

# A Surgical Model for the Kinetics and Quantification of Nutrient Absorption in Swine: Its Application in Carbohydrate Metabolism

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Nutrient digestibility has been studied thoroughly in swine, but not kinetics of nutrient absorption. A catheterized grower pig model was tested for achievable independent series of portal vein blood collections and ability to separate effects of  $\beta$ -glucans on nutrient absorption patterns. Two pigs (35 kg BW) were surgically modified with catheters in the hepatic portal vein and carotid artery and an ultrasonic flow probe around the portal vein. Catheters and probe were exteriorized and secured dorsally. Fibrosis and adhesions were minimized by avoiding excessive manipulation and drying of viscera, confirmed by post mortem analyses. Catheter placement was secured using anterior modifications and non-absorbable suture. Pigs were fed parenterally until regular feeding resumed. Catheters were flushed regularly with heparinized saline (200 IU/L). After 10 d, pigs were fed diets containing 0, 4, or 8% barley  $\beta$ -glucans for five consecutive 7-d periods, the 0 and 4% twice. On d 7, blood was collected every 10 min from -10 to 60 min, 30 min to 240 min and 60 min to 420 min postprandially; flow was measured simultaneously. Plasma was analyzed for glucose, insulin and VFA, and their net absorption was calculated from blood (plasma x hematocrit) portal-arterial differences x blood flow. Dietary  $\beta$ -glucans did not affect energy digestibility. Peak portal glucose and net absorption of glucose were delayed by 30 min for diets containing  $\beta$ -glucans. Relative hydrolysis of starch to glucose was 89% and 85% for the 4% and 8%  $\beta$ -glucans diets, respectively, compared to the 0% diet. Portal VFA peaked 5 to 6 hr postprandial and was increased by  $\beta$ -glucans.

**Implications:** The catheterized pig model will thus allow the study of absorption kinetics of carbohydrate metabolites (glucose, VFA).