FEATURE

How much have our finisher pigs changed in composition over time?

By Dr FAN LIU, Rivalea (Australia) Pty Ltd; Dr ROGER CAMPBELL, RG Campbell Advisory Pty Ltd; Professor FRANK DUNSHEA, University of Melbourne; Dr JOHN PLUSKE, Australasian Pork Research Institute Ltd.

The value of a finisher pig in Australia is largely determined by the weight of the carcase at slaughter (HSCW; hot standard carcase weight) and its backfat depth, or P2 (in mm).

A grid system is typically used by processors that shows the specification(s) of HSCW and P2 that maximises carcase value, but which also shows price penalties (deductions) that apply to carcasses falling outside the optimum specification(s).

Penalties for finisher pigs will usually apply to carcasses that are too fat, too thin, too light or too heavy, with over-fat carcasses usually receiving the greatest penalties.

It is therefore important for producers to grow and manage their pigs to slaughter in ways where the greatest proportion of pigs meet the carcase weight and P2 backfat specifications that maximise carcase value.

What a pig eats and how much it eats throughout the period before being sent to the processor will play major roles in how the pig dresses up after slaughter and therefore what price a producer receives.

The Australian market has, over time, required carcases with a reduced fat content, and accordingly genetic selection has targeted reduced P2 backfat (as an indicator of overall body fatness), in conjunction with increased average daily gain and improved feed efficiency driven by greater muscle (or protein) deposition, to meet this requirement.

It is the relationship between muscle deposition and fat deposition that largely determines how the pig should be fed and managed up to slaughter.

Assuming that protein supply and balance in the diet is not limiting muscle growth, then quantifying energy requirements will help nutritionists set daily energy allowances (based on estimated levels of feed intake) to maximise muscle growth without excessive P2 fat deposition, and in turn maximise carcase value.

Of course, there are numerous other factors that contribute to pig growth that may impact on carcase weight and P2 backfat depth such as housing, time of the year, sex of the pig, and immunocastration, that need to be taken into account.

Much of the original work that was done in establishing these relationships was conducted in a series of landmark studies by Dr Roger Campbell and colleagues in the 1980s and 1990s.

Using the genetics at the time, and as shown in Figure 1, it can be seen that the relationship between energy intake and muscle (protein) deposition followed a classical linear-plateau pattern. Later work in the early 2000s by Dr Ray King and colleagues, though, showed that protein deposition increased linearly in response to elevated dietary energy intake, and that boars, and to a lesser extent the gilts, showed that their upper limit to protein retention might not be reached below about 120 kg liveweight.

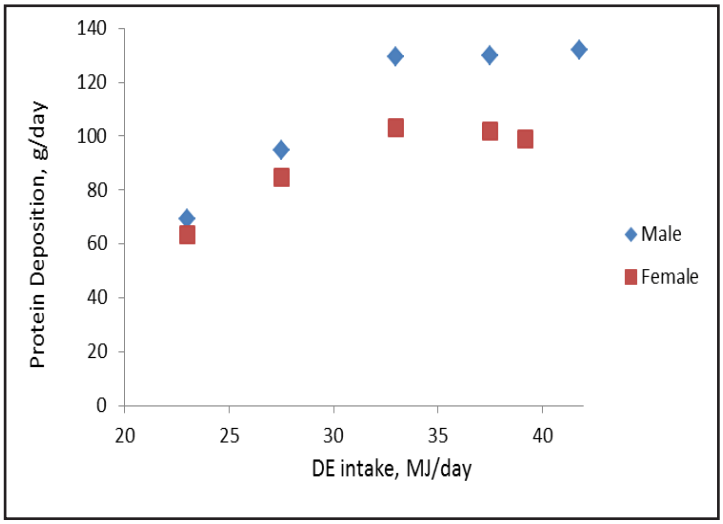

Figure 1. Relationship of protein deposition and energy intake in entire male and female pigs (Campbell et al. 1985).

Figure 2. Body composition of pigs was measured at the start and end of the study using x-ray technology. *(Photo courtesy Professor Dunshea).*

However, given the intense genetic selection that has gone on since these times, have relationships between dietary energy intake and muscle and fat deposition (and hence P2 backfat depth) changed?

Are the daily nutritional requirements of the modern-day pig, and hence the diets they are fed, satisfactory to still maximise carcase value especially given the high cost of grains and some other ingredients at the present time?

These were the questions addressed in a recently completed APRIL project conducted by Dr Fan Liu and colleagues at Rivalea (Australia) Pty Ltd – Review of relationships between energy intake and performance and body composition changes in 60-108 kg pigs with modern genetics using a DXA scanner.

In the study conducted in 2019, individually-housed entire male and female pigs (Primegro™ Genetics, Corowa, NSW, Australia) were fed seven different amounts of digestible energy (DE) of a wheat-based diet containing 14.3 MJ DE/kg [25.8, 29.0, 32.6, 35.3, 38.5, 41.5 and 44.2 MJ DE/d (ad libitum) for males, and 25.8, 28.9, 32.0, 35.6, 38.3, 40.9 and 44.5 MJ DE/d (ad libitum) for females] between 60 kg and 108 kg live weight.

Body composition of (anaesthetised) pigs was measured on pigs at the start and end of the study using dual energy X-ray absorptiometry (DXA) Figure 2), a machine that uses X-ray technology to estimate the protein, fat, water and bone contents of pigs.

At the end of the study, after DXA assessment, pigs were slaughtered in a commercial abattoir where the HSCW (Australian Trim 1 standard) and P2 backfat thickness and loin depth were measured.

Various statistical tests and procedures were then conducted on the data to analyse the results.

All in all, the results from entire male and female pigs showed that despite energy intake not changing significantly compared to the same breed 15-20 years ago, they both had much the same body protein contents, although and as would be expected, entire male pigs were ~16% more efficient at converting energy to muscle than female pigs.

The most significant finding though was in the amount of whole-body fat and P2 backfat thickness, with there being 16% and 15% less body fat in entire males and females, respectively, and a 22% and 15% lower P2 backfat thickness in intact males and females, respectively.

These changes presumably reflect the emphasis on selection for backfat depth reduction for the Australian

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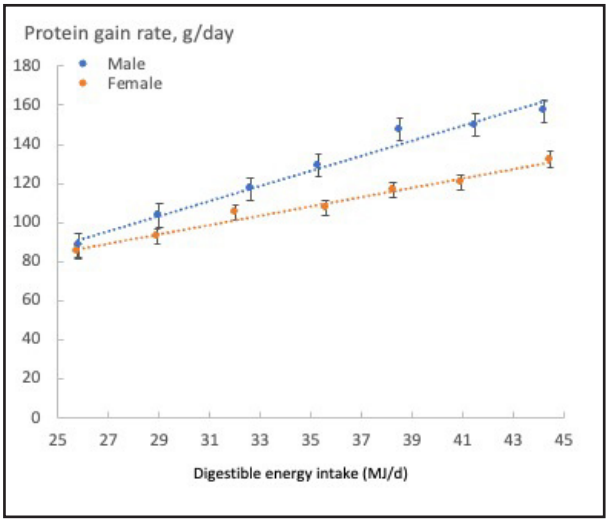

Figure 3. Relationship between DE intake (MJ/day) and protein gain rate (g/day) in entire male and female pigs.

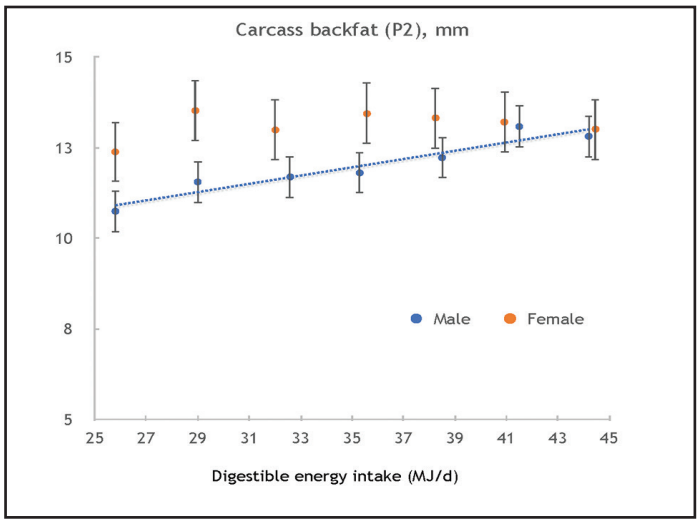

Figure 4. Relationship between DE intake (MJ/day) and carcass backfat (P2 site, mm) in entire male and female pigs at 108 kg live weight.

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market. Importantly, protein deposition rate of entire male and female pigs in the carcase both increased linearly with increased energy intake in the tested range (Figure 3).

Carcass P2 backfat thickness increased linearly in response to the increased daily energy intake in male pigs but not in female pigs (Figure 4).

Interestingly, a strong relationship between body fat content and P2 backfat thickness was not seen, suggesting that the modern-day pig has other means of meeting the requirement for a lower carcass P2, e.g., adjusting body shape, carcass length, where fat is distributed/deposited, and (or) by increasing heat production at higher energy intakes.

What are the commercial implications of these findings?

Dr Fan Liu commented that, on the assumption that finisher pigs can be marketed by body weight, then (a) restricting dietary energy intake in intact male pigs can reduce carcass backfat (when slaughtered at a fixed body weight), (b) that unrestricted feeding in female pigs should be considered because their protein deposition rate increased linearly in response to increased dietary energy and feed restriction did not effectively reduce carcass backfat thickness in female pigs, but (c) that the economics of restricted and unrestricted feeding should be evaluated in intact male and female respectively under commercial (i.e., group-housed) conditions, with the cost of duration of growth and mortality rate taken into consideration.

It is important to point out that the outcomes and practical considerations from this project reflect those of this genotype (Primegro™ Genetics) and the conditions of the study (individually-housed pigs reared under good conditions), and it is likely that other genotypes will respond differently to the energy levels used in this project.

Furthermore, as mentioned previously and irrespective of genotype, there are other factors that need to be considered when feeding finishing pigs to maximise carcase value.

These include factors such as housing and environmental conditions (e.g., whether outdoor or indoor), immunocastration, time of the year, target carcase weight and P2 (if appropriate), stocking density and feeding regimens.

Bottom line, consult your nutritionist and genetics provider to receive the latest up-to-date information that will maximise carcase value and margin-over-feed-cost for your operation.

References available on request.