RESEARCH ABSTRACT
PORK QUALITY

Title: Effect of different fat sources and vitamin E (VE) status on antioxidant status, carcass characteristics, and meat quality of pigs grown to heavy slaughter weight – **NPB #16-208**

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Scientific Abstract:

A variety of energy sources are added to swine diets. These sources pressure the oxidative capacity of the body to varying degrees depending on their fatty acid profile. This affects the need for antioxidant vitamins and can affect animal health and performance as well as pork quality. The effect of fat source on the pig itself as well as the ultimate pork quality is a function of the amount of fat in the diet and the amount of time the pig is fed the different fat source. This impact will obviously increase then with heavier slaughter weights. This project evaluates the potential interaction of fat source and vitamin E need in heavy slaughter weight pigs.

In Exp. 1, a total of 64 individually-fed pigs (32 barrows, 32 gilts; 28.41 ± 0.83 kg) were randomly assigned to 8 dietary treatments in a 4 × 2 factorial arrangement. Fat treatments included cornstarch (CS), tallow (TW), corn oil (CO) and coconut oil (CN); the cornstarch diet was formulated to equalize presumed daily intake of non-fat ingredients to that of the 5% fat added

diets. Vitamin E (VE) supplementation was at 11 and 200 IU/kg. Diets were fed in 5 phases over the growth phase with plasma collected near the end of each phase. When slaughtered at approximately 150 kg, carcass traits and primal cuts were measured and plasma, loin muscles, and fat samples were collected. Interactions between fat and VE were observed ($P < 0.05$) on plasma VE concentration at the end of Phase 2 (50-75 kg), Phase 3 (75-100 kg), Phase 4 (100-125 kg), and Phase 5 (125-150 kg). Pigs fed with CO had the highest plasma VE concentration ($P < 0.05$) from Phase 2 to Phase 5 when supplemented with 11 IU/kg VE. However, in pigs fed 200 IU/kg VE, the plasma VE concentration increased linearly ($P < 0.001$) with increasing time and it increased faster ($P < 0.05$) in pigs fed with the CN and TW diets compared to pigs fed the CS and CO diets. No differences in ADG, carcass traits, subjective meat quality, and yield of Boston-butt, picnic-shoulder, and spare-rib were observed ($P > 0.10$). Increasing VE from 11 to 200 IU/kg improved ham yield ($P < 0.05$) and plasma VE concentration ($P < 0.0001$), but decreased belly depth ($P < 0.05$). Increasing dietary VE from 11 to 200 IU/kg increased ($P<0.001$) the tocopherol concentration in both liver and loin muscle. Pigs from the CS group had greater area of loin-muscle than the CN and CO group ($P < 0.05$). Belly depth for pigs from the CN group was greater than the other fat treatments ($P < 0.05$). The pigs fed the CN diets had the highest lateral flex test ($P < 0.05$) and lowest vertical flex test ($P < 0.05$). Pigs from the CN group had the highest ($P<0.05$) total saturated FA content and the lowest ($P<0.05$) total polyunsaturated FA content and iodine value in the backfat, belly fat and liver. Pigs from the TW group had the highest ($P<0.05$) total monounsaturated FA content in the backfat, belly fat and liver. Pigs from the CO group had higher liver SOD activity ($P=0.03$) than the other treatments.

In Exp.2, a total of 72 individually fed pigs (36 barrows, 36 gilts; 28.55 ± 1.16 kg) were randomly assigned to 12 dietary treatments in a 2 × 6 factorial arrangement. Fat treatments were tallow and corn oil. The VE treatments included four levels of α-tocopheryl-acetate (ATA; 11, 40, 100, and 200 ppm) and two levels of mixed tocopherols (primarily γ-tocopherol; 40 and 100 ppm). Plasma, liver, loin, and fat samples samples were collected at slaughter. Increasing dietary ATA linearly increased overall ADG ($P=0.02$) from 28 to 150 kg. An interaction between fat sources and ATA was observed on cumulative ADG during Phase1-3 (28-100 kg; $P=0.04$) and Phase1-4 (28-125 kg; $P=0.03$) wherein pigs fed the corn oil diets, but not the tallow diets, had increased ADG with increased dietary ATA. Increasing dietary ATA increased ($P<0.001$) plasma ATA concentration, while decreased ($P<0.001$) plasma γ-tocopherol concentrations at the

end of Phase 1 to Phase 5. Increasing dietary ATA also increased SOD activity (quadratic, $P<0.05$; highest at 100 ppm), and decreased MDA content (quadratic, $P<0.05$; lowest at 40 ppm) in the liver. The FA profile in the backfat, belly fat, and liver was affected by fat source ($P<0.05$) but generally not the VE treatment, pigs fed corn oil diets had less SFA ($P=0.02$) and MUFA ($P<0.0001$), but more PUFA ($P<0.0001$) than pigs fed tallow diets in the backfat, belly fat, and liver.

In summation, beneficial effects of dietary VE supplementation were observed on growth performance, antioxidant status, and meat oxidative stability of pigs, but not on carcass characteristic and meat color. Altering the dietary FA profile by the addition of different fat/oil sources affected meat quality related to the FA profile of fat tissues and liver. Interactions between fat sources and VE supplementation in plasma VE concentration and several other measurements were occasionally observed.