vation of significant population shifts. Due to its slower rate of hydrolysis, it is possible that resistant starch is degraded throughout the colon while lactulose hydrolysis and fermentation mainly occur in the proximal colon.

**In vitro degradation of starch by Bacteroides thetaiotaomicron alone or in association with a human H₂-utilizing acetogenic bacterium.** V Rochet, A Bernalier, M Durand (INRA, laboratoire de nutrition et sécurité alimentaire, 78350 Jouy-en-Josas, France)

Starch that escapes digestion in the small intestine may constitute an important source of carbohydrates for colonic bacteria. Its degradation and fermentation by amylolytic bacteria produced short-chain fatty acids (SCFA) and the gases H₂ and CO₂. In methane-excreting subjects, H₂ can be reutilized in situ by methanogens. However it has recently been shown that when methanogenesis is low reductive acetogenesis (4 H₂ + 2 CO₂ → 1 acetate + 2 H₂O) may become a significant pathway of H₂ disposal (Bernalier et al (1994) In: Nouvelles tendances en microbiologie anaérobie SFM, Paris, 110-118).

The objective of the present work was to investigate in vitro the interactions that occur during starch hydrolysis between Bacteroides thetaiotaomicron, a hydrolytic bacterium of the dominant colonic flora, and an H₂-utilizing acetogenic bacterium, strain M5a3, isolated in our laboratory from human feces (Decaudin et al (1994) In: Nouvelles tendances en microbiologie anaérobie SFM, Paris, 304-307).

The kinetics of the starch degradation was studied in monoculture (B thetaiotaomicron) and coculture (B thetaiotaomicron + M5a3) after 1–8 d of incubation at 37°C. The substrate consumption was assayed enzymatically (Boehringer assay). The glucose liberated from the starch was measured by the GOP method. The fermentation products (gases and SCFA) were analysed by gas chromatography and the ethanol was determined enzymatically (Boehringer assay).

The addition of acetogenic bacterium induced an increase in the rate of starch hydrolysis by B thetaiotaomicron. The maximum extent of starch degradation was obtained after 3 d of coculture compared with 8 d in monoculture.

The hydrogen concentration in the coculture was always lower than in the monoculture (43 μmol/l vs 135 μmol/l respectively), where it accumulates, which indicates that the acetogenic bacterium was able to use the H₂ produced by the hydrolytic bacterium. Acetate, propionate and succinate were always the main products of the starch metabolism. However, a change in the fermentation pattern was observed in the presence of the acetogenic strain. The acetate concentration was higher in coculture (15.1 mmol/l vs 7.2 mmol/l in the monoculture). As the increase in acetate production was concomitant with a decrease in the H₂ concentration, it could be partly due to its formation by the strain M5a3 which mainly produces acetate from H₂/CO₂ metabolism. Nevertheless the existence of an interspecies H₂-transfer inducing a shift in the metabolism of B thetaiotaomicron to acetate is also likely.

This work demonstrates the existence of an interrelationship between B thetaiotaomicron and an acetogenic bacterium leading to a faster degradation of starch. It also suggests that in the colonic ecosystem, reductive acetogens have a significant effect in H₂-reutilization and acetate formation in vivo.

**Distribution of elastase I and II messenger RNAs in calf tissue.** I Le Huerou-Luron, M Gestin, R Toullec, P Guilloteau (INRA,