

Increased adaptation time improves pig response to functional amino acid supplementation.



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Highlights

- Average daily gain and feed efficiency were improved by feeding functional amino acids above requirements for growth for 2 weeks before Salmonella infection.
- Inflammatory reaction due to Salmonella was attenuated by a longer adaptation period to functional amino acids.
- Salmonella shedding and intestinal presence were reduced in pigs fed functional amino acids for 2 weeks before infection.
- Positive effects of adaptation period to functional amino acids above requirements for growth may be related to improved gut health in pigs.

A previous study conducted at the Prairie Swine Centre and the University of Saskatchewan revealed improved performance of pigs under Salmonella infection when fed functional amino acids (FAA) above requirements for growth. The positive effects were mainly associated with enhanced gut health and improved immune status. Here, researchers attempted to assess whether a longer adaptation period to FAA supplementation would further enhance the previously reported benefits. To achieve this, weanling pigs were fed a basal amino acid profile (AA-) throughout the trial period (FAA-) or a functional amino acid profile only in the post-inoculation (FAA+0), for 1 week pre- and post-inoculation (FAA+1), or throughout the trial period (FAA+2). The functional amino acid profile contained threonine, methionine, and tryptophan at 120% of requirements. Diets contained no animal products or antibiotics, and all the pigs were inoculated with Salmonella after a 2-week pre-inoculation period.

Pigs fed functional amino acids for a longer period showed improved gut health and had lower counts of Salmonella in feces and colon digesta.

Researchers also measured the activity of an enzyme called myeloperoxidase (MPO) in fecal and digesta samples. This enzyme has increased activity during situations of gut inflammatory reaction and has been recognized as an important diagnostic and prognostic tool in assessing enteric disease status. Fecal

Table 1. Pre- and post-inoculation growth performance of Salmonella-inoculated pigs

Item	Dietary		Treatment		SEM	P-value
	FAA-	FAA+0	FAA+1	FAA+2		
Initial body weight (day -14), kg	11.74	11.63	11.63	11.73	0.346	NS
Inoculation body weight (d 0), kg	16.85	16.34	16.74	17.40	0.701	NS
Final body weight (day 7), kg	18.33	18.62	19.55	20.59	1.093	NS
Pre-inoculation period (day -14 to -7)						
Average daily gain, kg	0.290	0.248	0.289	0.281	0.032	NS
Average daily feed intake, kg	0.446	0.381	0.405	0.407	0.049	NS
Gain:Feed, kg/kg	0.65	0.65	0.71	0.69	0.089	NS
Pre-inoculation period (day -7 to 0)						
Average daily gain, kg	0.440	0.424	0.441	0.529	0.061	NS
Average daily feed intake, kg	0.778	0.750	0.740	0.801	0.042	NS
Gain:Feed, kg/kg	0.57	0.57	0.60	0.66	0.088	NS
Post-inoculation period (day 0 to 7)						
Average daily gain, kg	0.211b	0.326ab	0.401ab	0.456a	0.059	0.01
Average daily feed intake, kg	0.720	0.705	0.763	0.727	0.052	NS
Gain:Feed, kg/kg	0.29b	0.46ab	0.53ab	0.63a	0.099	0.02

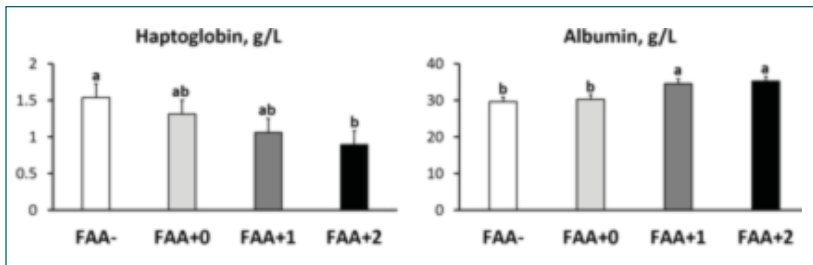


Figure 1. Haptoglobin was increased and albumin was decreased post-Salmonella inoculation. Overall haptoglobin was lower in FAA+2 compared to FAA- pigs while FAA+2 and FAA+1 pigs had higher albumin compared to FAA- and FAA+0 ($P < 0.05$).

MPO was increased post-inoculation, which confirms the negative effects of Salmonella in the gut. Interestingly, MPO content measured in fecal and colonic digesta samples were lower in FAA+2 and FAA+1 pigs compared to FAA-, indicating decreased intestinal inflammation with longer adaptation period to FAA supplementation. An improved gut health led to a reduced Salmonella shedding in feces in FAA+2 pigs compared to FAA- and FAA+0. Also, Salmonella presence in colon digesta was increased in FAA- and FAA+0 pigs compared to FAA+2.

The researchers measured the content of two blood proteins, haptoglobin and albumin. These proteins are directly related to the overall health status of pigs, with haptoglobin being increased and albumin being decreased during situations of trauma, infection, or inflammation. As expected, Salmonella increased haptoglobin and decreased albumin. However, these trends were counteracted by supplementation of FAA for a longer period, where overall haptoglobin was lower in FAA+2 compared to FAA- pigs while FAA+2 and FAA+1 pigs had higher albumin compared to FAA- and FAA+0 (Figure 1). These findings are in line with the reduced shedding and intestinal counts of Salmonella in pigs fed FAA-fortified diets for a longer period before infection.

Post-infection growth performance was improved in pigs fed functional amino acids for a longer period

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