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Fecal Bacterial Community Succession of Holstein Calves and its Modulation by Providing Prebiotics Fed with Milk Replacer

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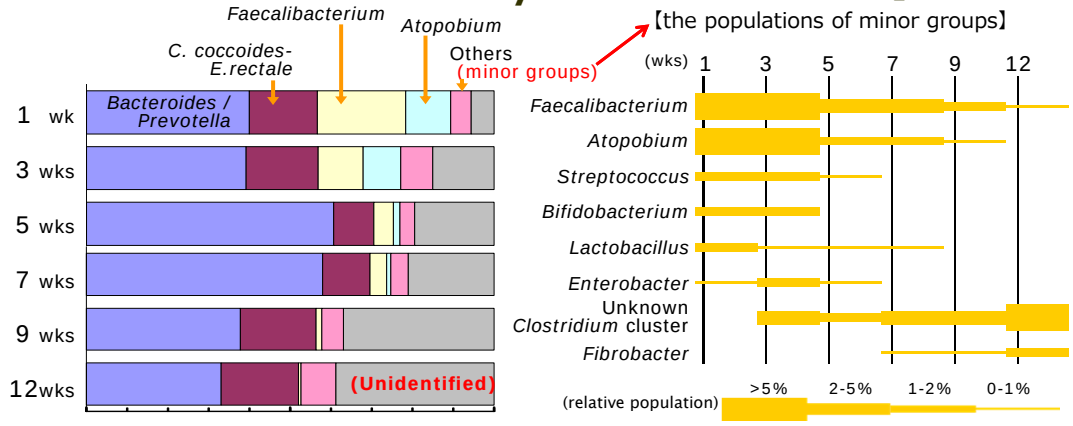
Rearing healthy calves is a key to success in dairy/beef production. For this purpose improving gastrointestinal (GI) function of calves is critical, while the microbial community of the GI tract involved in the function has not been well understood.

【Fecal bacterial community of Holstein calves】



Experimental procedure

***Animals:**
4 female Holstein calves
***Diets:**
Commercial MR (CP28%, CFat15%; MAX. 1200g/day) **weaned at 56d**
Commercial CS (CP18%; MAX. 2400g/day)
Chopped timothy hay (*ad libitum* intake)
***Fecal sample analysis:**
--Faecal samples were collected from calves by rectal stimulation on w 1, 3, 5, 7, 9, 12.
--the sample was used to determine bacterial community composition by **sequence-specific SSU rRNA cleavage method** (Uyeno et al, Appl. Environ. Microbiol. 70:3650 [2004]).

Bacteroides-Prevotella and the *Cl. coccoides-Eu. rectale* groups constituted the major fraction of throughout the 12-week period and other minor groups change in response to animal growth at the group level. The change was more prominent in the period around weaning (8w). Markedly, unknown *Clostridium* cluster and major ruminal fibrolytic bacteria (*Fibrobacter*) increased with the calves aged, possibly as a result of postnatal development of the digestive tract and subsequent improvement in the digestibility of fiber.

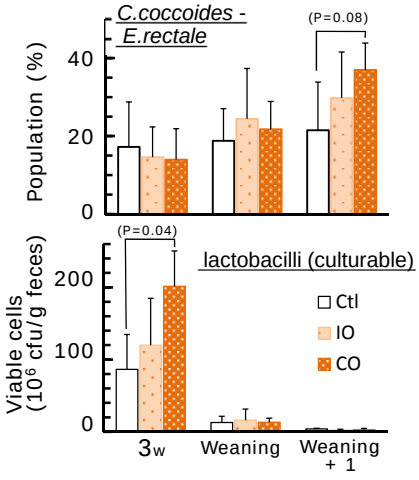
【Effects of oligosaccharides on performance and the fecal bacterial community】

[Performances & Diarrhea Incidence]

	Ctl	IO	CO	SE
DG (kg)	0.64	0.55	0.64	0.03
Feed Efficiency (Mcal/BWGkg)	5.79	6.84	6.18	0.25
Diarrhea Incidence Rate (per head)				
Total(d7-d48)	**0.12^{a,b}**	**0.17^{a}**	**0.08 ^{b}**	0.04
d7-d20	**0.29^{a}**	**0.34^{a}**	**0.20^{b}**	0.03
d21-d34	0.05	0.09	0.04	0.03
d35-d48	0.02	0.07	0.01	0.05

Feeding CO decreased the incidence of diarrhea ($P<0.05$), particularly in a very-early stage.
The higher tendency of *Cl. coccoides-Eu. rectale* population was observed CO group than control group at 1w postweaning. CO feeding also increased viable lactobacilli at 3w but no difference was observed in the counts among the three groups 1w postweaning.

[Fecal bacterial community]



Experimental procedure

***Animals and groups:**
24 male Holstein calves (8 x 3 groups)
(i) Control group (**Ctl**)
(ii) Isomalto-origo group (**IO**; 15g/day)
(iii) Cellooligosaccharides group (**CO**; 5g/day)
***Diets:**
Commercial MR (CP24%, CFat21%; MAX. 500g/day) Weaning was set for each calves who could consume designated amount of CS (1kg/day).
CS and timothy hay, same as in Expt 1
***Measurements:**
--The animals' health and feed intake were monitored daily and body weight was measured weekly.
--Fecal samples for bacterial analysis were collected on 3w, at weaning and 1w after weaning. Bacterial composition was determined by the method described above, and Rogosa agar (Oxoid) was used for lactobacilli count.

Conclusions

- The young calf undergoes drastic changes in its intestinal bacterial community during the first 3 months of life.
- When administered to young calves, CO is possible to promote bacterial groups which are specifically recognized in the ruminant's community, for instance, fibrolytic bacteria and lactic acid-utilizing bacteria.

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