TECH TALK

Effects of Organic Chromium in Swine

Article Provided By:

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Introduction:
Absorption of chromium from feedstuffs is minimal, with only 0.5-2.0% being absorbed1. Therefore, research has demonstrated increased bioavailability of chromium when animals are supplemented with an organic source2. The most common forms of chromium available for livestock supplementation are chromium tripicolinate and chromium propionate. However, chromium tripicolinate has been reported to be more bioavailable than other chromium sources in swine tissues3.

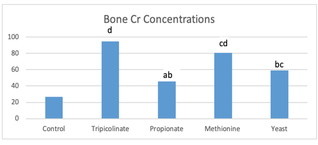
Research Summary:
The interest in chromium supplementation in swine diets occurred when the addition of chromium tripicolinate resulted in improved carcass quality of finished pigs4. Following this research was a demonstration of increased litter sizes of breeding sows supplemented with chromium tripicolinate5. Improved performance and carcass characteristics continued to be reported as the acceptance of organic chromium supplementation expanded throughout the swine industry6. The below information summarizes chromium tripicolinate research results when fed in swine diets.

Benefits of Chromium Include:
- Helps improve glucose metabolism
- Tripicolinate is more bioavailable in swine tissue
- Helps reduce mortality
- Helps increase muscle percentage

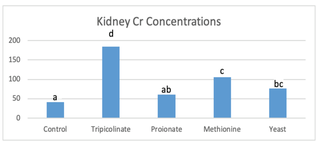
Research results evaluating the effects of different sources of organic chromium on tissue deposition in swine are summarized below3.

Experimental procedure
- 40 pigs (20 barrows and 20 gilts)
- Initial weight 106 lb
- Study duration 75 days average

Response Variables
- Bone
- Kidney
- Liver
- Loin
- Ovary



a,b,c,d Means with different superscripts differ (P < 0.05)



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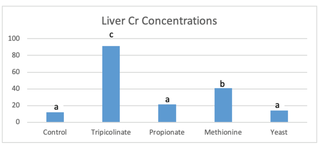
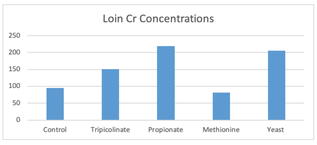
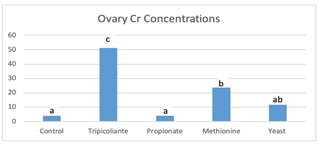


a,b,c Means with different superscripts differ (P < 0.05)



Means do not differ (P > 0.05)



a,b,c, Means with different superscripts differ (P < 0.05)

Conclusions:
1. Mean bioavailability of other Cr sources relative to Cr-Tripicolinate in tissues:
a) Cr-Methionine = 50.5% (36.2 to 79.1%)
b) Cr-Yeast = 22.8% (2.5 to 47.9%)
c) Cr-Propionate = 13.1% (0.2 to 19.0%)
2. Cr-tripicolinate tissue deposition comparisons:
a) 7.63 times more deposition than Cr-propionate
b) 4.39 times more deposition than Cr-yeast
c) 1.98 times more deposition than Cr-methionine

Meta-analysis research results evaluating the effects of Cr supplementation on performance and carcass characteristics are summarized below6.

Table 1. Summary of the effect sizes (Hedges's *g*) between dietary Cr supplementation vs. no supplementation for performance and carcass characteristics of growing-finishing swine calculated according to fixed effects models

Response variable	Studies	Exp.[1]	n[2]	Hedges's *g*[3]	95% Confidence Interval	*P*-value	*Q*[4]	*P* of *Q*	*I*-squared,[5] (%)
Growth Performance									
ADG	31	36	74	0.149	0.021 to 0.277	0.023	81.205	0.239	10.11
ADFI	29	34	70	0.006	-0.126 to 0.137	0.935	80.451	0.163	14.23
G:F	31	36	74	0.302	0.176 to 0.431	< 0.001	86.768	0.129	15.87
Carcass Characteristics									
Dressing percentage	23	26	51	0.171	0.023 to 0.320	0.024	70.305	0.031	28.88
Percentage carcass lean	22	26	52	0.491	0.329 to 0.654	< 0.001	114.733	< 0.001	55.55
LM area	29	34	72	0.494	0.359 to 0.628	< 0.001	159.129	< 0.001	55.38
Percentage carcass fat	9	10	16	-0.372	-0.652 to -0.093	0.009	42.177	< 0.001	64.44
10th-rib fat thickness	24	29	59	-0.416	-0.565 to -0.267	< 0.001	101.905	< 0.001	43.08
Average backfat thickness	18	19	35	-0.116	-0.292 to 0.060	0.196	56.650	0.009	39.98

[1]Number of experiments
[2]Number of comparisons
[3]Standardized unit less effect size for differences between control and Cr-supplemented groups calculated according to Hedges and Olkin (1985)
[4]Cochran's *Q*-values to identify the presence of heterogeneity among studies in fixed effects models, as described by Borenstein et al. (2009).
[5]Degree of heterogeneity among studies in fixed effects models calculated according to Higgins and Thompson (2002).

Conclusions:
1. Cr supplementation in diets of growing-finishing swine decreases fat and increases lean deposition
2. Cr supplementation improves G:F

Chromium Research Summary:
Sows
- Increase in live pigs born
- Increase in total number of piglets born
- Decrease in stillborn and mummified piglets
- Cr-tripicolinate bioavailability was improved over other Cr sources
- Improved first service farrowing rate

Grow-Finish
- Increased gain and carcass quality
- Increased longissimus muscle area
- Improved G:F
- Reduced carcass fat percentage and increased muscle percentage

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References

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