



SELISSEO (HYDROXY-SELENOMETHIONINE): EFFECTS ON THE IMMUNE SYSTEM IN SWINE

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Developing feeding strategies to help reduce the negative effects of stress on swine is an ongoing challenge. Stressful conditions can increase what are called reactive oxygen species (ROS) which can damage cells and impair immune system function. These ROS are activated molecules of oxygen which increase during late pregnancy and lactation in sows, and during weaning and environmental changes in young pigs.

One way to help protect cells from ROS damage is by enhancing the pigs' antioxidant defense system. One of the key nutrients in this process is selenium. Selenium is stored in tissues as selenium-containing proteins. Research shows that the use of hydroxy-selenomethionine, commercially known as Selisseo, results in significantly higher amounts of selenium deposited into muscle compared to selenium yeast or sodium selenite. Thus, when the pig is stressed, the enhanced selenium reserves in tissues are available to help with the immune response.

The purpose of this article is to review two research trials involving sows and young pigs; demonstrating how Selisseo helps with activating two key immune markers. One of the markers is called glutathione peroxidase, a key enzyme, which helps detoxify ROS and will be shown in the sow study. The other marker is called total antioxidant capacity, which is a measure of antioxidant status, and will be illustrated in a study with young pigs.

The sow study involved three treatments throughout gestation. Treatment 1 was the control without any added selenium. Treatment 2 was the control diet with 0.3 ppm added selenium from sodium selenite. Treatment 3 was the control diet with 0.3 ppm from Selisseo. Glutathione peroxidase measurements were taken from blood samples on day 30, 60, 90 and 110 of gestation and day 0 of lactation as shown in Table 1 below.

Table 1. Supplemental Selenium in Gestation¹

Glutathione Peroxidase, U ml⁻¹	Control (no selenium)	Sodium Selenite (SS), 0.3 ppm	Hydroxy-Selenomethionine (OH-SeMet), 0.3	Differences (OH-SeMet) vs. SS
Gestation (Day 30)	1144	1129	1181	+4.6%
Gestation (Day 60)	1396 ^b	1432 ^b	1602 ^a	+11.9%
Gestation (Day 90)	1021 ^b	1104 ^{ab}	1293 ^a	+17.1%
Gestation (Day 110)	1228 ^b	1205 ^b	1379 ^a	+14.4%
Lactation (Day 0)	1005 ^b	1110 ^{ab}	1235 ^a	+11.3%

¹ Food and Function 2020:11, 7748-7761; 15 sows on Trts 1 and 3; 13 sows on Trt 2
Means within rows with different superscripts are significantly (P < .05) different

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Sows fed diets with Selisseo had significantly higher glutathione peroxidase values during days 60, 90 and 110 of gestation and lactation at day 0 compared to those sows without added selenium. In addition, the sows on Selisseo had higher glutathione peroxidase values ranging from 11 to 17% during gestation at days 60, 90 and 110 and lactation at day 0 as opposed to those on sodium selenite. Thus, the sows on Selisseo had higher values of glutathione peroxidase which helps support the immune system during gestation when sows undergo greater levels of ROS.

The nursery study involved 180 crossbred pigs; five treatments with six pigs per pen with an average initial weight of 17 lb. The five treatments were: 1. Negative control (basal diet with no added selenium), 2. Positive control (basal diet with 0.3 ppm selenium from sodium selenite (SS)), 3. Basal diet + 0.1 ppm Selisseo, 4. Basal diet + 0.2 ppm Selisseo, 5. Basal diet + 0.3 ppm Selisseo. While there were no performance differences (data not shown) in this 28 day study, the differences in total antioxidant capacity are shown in Table 2 below.

Table 2. Total Antioxidant Capacity (T-AOC) in Nursery Pigs¹

Item	Negative Control Basal Diet with no added selenium	Positive Control Basal Diet with Sodium Selenite @ 0.3 ppm	Basal Diet + Hydroxy - Selenomethionine (OH-SeMet) @ 0.1 ppm	Basal Diet + (OH-SeMet) @ 0.2 ppm	Basal Diet + (OH-SeMet) @ 0.3 ppm
Serum T-AOC, U/ml	1.19 ^a	1.25 ^{ab}	1.27 ^{ab}	1.53 ^{bc}	1.48 ^{abc}
Liver T-AOC, U/mg protein	0.36 ^a	0.35 ^a	0.41 ^{ab}	0.39 ^{ab}	0.48 ^b

¹Archives of Animal Nutrition (2019) <https://doi.org/10.1080/1745039X.2019.1641368>

Means within rows with different superscripts are significantly (P < .05) different

The lowest T-AOC values (serum and liver) were with the pigs on the negative control diets and those supplemented with 0.3 ppm SS. Interestingly, pigs fed diets with only 0.1 ppm Selisseo had numerically higher values than those pigs fed diets with SS at 0.3 ppm. Compared to those pigs fed diets with SS, pigs fed diets with Selisseo at 0.3 ppm had 18 and 37% increases in T-AOC for serum and liver, respectively. These data clearly show that Selisseo is superior to SS in increasing the T-AOC in nursery pigs which supports their immune system during times of stress such as weaning and changes in environment.

Summary

Based on extensive research studies with Selisseo, the incorporation of Selisseo as a standard in the Kent Sow and Starter programs will provide additional support for immune system function.