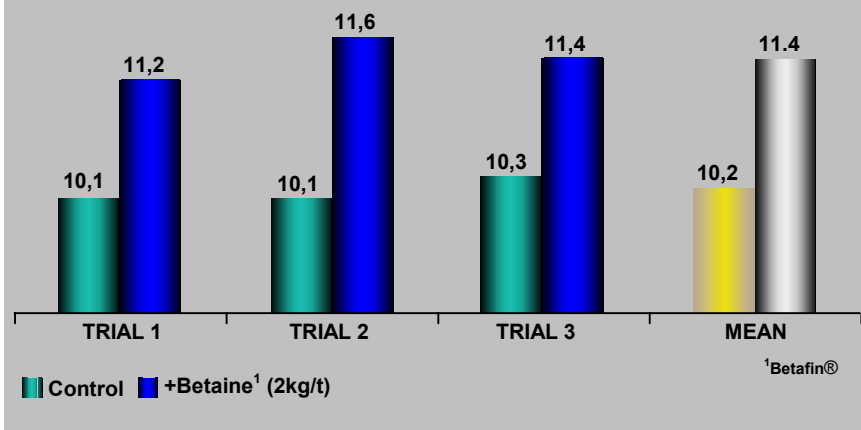


Betaine's dual role

A natural extract of sugar beet is gaining popularity in pig feeds, benefiting feed manufacturers, producers and processors.

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Figure 1. Betaine in the lactating diet increases litter size in the subsequent farrowing. A summary of 3 trials at QAF Meat Industries (formerly Bunge), Australia.



Dietary betaine acts both as an osmolyte, reducing the pig's energy demands to maintain cellular water and ion balance, and as a methyl donor. This can save on dietary energy for maintenance purposes and on the need for other dietary methyl donors such as methionine and choline, both providing opportunities to reduce

feed costs.

Reducing an animal's maintenance energy requirement through improved osmoprotection effectively frees some feed energy for lean meat growth. As 40-50% of maintenance energy goes in meeting the demands of the gut and other visceral organs, then even small reductions in

maintenance requirements can have dramatic effects on pig performance, as more energy is available for lean meat growth. Improving osmotic balance in the cells lining the intestines can also aid nutrient absorption and can contribute to more consistent pig performance.

Table 1. Two trials in Germany using betaine addition to reduced energy diets for grower-finisher pigs.

	TRIAL 1			TRIAL 2		
	Control +	Betaine ¹ (-4.3%DE ²)	Improvement versus control	Control +	Betaine ¹ (-3% DE ²)	Improvement versus control
Days of growth	102	100		129	129	
Daily gain (g)	760	785**	+3%	731	735	
FCR	2.76	2.80		2.92	2.98	
Fat thickness at P2 (mm)	15.8	15.7		16.8	16.3*	-3%
Meat thickness (mm)	62.8	64.2**	+2%	61.8	63.3**	+2%
Lean meat %	57.1	57.4		56.1	56.8**	+1%
Drip loss %	4.9	4.0	-18%	3.6	3.6	

¹Betafin® Danisco Animal Nutrition (1 kg/t)

²DE = Digestible Energy

**P<0.05 *P<0.10

Table 2. Betaine addition to untreated or pST-treated pigs, 64-102kg body weight.

	Untreated		pST Treated		P value Betaine ¹
	Control	+ Betaine ¹	Control	+ Betaine ¹	
Daily gain, g	1067	1162	1308	1379	0.05
FCR	2.55	2.38	2.11	2.06	0.16
Carcass lean gain, g/d	673	752	863	915	0.03
(Index)	(100)	(112)	(128)	(136)	

¹Betafin®

Source: Victorian Institute of Animal Science, Werribee, Australia

Maintaining water balance

The function of water within the cell is often overlooked. Water plays a key role in metabolism. Maintaining a constant level of water balance is a continuous challenge for the cell. The primary mechanism is simply osmosis, whereby the movement of water in and out of cells is directed by the concentrating gradient of salts and solutes between the inside and outside of the cell. In cases where the concentration gradient of salts and solutes between the inside and outside of the cell is incorrect to allow for osmosis, the pig employs sodium/potassium ion pumps to maintain cellular water balance. However, resorting to this mechanism requires energy. Surprisingly, it has been estimated that between 30 and 60% of the maintenance energy used by visceral organs goes into maintaining water balance via the sodium/ potassium ion pumps. As an effective osmolyte, betaine "holds" water inside the cell. Minimising the cell's reliance on energy expensive ion pumps by supplementing the diet with osmolytes such as betaine, offers potential energy and feed cost savings.

Commercial benefits

Keeping the delicate finger-like villi of the gut lining in good condition counteracts common problems

during periods of stress such as disease challenge, digestive upset and dehydration, all of which can disrupt nutrient digestion and absorption, and depress pig performance.

The commercial benefits of supplementing pig diets with betaine were demonstrated in two recent German trials where a net benefit of around 1 Euro per pig was obtained in grower-finishers (30kg-120kg) by the inclusion of betaine (Betafin®) in diets where the energy specification had been reduced by 3-4% (Table 1). Even though the energy of the diet was reduced, daily weight gain, lean meat percentage and meat thickness were all either maintained or improved with betaine in the feed. Both trials showed lean meat benefits from the use of betaine, and spot tests of 29 hams in one trial also showed less carcass drip loss in betaine-fed pigs.

Betaine as a methyl donor

These improvements are not all down to betaine's osmoprotection properties. Methyl donation, betaine's additional function, can contribute to performance benefits and reduce feed costs by replacing some supplemental dietary methionine and choline.

Methyl groups are continually required by the pig for essential metabolic processes (e.g. DNA, RNA and protein synthesis) and

can be obtained from dietary sources such as choline, methionine or betaine.

Betaine is the most efficient methyl donor of the three. All supplemental choline and a part of dietary methionine can therefore be replaced for this particular function, offering some further cost-saving opportunities in feed formulation.

The benefits of betaine are particularly pronounced in situations where dietary energy is limiting performance. For example, heat-stressed sows during lactation usually eat less than the optimum to support the energy demands of milk production. Consequently sows lose weight through the mobilisation of body tissues, which often results in decreased litter size at the subsequent farrowing. Betaine has been shown to help compensate for this, enabling sows to deliver larger litters next time round (Figure 1).

In recent trials conducted in Australia, betaine has been shown to improve performance in pigs treated with porcine somatotrophin (pST), a product of increasing interest in some countries for improving carcass quality. The reduction in maintenance energy costs by using betaine in pST-treated pigs had a synergistic effect on pig performance, increasing carcass lean gain by 36% compared to non pST treated control pigs. This compared to a 12% increase in lean gain in non pST treated pigs fed betaine in the diet (Table 2). **PP**

Key Words: Betaine, Betafin, Betafin (pig), Betafin (swine), Lean meat, Backfat, Carcass yield, Pig, Swine, Sow, Litter size, Drip loss