Performance of nursery pigs fed zinc, copper, manganese, and iron in inorganic or organic (SQM™) forms

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Zinc, copper, manganese and iron are all important trace minerals necessary for optimum swine growth and performance. The use of organic trace minerals provides additional assurances that those minerals do not bind with an antagonist and are actually delivered in a form that allows them to be absorbed and utilized by the pig. A question always arises as to what level of inclusion the organic minerals should be added to the diet compared to their inorganic counterparts. This study was conducted to evaluate the inclusion of organic trace minerals (SQM™) as a partial or complete replacement of inorganic trace minerals.

Baby pigs starting at early weaning were fed to approximately 60 lbs. Diets were corn and soybean meal based diets, formulated according to industry standards (Table 1). Ninety-six barrow pigs (Choice Genetics CG32 maternal line) were randomly assigned to one of three diets with added trace minerals (zinc, copper, manganese and iron) as follows: Control = 100% inorganic trace minerals; 50:50 = 50% inorganic trace minerals and 50% SQM trace minerals; 100 = 100% SQM trace minerals. There were 8 replicates of 4 barrows for each dietary treatment. There were no trace mineral injections given to any pigs. Pigs were housed in raised slotted floor pens (5x10 ft) with ad libitum access to feed and two nipple waterers. LED white natural light was provided continuously for 20 hr/d and 4 continuous hours of darkness. Pigs were observed at least three times daily for overall health, behavior and environmental conditions. Body weights and feed consumption were measured on days 0, 7, 14, 39 and 60. Data were analyzed using GLM ANOVA NCSS, Utah, with mean differences determined using a protected F-test.

Table 1. Composition of base diets:*

		Phase 1	Phase 2
Item	Unit	(0-39 days)	(40-60 days)
Protein	%	19.00	16.00
Energy	Kcal/lb	1425.00	1450.00
Lysine	%	1.10	0.85
Meth + Cyst	%	0.90	0.70
Calcium	%	0.85	0.65
Total Phos.	%	0.94	0.81
Avail. Phos.	%	0.65	0.55
Sodium	%	0.22	0.18
Zn	ppm	30.00	30.00
Cu	ppm	10.00	10.00
Mn	ppm	15.00	15.00
Fe	ppm	65.00	65.00

* Nutrient specifications for all 3 trace mineral treatments (added Zn, Cu, Mn, Fe) as follows: Control= 100% inorganic TM sources; 50:50= 50% inorganic and 50% SQM TMs; 100= 100% SQM trace minerals.

Results

There was no baby pig mortality experienced in this study. Results are displayed in Table 2. By day 7 of the study, the baby pigs receiving either diet containing SQM trace minerals showed a significant ($p<0.01$) improvement in weight gain compared to the control (inorganic trace minerals) diet. This difference in performance was maintained until day 39, when pigs receiving the 100% SQM trace minerals were now significantly ($p<0.001$) heavier than the 50% SQM diet as well. This significant difference ($p<0.001$) in body weight between the three treatments carried through to the end of the study at day 60.

Feed consumption through the first 14 days was different ($p<0.01$) between the control diet pigs and those receiving diets containing SQM trace minerals. By day 39 feed intake was similar between all treatments and remained that way through to the end of the study at day 60.

Table 2. Performance of baby pigs receiving diets containing inorganic or SQM trace minerals (zinc, copper, manganese and iron).

Item	Control	50:50	100	SEM	p-value
Body weight, lbs					
Initial	8.84	8.78	8.95	0.143	0.71
Day 7	10.196[a]	10.733[b]	10.908[b]	0.144	0.009
Day 14	15.438[a]	16.038[b]	16.391[b]	0.129	0.001
Day 39	29.922[a]	30.929[b]	31.648[c]	0.193	0.001
Day 60	59.218[a]	60.975[b]	62.242[c]	0.403	0.001
Feed conversion, feed/gain					
0-7 days	1.13	1.136	1.139	0.011	0.83
0-14 days	1.434[a]	1.409[ab]	1.382[b]	0.013	0.048
0-39 days	1.732[a]	1.676[b]	1.651[b]	0.0164	0.011
0-60 days	1.938[a]	1.887[b]	1.855[b]	0.0125	0.001
Feed consumption, lbs/day					
0-7 days	0.2183[a]	0.3165[b]	0.3183[b]	0.004	0.001
0-14 days	0.676[a]	0.73[b]	0.735[b]	0.0115	0.004
0-39 days	0.936	0.952	0.961	0.011	0.310
0-60 days	1.628	1.641	1.648	0.015	0.590

[a,b,c] Means in the same row with different superscripts differ ($p<0.05$)

Feed efficiency was significantly improved ($p<0.05$) by day 14 of the study between the 100% SQM supplemented diet and the control diet. Throughout the remainder of the study, those pigs receiving either level of SQM trace minerals resulted in more efficient gains than that obtained by the pigs receiving the control diet.

Discussion

The fortification of SQM trace minerals benefited the performance of the baby pigs early on in the feeding period. The overall outcome of the study indicates that the addition of all the supplemented trace minerals (zinc, copper, manganese and iron) in the form of SQM provides a benefit in growth and feed efficiency during those first weeks after weaning. The greater the replacement of inorganics with organics (SQM), the larger the response observed was evident. Formulating with SQM trace minerals minimizes the negative impact of antagonist ingredients in the diet, such as the potential negative interaction between trace minerals during absorption. This study shows that fortifying diets with SQM trace minerals is a key component to optimize performance of baby pigs post weaning.

To learn more about the benefits of feeding SQM protected minerals™, contact Jack Garrett at 303-506-7200, email jackg@qualitechco.com or visit us at qualitechco.com

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