

#### **4B-104: Improving the efficiency of pig feed manufacturing and application of additives**

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#### **Aims and Objectives:**

1. To reduce production costs for high-quality pork through understanding how commercial processing conditions affect mill throughput, processing energy efficiency, product durability and the nutritional value of pig feed.
2. To develop NIR calibrations and other tools which can be used by feed manufacturers to adjust processing conditions for specific grain samples and ingredient mixtures to improve manufacturing efficiency, product durability and nutritional value for pigs.
3. To determine whether NIR calibrations of the final processed feed can be developed to reliably predict factors that determine animal performance.

#### **Key Findings:**

- Characteristics of individual grains that influence pellet quality and nutritional value are not additive in mixed diets, and sorghum characteristics can dominate.
- The size of grain particles significantly affected the RVA, *in vitro* starch digestion parameters, pellet hardness and durability, and efficiency of feed use by young pigs.
- Regrinding large particles increased the efficiency of feed use by young pigs by up to 22% with sorghum based diets and 15% with barley based diets.
- Low conditioning temperature for an extended period significantly increased the rate of *in vitro* starch digestion and efficiency of feed use by growing pigs.
- Addition of surfactants to diet mixtures produced small and variable results in mills.
- There were significant differences between the soft, hard and naturally sprouted wheats in energy use during processing, pellet quality and weaner feed efficiency.
- Significantly more energy was used during processing and pellet formation for the soft wheat diets compared with the hard or naturally sprouted wheat diets.
- The sprouted wheat pellets were significantly softer and appeared less durable than either the soft or hard wheat pellets.
- Although feed consumption for pigs offered the sprouted wheat diets was greater than for pigs offered the soft or hard wheat diets, efficiency of feed use was 16% less than the soft wheat diets. There was no difference between the soft and hard wheats in efficiency of feed use.
- Increasing conditioning temperature from 60°C to 80°C significantly reduced the efficiency of feed use in weaner pigs by 16%.
- *In vitro* starch digestion parameters strongly correlated with efficiency of feed use, suggesting the *in vitro* assay can be used to rapidly screen feed products.
- Preliminary NIR calibrations developed from scans of the pellets reasonably predicted Faecal DE content, *in vitro* starch digestion parameters and physicochemical characteristics of the pellets.

#### **Application to Industry:**

- Process control during pig feed manufacture (milling, conditioning, etc.) have marked effects (10-22%) on the efficiency of feed use by pigs.
- Factors affecting the efficiency of pig feed processing are known, but would be best applied in industry through a spreadsheet model that is being developed.
- Availability of rapid *in vitro* techniques that predict animal performance.
- Confirmation of differences between NIR calibrations for mash and pellet diets.
- Availability of NIR calibrations for pellets to accurately predict animal performance.