

# Technical *Bulletin* #21

## Small Peptides Protein Increase Amino Acid Absorption and Production of Pancreatic Hormones

*An explanation of the high performance of young pigs on diets containing DPS®.*

DPS is an animal protein supplement derived from 100% porcine origin. Pigs on starter diets containing DPS have exhibited superior, or at least equal performance to pigs on starter diets containing protein supplements that are high quality and much more expensive. Because DPS is an enzymatically hydrolyzed protein, it should have more short-chained amino acids (AA) and have positive effects on the AA absorption and production of pancreatic hormones. This may be one of the key reasons to explain why pigs on diets containing DPS exhibit superior performance.

Small peptides may be transported by the enterocyte. Their transport is associated with membrane or cytosol hydrolysis and their amino acids are taken up by portal blood. There is evidence that the intestinal transport systems for small peptides are different from those for free AA. With small peptides there is less competition for transport sites and this increases the efficiency of absorption. Rerat et al. (1988) evaluated the effects of the intestinal absorption of amino acids and pancreatic hormones (insulin and glucagon) production from either an enzymic hydrolysate of milk (PEP) containing a large percentage of small peptides (about 50% with less than five AA residues) and very few free AA (8%), or a free AA solution (AAL) of the same composition. Both products were infused intraduodenally in one of two amounts (55 or, 110 g) on average 57.0 kg weight pigs.

Two key results were: 1) The absorption of AA was greater, more rapid and more homogeneous after PEP infusion than after AAL infusion, independent of the amount infused. The influence of the amounts infused on amounts absorbed per hour was very marked when the solution was essentially composed of peptides, the absorption being significantly higher after infusion of 110 g than after 55 g at the 2nd and 4th hours, and for the total period (Figure 1). 2) Glucagon production was greater after PEP infusion (Table 1). The hourly glucagon secretion was highly correlated with the hourly total AA absorption. This result confirms that already observed by Rerat in previous research (Rerat et al., 1985a). It may therefore be concluded that this secretion was proportional to the amounts of AA absorbed, which were larger after infusion of small peptides, additionally the higher infusion level (110g) had higher glucagon production as compared to 55g level.

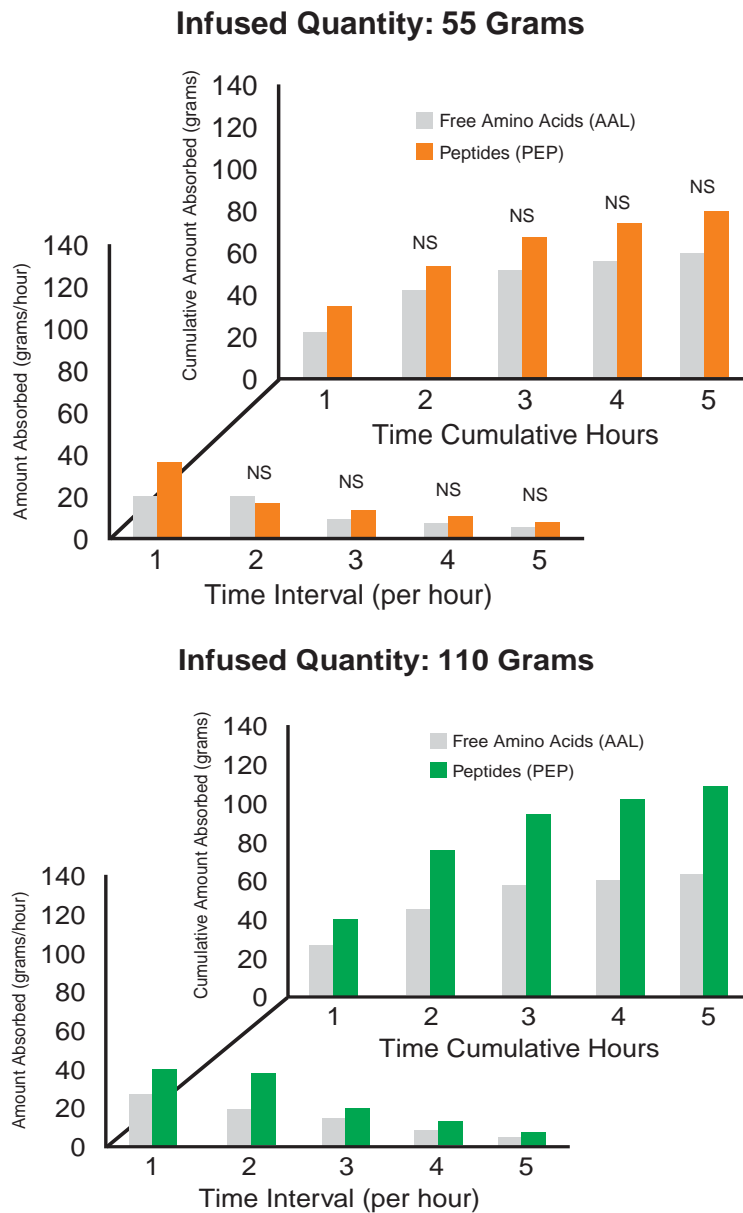
From this study, it may be concluded that absorption of AA was more efficient after infusion of PEP than of AAL, both in terms of rate and time-course, this was the case for total AA and for most essential and non-essential AA. After duodenal infusion of a mixture containing mainly short-chain peptides there was a larger absorption of AA, probably because there was no competition for the transport sites as is the case for free AA. This massive influx of AA in the portal vein stimulated the secretion of glucagon, and this stimulation was much more marked after infusion of a milk hydrolysate of milk protein (small peptides) than after that of free AA.

Although these results yield a potential explanation of the superior performance of young pigs on DPS, additional studies need to be conducted to fully explain this phenomena.

### REFERENCES

- Rerat. A., Chayvialle, J.A., Kande, J., Vaugelade, P, Vaissade P and Bourriet, T. (1985a). Canadian. Journal of Physiology and Pharmacology. 63: 1547-1559.
- Rerat. A., Simoes Nunes, C., Mendy., F and Roger, L. (1988). British Journal of Nutrition. 60: 121-136. Silk, D.B.A., Grimble, G.K. and Ress, R.G. (1985). Proceedings of the Nutrition Society. 44: 63-72.

**Figure 1.** Appearance of total amino acids in portal blood after duodenal infusion of solutions containing 55 or 110 grams free amino acids of milk-protein hydrolysate.



**Table 1.** Hourly production of glucagen (ng) after duodenal infusion of solutions containing 55 or 110 grams free amino acids (AAL) or milk protein hydrosate (PEP).

		Time-Interval After Infusion (hours)					
		0-1	1-2	2-3	3-4	4-5	0-5
Substrate	Type	Mean	Mean	Mean	Mean	Mean	Mean
55	AAL	1981	2288	1021	325	238	5778
	PEP	4770	5163	1445	726	337	12381
110	ALL	3362	2142	1091	436	204	7235
	PEP	5947	6641	2700	1112	473	16872

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