Dried Blood Plasma - A Unique Protein Source for Early-Weaned Pigs

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Spray-dried porcine (pig) plasma is a relatively new feed ingredient that is creating quite a stir in the swine industry. This product was first identified as an effective protein source for early-weaned pigs by researchers at Iowa State University in 1990. Over the past five years, extensive research has been conducted at several universities, including the University of Kentucky, to evaluate this product and some of its components under a variety of weaning programs and environmental conditions.

Where does this product come from? Most of the dried plasma is produced by American Protein Corporation, whose headquarters are in Ames, Iowa. This company collects and processes blood from a number of large hog slaughter plants throughout the country. At these plants, blood is collected in chilled vats and transported by insulated trucks to processing plants where the plasma is separated from the red blood cells. The plasma is then carefully spray dried. It is then shipped to ingredient suppliers and feed manufacturers throughout the feed industry for use in pig starter feeds. The red blood cells are also dried and shipped to ingredient suppliers and feed manufacturers.

In what types of feed are these products used? Dried blood plasma is mainly used in prestarters or “Phase 1” starter feeds for pigs weaned at an early age and weighing 1 O-l 5 pounds or less. Two reasons — (1)l the early growth stage is where plasma is most effective, and (2) plasma is very expensive and can only be used during a time when small amounts of feed are consumed. Dried blood cells are most commonly used in “Phase 2” starter diets, which follow the Phase 1 starters.

What does dried plasma do for pigs? Mainly, it enhances growth rate and feed intake during the postweaning phase. When pigs are weaned at an early age, they usually do not eat much feed for the first few days, then gradually start eating as they adapt to dry feed. During this time, they draw from their “baby fat” for energy and often will look very “rough”. Pigs will typically lose weight for 2-3 days, then they will gain back that weight over the next few days and reach their weaning weight again about 5-7 days after weaning. However, pigs fed dried plasma have a much shorter and less pronounced growth lag. They begin eating feed sooner and continue to grow at about the same rate as they did when they were nursing the sow.

Table 1 shows the dramatic increases in feed intake (39% increase) and growth rate (36% increase) resulting from feeding diets containing dried plasma during the first 2 weeks following weaning, in pigs that were weaned at 3 weeks of age. And these improvements in performance were over an exceptionally good diet that contained 20% dried skim milk. Pigs fed plasma for 2 weeks weighed 4% pounds more at the end of the experiment (at 7 weeks of age) than the controls, and this 4% pound advantage resulted from the feeding of 1 pound of plasma protein (.89 lb of

feed/day x 14 days x 8% plasma in the diet = 1 .O lb of plasma).

How does dried plasma work? We still do not know for sure. Dried plasma seems to stimulate feed intake in young pigs during the critical days following weaning. But whether this is a cause or an effect is not real clear. In other words, do pigs fed plasma grow faster because they eat more, or do they eat more because they grow faster. One thing that we do know for certain — the globulin proteins in dried plasma are the factors that are responsible for the improved performance of pigs fed plasma (this was discovered by our swine nutrition group at UK). The globulin proteins are commonly called "immunoglobulins", and they are responsible for enhancing immunity in the recipient animal. One of these immunoglobulins is gamma-globulin, the factor that is sometimes given to humans before travelling into an area where there is risk of disease.

If the immunoglobulin fraction in plasma protein gives protection against disease-causing organisms, then pigs ought to respond more to plasma protein when given a challenge. We found this to be the case. Figure 1 shows that pigs reared in a conventional, on-farm nursery (where there are more microorganisms that cause subclinical disease) responded more to plasma protein in the diet than pigs reared in an off-site, extremely clean environment.

Does bovine (beef) plasma work also? Yes, it seems to work nearly as well as porcine plasma. In fact, blood is now being collected from cattle slaughter plants and processed in a similar manner as porcine blood. And, based on research conducted at UK, the immunoglobulin fraction of bovine plasma also is effective in stimulating growth and feed intake in young pigs.

How much plasma is needed? Generally, prestarter or Phase 1 starter diets will contain 5-8% plasma. Research has shown that performance generally maximizes at about 8% plasma in the diet. In pigs weaned at 2½-3 weeks, plasma diets are generally fed for the first 7-10 days following weaning. In pigs weaned at 4 weeks, plasma diets may need to be fed only the first few days after weaning. In very early weaned pigs (1½-2 weeks) plasma diets are recommended for about 2 weeks.

Dried blood cells, if used, are generally included in the diet following the plasma diet at levels of 2-3%.

What is the cost of dried plasma and dried blood cells? Dried plasma is rather expensive because the demand is high and the supply is limited. Presently, it sells for approximately $1.75 to $2.00 per pound. Dried blood cells are approximately $.35 to $.40 per pound.

Based on the results of the UK experiments (Table I), the feeding of 1 pound of plasma protein per pig ($1.75-$2.00 per pig) resulted in a 4½ pound heavier pig at 7 weeks of age. While this may be borderline on cost-effectiveness, one should keep in mind that (1)commercial starters generally contain less dried plasma

than the 8% that we used, and (2) plasma diets are generally fed for a shorter period of time (1-1 ½ weeks) than in our experiments (2 weeks). So, in practice, the cost per pig for dried plasma is probably closer to $1 .00 per pig.

Another important factor to consider is that getting pigs off to a good start in the nurserytranslates into better performance during the growing-finish period. Some studies have shown that, in pigs coming out of the nursery, every additional pound per pig translates into an additional 3-4 pounds per pig at the end of the grow-finish period. Put another way, each additional pound per pig coming out of the nursery reduces the time for that pig in the grow-finish facility by 2 days.

Table 1. Spray Dried Plasma for Young Pigs - University of Kentucky"

	Control[b]	Plasma[b]
First 2 Weeks Postweaning		
Daily gain, lb	.47	.64
Daily feed intake, lb	.64	.89
Feed/gain	1.36	1.41
Entire Test (to 4 Weeks)		
Daily gain, lb	.62	.78
Daily feed intake, lb	1.09	1.26
Feed/gain	1.81	1.65

'Adapted from Coffey et al. (1995). Summary of three 4-week experiments involving 128 pigs weaned at an average of 21 ± 2 days (13 lb initial weight). The experiments were conducted at the University of Kentucky.

[b]Control diet (1.4% lysine) was corn-soybean meal with 20% dried skim milk and 20% dried whey. Plasma diet (1.4% lysine) was corn-soybean meal with 8% dried plasma, 1 1% lactose, and 20% dried whey. Pigs were fed these diets for 2 weeks, then fed a common diet (1.2% lysine) consisting of corn, soybean meal and 10% dried whey for the following 2 weeks.

Figure 1. Responses of young pigs to diets containing 8% spray-dried porcine plasma (SDPP) in housed in a conventional, on-farm nursery or in a new experimental, off-site nursery. Three experiments involving 256 pigs weaned at 21 ± 2 days of age. Coffey et al. (1995).