



**HAL**  
open science

## Energy metabolism in pig colonocytes after adaptation to a high fibre diet

B Darcy-Vrillon, Mt Morel, C Cherbuy, F Bernard, Jc Meslin, L Posho, F Blachier, Ph Duée

► **To cite this version:**

B Darcy-Vrillon, Mt Morel, C Cherbuy, F Bernard, Jc Meslin, et al.. Energy metabolism in pig colonocytes after adaptation to a high fibre diet. *Reproduction Nutrition Development*, 1992, 32 (5-6), pp.494-494. hal-00899550

**HAL Id: hal-00899550**

**<https://hal.science/hal-00899550>**

Submitted on 11 May 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

### Energy metabolism in pig colonocytes after adaptation to a high fibre diet.

B Darcy-Vrillon, MT Morel, C Cherbuy, F Bernard, JC Meslin, L Posho, F Blachier, PH Duée (*INRA, Laboratoire d'Écologie et de Physiologie du Système Digestif et Laboratoire de Nutrition et Sécurité Alimentaire, 78352 Jouy-en-Josas, France*)

Energy metabolism in the colon has been poorly investigated. Feeding highly fermentable carbohydrates in the diet leads to an increased short chain fatty acid production in the colon, the effect of which on colonic mucosal metabolism is essentially unknown. The aim of the present study was to identify fuel substrates in colonic epithelial cells isolated from pigs adapted to a high vs low fibre diet.

For 4 wk post-weaning, 24 piglets were fed a low fibre diet (4% purified cellulose). Then 12 animals were fed the same diet for the following 5 wk, whereas the other 12 received a diet enriched in sugar beet fibre (12%). Colonocytes were isolated from the proximal colon using a method involving EDTA (10 mM), followed by hyaluronidase dissociation buffer (0.8%). The cell preparation was viable for 60 min at least, based on a linear metabolisation of U<sup>14</sup>C-glucose, and a minimal leakage of LDH activity into the extra-cellular medium. With both diets, colonocytes had a significantly higher capacity for glutamine and glucose utilisation (1–2 nmol/min, 10<sup>6</sup> cells) than for butyrate or lactate (0.4–0.6 nmol/min, 10<sup>6</sup> cells). Conversely, based on <sup>14</sup>CO<sub>2</sub> production, the oxidative capacity was 2–3-fold higher for butyrate or lactate than for

glucose or glutamine. In all cases, glycolysis accounted for most of the glucose disappearance (60–75%), whereas oxidation accounted for 10–15% only. With both diets, butyrate (10 mM) was converted to ketone bodies (55%) and CO<sub>2</sub> (45%). Glutamine (5 mM) was converted to glutamate, ammonia, aspartate and alanine. Glutamine oxidation accounted for < 10% of the substrate disappearance. Both glycolysis and oxidation of glucose were significantly reduced in the presence of butyrate (10 mM), accounting for a 30% decrease in glucose utilisation. Butyrate (10 mM) did not affect glutamine metabolism. Glucose (5 mM) or glutamine (5 mM) had hardly any effect on butyrate metabolism.

With the high fibre diet, the capacity for glucose utilisation was significantly lower (0.8 vs 1.25 nmol/min, 10<sup>6</sup> cells), due to a 30% decrease in glycolysis. The capacity for butyrate utilisation tended to be higher in colonocytes derived from pigs fed the high fibre diet (0.51 vs 0.37 nmol/min, 10<sup>6</sup> cells).

In conclusion, a viable preparation of isolated colonocytes was obtained in the pig. Data suggest that butyrate is a major oxidative substrate in these cells, as previously found in rat and man (Roediger, 1980; Ardawi and Newsholme, 1985). Colonic cells from pigs adapted to a high fibre diet exhibited modified metabolic characteristics.

### References

- Ardawi MS, Newsholme EA (1985) *Biochem J* 231, 713-719  
 Roediger WEW (1980) *Gut* 21, 793-798