tistical analysis. The increase in TG ($P < 0.001$), VLDL-TG ($P < 0.001$) and VLDL-C ($P < 0.001$) was greater for the pm than the am meal. VLDL-TG was greater ($P < 0.02$) at T_1 (+49%) and T_2 (+23%) after the pm meal than after the am meal. The LpE:B levels (markers of TRL remnants) were higher ($P > 0.05$) at T_1 (+30%) and T_2 (+23%) after the pm meal than after the am meal. Conversely, LDL-C levels were lower ($P < 0.05$) following the pm meal at T_5 (–13%), T_6 (–17%), T_7 (–22%) and T_8 (–17%) than after the am meal. There were no statistically significant differences between am and pm for HDL-C and LpB:C-III. The results of the present study showed clear differences in postprandial lipemia between an am and pm meal. These observations support the concept of a slower TRL metabolism during the night as compared within during the day.

Measurement of the overall digestibility of carbon from carbohydrates following the ingestion of ^{13}C-carbohydrates in patients with a malabsorption syndrome.

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Dietary carbohydrates (CHO) that are not absorbed in the small intestine are fermented in the colon, producing gases (CO_2, H_2), short-chain fatty acids and bacterial mass. Currently, there is no available method to determine precisely the amount of unabsorbed dietary CHO and their fermentation products excreted in stools. Since carbon is present in CHO and a majority of fermentation metabolites (CO_2, short-chain fatty acids, bacterial mass, etc), its labelling and measurement could be an interesting method to use in the investigation and follow-up of patients with a malabsorption syndrome. For this purpose, patients with a malabsorption syndrome and normal subjects were given orally CHO naturally enriched with ^{13}C and we measured the overall excretion of ^{13}C in the stools and breath ($^{13}CO_2$). Ten patients with the short bowel syndrome (SBS) (length 73 ± 40 cm, mean ± SD) with ($n = 8$) or without ($n = 2$) the colon remaining in continuity and eight healthy volunteers (HV) ingested a test meal after an overnight fast (3 318 kJ, protein-fat-CHO, 17:26:57% energy) containing naturally ^{13}C enriched CHO in the form of 50 g corn starch (–12.22 8‰), 50 g sugar cane (–11.10 8 ‰) and carmine red as a faecal recovery marker. Patients consumed a low-^{13}C diet and their stools were collected 1 day before and 3 days after the test meal. Breath samples were collected half-hourly and CO_2 production was measured using indirect calorimetry hourly for 6 h before and after the test meal ingestion. In the breath, in the premeal and red postmeal stools, ^{13}C enrichment was measured by an isotope ratio mass spectrometer (GC/CN-IRMS, Europa Scientific). Faecal and breath ^{13}C enrichment was corrected using the basal premeal value.

The excess faecal output of ^{13}C was 142 ± 85 µmol (range 14–299) and 6 ± 7 µmol (range 0–16) in SBS and HV, respectively. The percentage of ingested dose recovered in the stools was 23 ± 18% (range 3–61) and 1 ± 1% (range 0–3) in SBS and HV, respectively. The percentage of ingested dose exhaled in breath for 6 h was 31 ± 9% (range 16–42) and 25 ± 2% (range 20–29) in SBS and HV, respectively. In SBS, the percentage of ^{13}C excreted in stools was inversely related to that excreted in breath for 6 h (Spearman correlation Rho = –0.85, $P < 0.02$).

It was concluded that the faecal measurement of ^{13}C after the ingestion of a breakfast containing CHO naturally enriched with ^{13}C is a useful tool for assessing both the fat of CHO and their carbon containing fermentation products after their passage

through the digestive tract of patients with a malabsorption syndrome. In addition, our preliminary results show that a 6 h breath $^{13}CO_2$ test could be a valid indirect measurement of overall CHO digestibility carbon from dietary CHO.

Effect of algal fibre supplementation *(Eucheuma cottonii)* on intestinal absorption of glucose and insulin response in the pig. B Darcy-Vrillon [1], P Vaugelade [1], F Bernard [1], C Hoebler [2], F Guillon [2], S Mabeau [3], PH Duee [1] *([1] Unité d'écologie et de physiologie du système digestif, Inra, 78352 Jouy-en-Josas cedex; [2] Laboratoire de technologie appliquée à la nutrition, Inra, 44316 Nantes cedex 03; [3] Centre d'étude et de valorisation des algues, BP 3, 22610 Pleubian, France)*

Although marine seaweed is the source of several phycocolloids used in the food industry (alginates, carrageenan, agars), edible seaweed consumption is low in western countries. Their generally high content in soluble dietary fibre is of nutritional interest, however. As part of a systematic study of their nutritional properties, this work investigated the possible effects of algal polysaccharides on postprandial blood glucose levels and insulin response.

Four Large White pigs (48 kg) were surgically implanted with permanent catheters in the portal vein (PV) and the carotid artery (CA), and with an ultrasonic portal blood flow probe. Eight to 10 days after surgery, each of them received an alternate sequence of test meals (800 g of maize starch + casein) supplemented either with 40 g of algal fibres extracted from *Eucheuma cottonii* (EC, $n = 2$) or with 40 g of purified cellulose (PC, $n = 2$). The meals were given after a 24 h fast. Blood glucose and plasma insulin levels were monitored for 8 h after the meal. Glucose balance across the small intestine was also measured during this period. Then, after adaptation to the supplemented diet (6 days), the pigs were slaughtered at 5 h postprandial, and the digestive contents were sampled for subsequent analysis (stomach residue, intestinal content rheology).

Basal glycemia (3.6 ± 0.2 mM) and portal blood flow rate (30 ± 2 mL.min.kg) were identical for both diets. Portal and arterial glycemia increased following the meal intake, but the maxima reached (mean ± SEM) were significantly lower with EC: 6.7 ± 0.1 vs 8.1 ± 0.4 mM (PV); 4.8 ± 0.1 vs 6.0 ± 0.3 mM (CA). Moreover, glycemia peaked from 40 to 85 min with EC vs at 40 min with PC. In both groups, insulin concentration rose within 30–40 min after the meal; however, it returned more slowly to the basal level with EC diet (after 120 vs 90 min). As for glycemia, the peak levels (mean ± SEM) were significantly lower with EC: 148 ± 17 vs 229 ± 44 µU/mL (PV) and 84 ± 10 vs 153 ± 44 µU/mL (CA). Glucose absorption (mmol/min) was lower with EC in the first postprandial hour, but higher after 120 min. Nevertheless, the glucose absorption balance across the small intestine did not differ for 8 h after the meal, accounting for 46 ± 6% and 41 ± 5% of the starch ingested with EC and PC diets, respectively.

We concluded that the addition of 40 g of carrageenan-rich seaweed fibres to a high carbohydrate meal lowers blood glucose and insulin response as compared to that observed with purified cellulose, without modifying the intestinal glucose absorption balance.

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Kinetics of pancreatic secretion in milk- or soyabean-fed preruminant calves. Preliminary results. G Le Dréan [1], I Le Huërou-Luron [1], JA Chayvialle [2], V Philouze-Romé [1], R Toullec [1], P Guilloteau [1] *([1] Laboratoire du jeune ruminant, Inra-Rennes, 35042 Rennes cedex; [2] Inserm,*