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Pork CRC Research Summary

Project Number & Title:

1B-102 - Processing methods for improving the utilisation of cereal grains by pigs:
Development of a rapid *in-vitro* starch digestion technique for animal feed

Principal Developer:

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Background:

Assessing digestion is paramount to processing, and choice of ingredients and additives to maximize energy delivery from feeds. Cereal grains are used in pig feeds, and with a possible 17MJ/kg energy from starch, it is important to quantify ease of starch digestion in pig feeds prior to feeding. Existing techniques for *in-vitro* starch digestion, particularly in measuring glucose released are expensive, cumbersome and slow. A simple, robust and fast technique is required. In this project, we developed a technique that measures the amount of glucose, and therefore, digested starch, produced by digestive enzymes using a glucose meter (or glucometer) that is common in diabetics' management.

Methodology:

1. Identifying the digestive enzymes and concentrations to mimic gastrointestinal starch digestion
2. Examining and comparing the various methods for quantifying released glucose, and therefore, digested starch (= 0.9 x glucose)
3. Choosing a glucometer, compiling its detection speed, accuracy, sensitivity, and analyte volume, as well as developing an equation to calculate digested starch
4. Investigating the suitability of the glucometer to changes in processing, raw material, formulation, particle size, and digestion time.

Key Findings:

1. Enzymes and concentrations to use in *in-vitro* starch digestion were identified
2. The Accu-Chek Performa® glucometer (Roche Diagnostics Aust.Pty. Ltd., Caste Hill NSW 2154, Australia) was suitable and sensitive to measure glucose concentrations during starch digestion under different conditions and with various substrates
3. A new *in-vitro* starch digestion method was developed with the following characteristics:
 - (a) Substantial increase (e.g. 10X) in assay throughput compared to other methods
 - (b) Simple and inexpensive
 - (c) Easy to set-up with no specialised laboratory skills
4. The method is suitable for time-course measurements to understand kinetics of starch digestion, and can be set-up as part of quality control in feed processing

Conclusions:

- A new method for *in-vitro* starch digestion based on glucometry was developed
- The new method will speed up analysis of starch digestion
- Its simplicity and ease of use make it valuable in feed formulation/manufacture

Potential Users of Information (including value assessment):

Processors, nutritionists, agriculturists, and ingredient suppliers to evaluate/screen grain type/state, processing, and additives (e.g. enzyme) to e.g. predict energy delivery