THE USE OF CHROMIUM TRIPICOLINATE TO IMPROVE SOW PRODUCTIVITY

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A nutritional solution that has been shown to increase sow productivity is the supplementation of sow diets with the trace mineral chromium in the form of chromium tripicolinate. Chromium works by increasing insulin sensitivity which increases the uptake of glucose into insulin sensitive cells and increases the conversion of glucose to energy. Several studies in sows, including several studies that are published (Table 1), have shown an increase in the number of pigs born alive for sows fed diets supplemented with 200 ppb chromium from chromium tripicolinate. Additional findings include increased total born (Lindemann et al., 1995) and increased pigs weaned per litter (Lindemann et al., 1995; Hagen et al., 2000) in sows fed diets supplemented with 200 ppb chromium from chromium tripicolinate. A study in which chromium tripicolinate was delivered by top-dress to provide an equivalent dietary chromium level of 200 ppb (Real et al., 2007) found an increased farrowing rate for sows supplemented with chromium tripicolinate. Taken together, these data suggest that supplementing sow diets with chromium tripicolinate to provide 200 ppb chromium can improve sow productivity.

A large-scale field study involving 48,000 sows (Hagen et al., 2000) observed a trend for reduced mortality in sows supplemented with 200 ppb chromium from chromium tripicolinate (Control 10.95% vs. Chromium Triplicolinate 9.38%). In this study, a 6-month loading period was used for the test diets to enable a build-up of body chromium stores. Interestingly, the magnitude of mortality reduction appeared to be greater in parity 1 and older parity sows (>3 parity). Further large-scale trials would be beneficial to validate improvements in sow productivity and livability in sows supplemented with chromium tripicolinate. However, the data that are currently available show that chromium tripicolinate can be a tool to improve sow productivity at a level that provides a suitable ROI. An economic analysis of the large field study (Hagen et al., 2002) indicated an ROI of approximately 4.9:1 based on improvements in sow productivity. Since the marketplace has evolved to provide chromium tripicolinate at a lower cost, there could be opportunity for greater ROI.

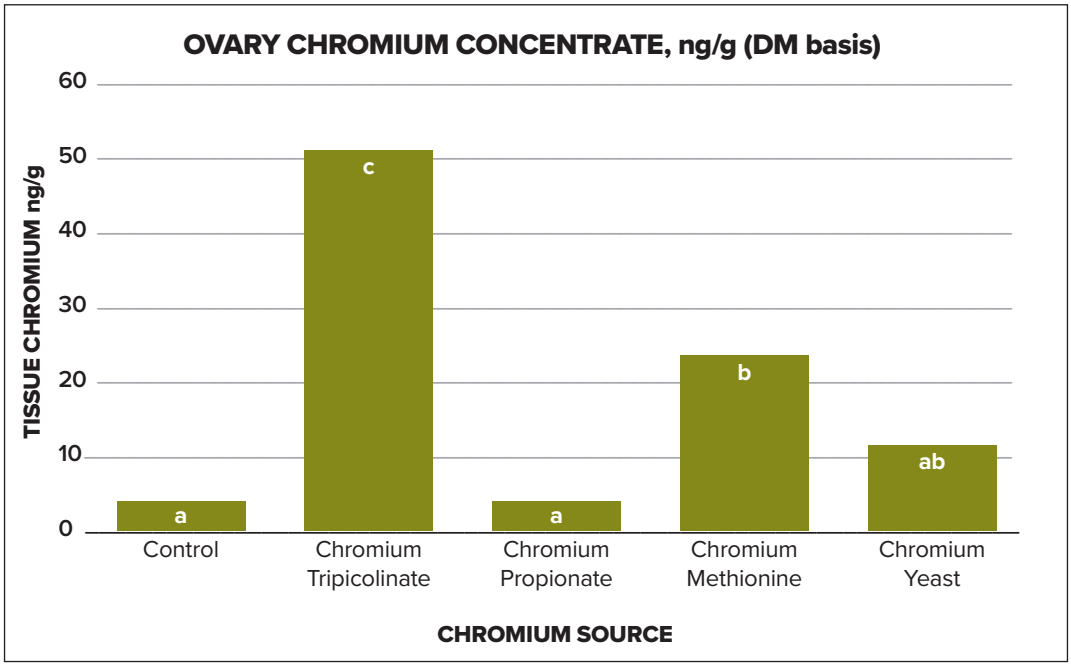
TABLE 1. The effect of supplementation of sow diets with chromium tripicolinate (200 ppb) on piglets born alive

NUMBER OF PIGLETS BORN ALIVE			
TRIAL	**CONTROL**	**CHROMIUM TRIPICOLINATE**	**DIFFERENCE**
Trial 1[1]	8.93[a]	11.25[b]	**+2.32**
Trial 2[2]	9.94	10.01	**+0.07**
Trial 3[3]	9.55	10.60	**+1.05**
Trial 4[4]	10.05[a]	10.42[b]	**+0.37**
Trial 5[5]	10.77	11.45	**+0.68**
Trial 6[6]	9.49[x]	9.82[y]	**+0.33**
AVERAGE	9.79	10.59	**+0.80**

[1]Lindemann et al., 1995 [2]Campbell et al., 1996 [3]Aguilar et al., 1998 [4]Hagen et al., 2000 [5]Lindemann et al, 2000 [6]Lindemann et al., 2004
[a,b]Means are different (P < 0.05); Means tend to be different (P < 0.10)

In the US, two forms of organic chromium, chromium tripicolinate (AAFCO 57.155) and chromium propionate (AAFCO 57.166), are approved to supply 200 ppb of chromium to swine diets. A study conducted in pigs that evaluated the bioavailability of different chromium sources (Lindemann et al., 2008) found that feeding chromium tripicolinate led to increased tissue chromium levels in bone, kidney, liver, and ovary tissue when compared to other chromium sources. Increased bioavailability of chromium tripicolinate may be partly due to improved absorption. In a study conducted in humans (DiSilvestro and Dy, 2007) chromium tripicolinate was absorbed to a greater extent than other chromium supplements. The increased chromium concentration in ovarian tissue (Figure 1) is particularly interesting given the improvements in reproductive outcomes observed in sows supplemented with chromium tripicolinate. An enhancement of insulin activity by chromium tripicolinate may partly account for the improved reproductive outcomes as insulin has been shown to increase ovulation rate (Cox et al., 1987).

FIGURE 1. The effect of dietary chromium source on ovarian tissue chromium concentration. Different letters indicate differences that are statistically significant ($P \leq 0.05$).



Reference: Adapted from Lindemann et al., 2008