

Insulin resistance is increasingly being recognized as an important factor in the pathogenesis of ischemic heart disease. Estimating insulin sensitivity is time consuming and requires considerable expertise and equipment. Hence, we compared two insulin sensitivity indexes derived from plasma insulin (I) and glucose (G) in the basal state [$S_{ib} = 10^8 / (I.G.VD)$] and at the second hour (I2-h and G2-h) of an OGTT [$S_{i-2-h} = 10^8 / (I2-h.G2-h.VD)$] with measurements of insulin sensitivity using either the insulin modified FSIVGTT [$S_{i(IVGTT)}$, 47 subjects] or the euglycemic clamp [$S_{i(CLAMP)}$, 10 subjects]. VD was an estimate of the apparent glucose distribution volume.

$S_{i(IVGTT)}$ was found to be highly correlated ($P \leq 0.0001$) with S_{ib} and S_{i-2-h} in the overall population ($r = 0.827$ and $r = 0.893$, respectively). S_{i-2-h} was also highly correlated with $S_{i(IVGTT)}$ in subjects with normal glucose tolerance (NGT, $n = 31$), in those with impaired glucose tolerance (IGT, $n = 10$) and in those with type 2 diabetes ($n = 6$). A close correlation ($r = 0.897$, $P \leq 0.0001$) was found between S_{ib} and $S_{i(CLAMP)}$. The slopes of the correlation lines of S_{i-2-h} against $S_{i(IVGTT)}$ were compared between the three subgroups of subjects: NGT, IGT and overt type 2 diabetes, but no differences were observed.

For all these reasons, calculations of sensitivity indexes from plasma glucose and insulin concentrations in the basal state and during a conventional 2-h oral glucose tolerance test appear to be useful for coupling in the same simple and single test both a determination of glucose tolerance and an estimate of insulin sensitivity.

Metabolic fate of starch ingested in a complex meal. N. Noah^{a,b}, Y. Zaïr^b, P. Maugère^b, M. Krempf^b, M. Champ^{a,b} (Inra, rue de la Géraudière, BP 71627, 44316 Nantes cedex 03; ^bCRNH Hôtel-Dieu, place A. Ricordeau 44093 Nantes cedex 01, France).

Introduction: While some starchy foods are recommended in the diets of diabetics or sportsmen, their metabolic fates are still unclear.

Aim of the study: To evaluate the splanchnic captation of glucose coming from the digestion of a ^{13}C -naturally enriched starch in humans, and its use at peripheral levels.

Methods: Six volunteers were infused with a tracer solution (6,6 2H_2 -glucose) at a constant rate in the arm in order to calculate the glucose flux. Blood samples were collected in the other arm. Two hours after the beginning of the infusion, the subjects ingested a balanced meal containing pregelatinized maize starch (50 g glucose-equivalent). Respiratory exchanges were analysed using indirect calorimetry and CO_2 -expired samples were regularly collected during the 8-h period. Mass spectrometry techniques were used to analyse infused and ^{13}C -exogenous glucose in plasma, and expired $^{13}CO_2$. Results were expressed as mean \pm standard error of the mean.

Results: Postprandial glycemia and insulinemia maxima at 30–45 min were, respectively, 0.98 ± 0.1 g/L and 28 ± 10 mU/L. Glucose flux, 13 ± 1 mmol/kg/min at basal state, peaked at 20–22 mmol/kg/min (at 30 min) and returned to the basal value after 6.5 h. At that time, 89 ± 2 % of the exogenous glucose ingested arrived at the peripheral level. Endogenous glucose production was decreased by 25 %. Exogenous glucose, however, probably partly recycled, still represented 25 % of the circulating glucose 8 h after the meal. The total quantity of dietary glucose oxidized was 20.1 ± 1.3 g.

Conclusion: The rate of absorption, slower in the case of starch, does not seem to affect splanchnic captation. The glucose reaching the peripheral level may have been stored, under the form of neoglucogenic substrates or not, and then

released, leading to a prolonged and larger oxidation of exogenous glucose.

COLONIC MICROFLORA AND METABOLIC FUNCTIONS

Molecular mechanisms of butyrate action on HT-29 intestinal epithelial cell proliferation. S. Siavoshian, J.P. Segain, C. Cherbut, J.P. Galmiche, H.M. Blottière (Human Nutrition Research Center, CRI Inserm 95-08, CHU Hôtel-Dieu, Inra, 44035 Nantes cedex 01, France).

Sodium butyrate, a product of colonic bacterial fermentation, is able to inhibit cell proliferation and to induce the differentiation of colonic epithelial cells in culture. In a variety of cell systems, butyrate has been found to block cells in the G1 phase. D type cyclins appear early in the G1 phase and complex with cdk4 or cdk6. Then, they can bind to the unphosphorylated form of pRb, thus allowing E2F transcription factor to activate gene transcription. The p21 protein inhibits the action of G1/S cdk-cyclin complexes. The aim of our study was to investigate the mechanisms by which butyrate inhibits cell cycle progression toward S phase.

HT-29 cells were cultured in the presence or absence of increasing concentration of sodium butyrate (from 2 to 8 mM) for 24 h. Proteins were extracted, and cyclin D1, D3, E2F-1 and p21 expression were studied by western blotting. mRNA were extracted, and cyclin D1, D2 and p21 expression were studied by RT-PCR.

Butyrate inhibited cyclin D1 mRNA expression, without affecting its protein level. In contrast, butyrate stimulated cyclin D3 protein expression. We failed to detect any mRNA for cyclin D2 in HT-29 cells. Moreover, a dose-dependent decrease in E2F-1 expression was observed in HT-29 exposed to butyrate. In addition, after 6 h of incubation with

butyrate, p21 mRNA was detected and mRNA expression reached a plateau in between 12 and 24 h. At the protein level, no p21 was detected at 6 h. At 12 h, p21 was detected and the optimal detection was observed at 24 h.

Our results suggest that the inhibition of cell cycle progression by sodium butyrate may be explained by a modulation of cell cycle regulatory proteins such as cyclin D3 and p21.

Measurement of short chain fatty acids produced from resistant starch fermentation in the portal blood: A study in a pig model. L. Martin^a, H. Dumon^a, G. Lecannu^b, M. Champ^{b,c} (^aEcole nationale vétérinaire, Unité de nutrition et alimentation, BP 40706, 44307 Nantes cedex 03; ^bInra, Laboratoire de technologie appliquée à la nutrition, BP 71627, 44316 Nantes cedex 03; ^cCRNH groupe métabolisme, Hôtel Dieu, Place A. Ricordeau, 44093 Nantes cedex 01, France).

Colonic fermentation of resistant starch (RS) produces short chain fatty acids (SCFA) and an especially high proportion of butyric acid (*n*C4). This SCFA plays a specific role in the wholeness of colonic mucosa. In this study, we tested the hypothesis that the rate of starch fermentation could influence the production of *n*C4 and its utilization by the colonocytes in vivo.

Material and methods: Three experimental diets were formulated with three different resistant starches selected on the basis of their in vitro fermentation kinetic: raw potato starch (PoS), high amylose corn starch (HS) and retrograded high amylose corn starch (RHS). The animals ate 15 g of RS per experimental meal. Four pigs were fitted with two indwelling catheters (portal vein and carotid artery) and a flow probe (Transonic™) was placed around the portal vein. Results were analysed by ANOVA.