lated to attempts to induce RA in the rumen in vitro and in vivo, and understanding the relative importance of RA and M in the rabbit caecum.

The affinity for H_2 of RA is lower than that of M but the importance of RA in the hindgut has been related to the higher amounts of free amino acids, mucins and bile salts, inducive and/or inhibitory for RA and M respectively. Batch incubations of sheep rumen contents with these compounds added did not stimulate RA although selective inhibition of M was demonstrated, accompanied however by increased propionate production [2,3]. Addition of *Peptrostreptococcus productus* ATCC 35244 [4] or methanol [5] together with 2-bromoethane sulfonic acid (BES) to sheep rumen contents *in vitro* increased acetate production through RA. Such experiments *in vivo* are excluded however because of the very fast adaptation of the rumen to BES [5]. Use of a similar combination with a bacteriocin-like inhibitor of M resulted in similar results in vitro and in vivo (Nollet *et al*, in preparation). Also, direct introduction of frozen and thawed cattle hindgut contents to a sheep rumen did not affect rumen fermentation stoichiometry in vitro [5].

RA is a major characteristic of the caecal fermentation in young suckling rabbits, producing significant amounts of VFA with little or no M. Subject to a litter effect, RA is replaced gradually and partially by M with the increasing intake of solid feed [6]. However, caecal RA was clearly present in non-fasted rabbits only [7]. In contrast to the sheep caecum [8], monensin increased non fasted rabbit caecal M *in vitro*, accompanied by a decrease in butyrogenesis. Depression of M was observed with BES (Piattoni *et al*, in preparation). The results suggest that rabbit caecal RA is inhibited by monensin, although such an effect was not apparent from viable counts of bacteria active in RA. It is suggested that caecal bacteria capable of RA are different in sheep and rabbits.

1. Demeyer D, De Graeve K, Durand M, Stevani J (1989) *Acta Vet Scand* Supp 86, 68-75
2. Demeyer DI, Fiedler D, De Graeve KG (1996) *Reprod Nutr Dev* 36, 233-240
3. Immig, I (1997) *Arch Anim Nutr* (submitted)
4. Nollet L, Demeyer D, Verstreaete W (1997) *Appl Environ Microbiol* 63, 194-200
5. Immig I, Demeyer D, Fiedler D, Van Nevel C, Mbanzamihigo L (1996) *Arch Anim Nutr* 49, 363-370
6. Piattoni F, Demeyer D, Maertens L (1996) *Reprod Nutr Dev* 36, 253-261
7. Piattoni F, Demeyer D, Maertens L (1997) *World Rabbit Sci* (in press)
8. Mbanzamihigo L, Van Nevel CJ, Demeyer D (1996) *Anim Feed Sci Technol* 62, 215-228

Characteristics of H_2/CO_2 metabolism in acetogenic bacteria from the human colon.

M Leclerc[1], A Bernalier[1,2] ([1]*INRA, Laboratoire de Nutrition et Sécurité Alimentaire, Domaine de Vilvert, 78 352 Jouy-en-Josas cedex, France;* [2]*INRA, Laboratoire de Microbiologie, Centre de Recherche de Clermont-Theix, 63122 Saint-Genès-Champanelle, France)*

In the human colon, the fermentation of substrates which are not absorbed in the upper- digestive tract, leads to the production of short chain fatty acids (mainly acetate, propionate and butyrate) and

gases (H_2, CO_2 and, in some cases CH_4). A large part of the hydrogen produced is re-utilized *in situ* by hydrogenotrophic microorganisms (methanogenic archaea, sulphate-reducing and acetogenic bacteria). Reductive acetogenesis, i.e. acetate synthesis from CO_2 reduction, was demonstrated to be an active process of H_2 disposal in the colon of non-methane excreting subjects, harboring low numbers of methanogens [1,2]. The taxonomy and phylogeny of the H_2/CO_2-utilizing acetogenic strains isolated from non-methane producing human faeces, showed the important diversity of this microbial population [3]. These acetogenic bacteria belong to different genera including *Clostridium*, *Ruminococcus* and *Streptococcus*.

The aim of the present work was to investigate the characteristics of H_2/CO_2 metabolism in four of these acetogenic species (two *Clostridium* spp., a strain of *Streptococcus* and *Ruminococcus hydrogenotrophicus* sp. nov.[4]). The four strains were able to use H_2/CO_2 as sole energy source to produce acetate. Incorporation of $^{13}CO_2$ into acetate by these species further demonstrated the utilization of the reductive pathway of acetogenesis. Chemiosmotic mechanisms of ATP generation seemed to be involved during acetate synthesis. It is likely that those of *Clostridium* F5a15 were sodium-dependent in contrast to the other strains. The minimal threshold of H_2 uptake in these acetogens was higher than that of the predominant colonic methanogen, *Methanobrevibacter smithii*. Autotrophic metabolism in acetogenic strains was modulated by yeast extract, tryptone or rumen fluid. Vitamins were required for H_2/CO_2 metabolism in most strains except *Clostridium* M5a3. The presence of glucose also modulated H_2/CO_2 utilization by these acetogens but the conditions in which they were able to co-utilize both glucose and H_2/CO_2 varied according to the species.

1. Lajoie SF, Bank S, Miller TL, Wolin, MJ (1988) *Appl Environ Microbiol* 54, 2723-2727
2. Bernalier A, Lelait M, Rochet V, Grivet JP, Gibson GR, Durand, M (1996) *FEMS Microbiol Ecol* 19, 193-202
3. Bernalier A, Rochet V, Leclerc M, Dore J, Pochart P (1996) *Curr Microbiol* 33, 94-99
4. Bernalier A, Willems A, Leclerc M, Rochet V, Collins MD (1996) *Arch Microbiol* 166, 176-183

Study of the adaptation of the rumen ecosystem to the anti-methanogenic effect of monensin measured in vivo.

JP Jouany, B Lassalas (*INRA, Station de Recherches sur la Nutrition des Herbivores, Centre de Clermont-Theix, 63122 Saint Genès-Champanelle, France)*

Monensin is known as a potent anti-methanogenic agent in the rumen. According to the literature, its effect persists throughout treatment [1], or decreases quickly and disappears approximately two weeks after the start of the treatment [2,3].

Four adult sheep fitted with a special rumen cannula allowing rumen gas sampling [4] just before (T0), 2h after (T2) and 5h after feeding (T5) were used. Animals were fed a mixed diet of grass hay (950 g) and barley (400 g) given twice daily. During period 1 (15 days) sheep