5.18	5.14	5.19	NS
FG	2.52	2.53	2.52	2.54	NS

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A more detailed analysis of the carcass information showed there were key differences in carcass parameters between pigs fed minerals from Bioplex and pigs fed minerals from an inorganic source. Lean percentage was improved in pigs fed from Alltech's organic mineral source, Bioplex. Results are shown in Table 3 below.

Table 3. Trial 1 - Bioplex Grow Finish

	Industry standards for Inorganic	100% NRC standards for Inorganic	66% NRC as Bioplex	100% NRC as Bioplex	P value
Carcass wt.	203.4	204.0	202.5	203.1	NS
Carcass fat, inches	0.66	0.65	0.63	0.65	NS
Loin depth, inches	2.46 ^a	2.46 ^a	2.62 ^c	2.61 ^{bc}	0.01
Lean premium per carcass, \$	6.34 ^a	6.55 ^a	7.65 ^c	7.18 ^b	0.01

Note: Different superscript letters indicate statistical significance

Economic analysis of the four feeding programs, using the industry inorganic diets as the standard, revealed a return of \$0.59 per pig on the 66% Bioplex program compared to industry levels for trace mineral supplementation. The complete results are listed below in Table 4.

Table 4. Trial 1 - Bioplex Grow Finish

	Industry standards for Inorganic	100% NRC standards for Inorganic	66% NRC as Bioplex	100% NRC as Bioplex
Added cost per pig, \$	----	-0.09	0.71	1.10
Lean premium per pig, \$	----	0.20	1.30	0.83
Return per pig, \$	----	0.29	0.59	-0.27

In an effort to confirm the results of trial 1, a second trial was conducted on 1,188 pigs with an average starting weight of 57 lbs. for a 119.5-day feeding period. They were fed to an average market weight of 280 lbs. Current industry standard levels of inorganic trace minerals were compared to fortification using Bioplex at 66% of NRC recommendations to confirm findings from the first trial.

Results from the second trial mirrored results from the first trial; there were no differences in growth performance from pigs fed industry levels of inorganic minerals vs. pigs fed Bioplex at 66% of NRC recommendations. Results are shown below in table 5.

Table 5. Trial 2 - Bioplex Grow Finish

Treatment	Industry Inorganic	66% NRC Bioplex	P-value
ADG	2.03	2.03	NS
ADFI	5.06	5.02	.11
FG	2.49	2.47	NS

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Similar to the first trial, carcass analysis revealed there was an improved lean percentage and lean premium from pigs fed 66% NRC Bioplex compared to industry inorganic levels. Table 6 yielded an improved return of \$0.43/pig (table 7).

Table 6. Trial 2 - Bioplex Grow Finish

Treatment	Industry Inorganic	66% NRC Bioplex	P-Value
Carcass wt. lb	205.2	205.5	NS
Carcass fat, inches	.594	.576	NS
Loin depth, inches	2.61 ^a	2.70 ^b	<.0001
Lean premium per carcass, \$	8.34	9.04	--

Table 7. Trial 2 - Bioplex Grow Finish

	Industry Inorganic	66% NRC Bioplex
Added cost per pig, \$	--	\$0.67
Feed Cost, +/-per pig	--	-\$0.40
Lean premium per pig, \$	--	0.70
Revenue per pig, \$	--	\$0.43

Results clearly confirm the previous trial in which pigs fed at 66% NRC Bioplex promoted similar growth performance while improving loin depth, lean percentage and lean premium compared to pigs fed industry inorganic levels of trace minerals.

Bioplex trace minerals present the opportunity to minimize the natural resources needed to feed pigs and optimize mineral levels available to crops and the soil through organic matter such as manure, while continuing to deliver pig growth, feed efficiency and improving carcass characteristics. This is exemplified through our [Planet of Plenty™](#) initiative, focused on working together to produce enough safe, nutritious food for all, while caring for our animals and sustaining our land, air and water for future generations.