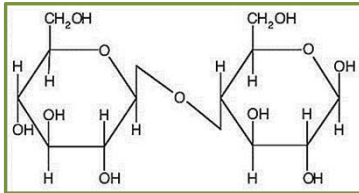


Increasing feed efficiency and changes in ruminal ecology of Holstein calves fed cellooligosaccharide for the first three months of age

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Cellobiose and cellooligosaccharide



- Disaccharides of glucose with a $\beta(1-4)$ bond
- Derived from enzymatic digestion of cellulose

Effects of feeding CE on ruminant performance:

- To increase propionate and total VFA levels in *in vitro* ruminal culture (Lila et al., 2006)
- To improve in DG and feed efficiency during the post-weaning period of calves (Hasunuma et al, 2011)

A feeding trial:

Animals

--40 female Holstein calves (6 experimental sites)

Ctl: control group (n =14)

CE: cellooligosaccharide group (n=13)

SB: CE + *Cl. butyricum* group (n=13)

Feeding

-- MR (3-45d), alfalfa hay (46d-),

-- CS (3-90d, MAX 2.4kg/d), concentrate (91d-)

-- **CE (3-45d, 5g/d; 46-90d, 10g/d)** for **CE, SB** group

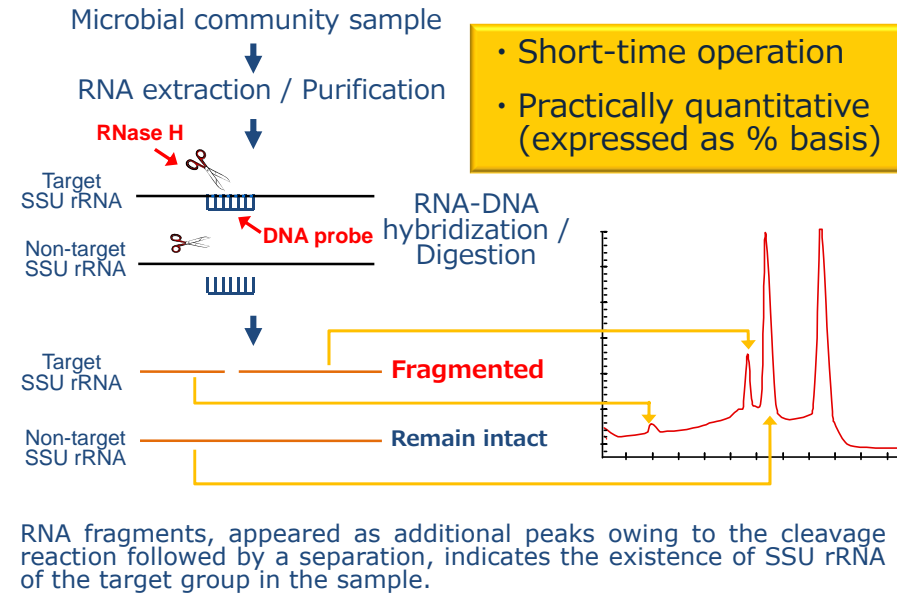
-- ***Cl. Butyricum* (3-90d, 10^8 cfu/d)** for **SB** group

Measurements

-- Health, feed intake (daily), body weight (weekly)

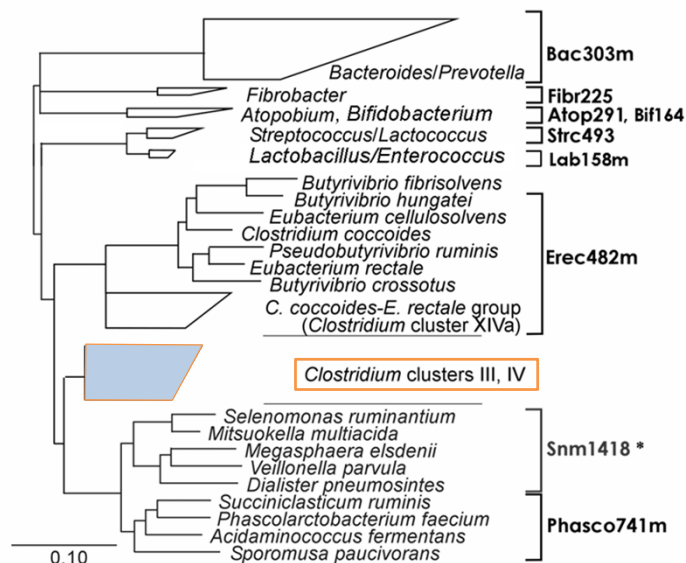
-- Organic acid & microbial community of the rumen (13 wk and 17 wk)

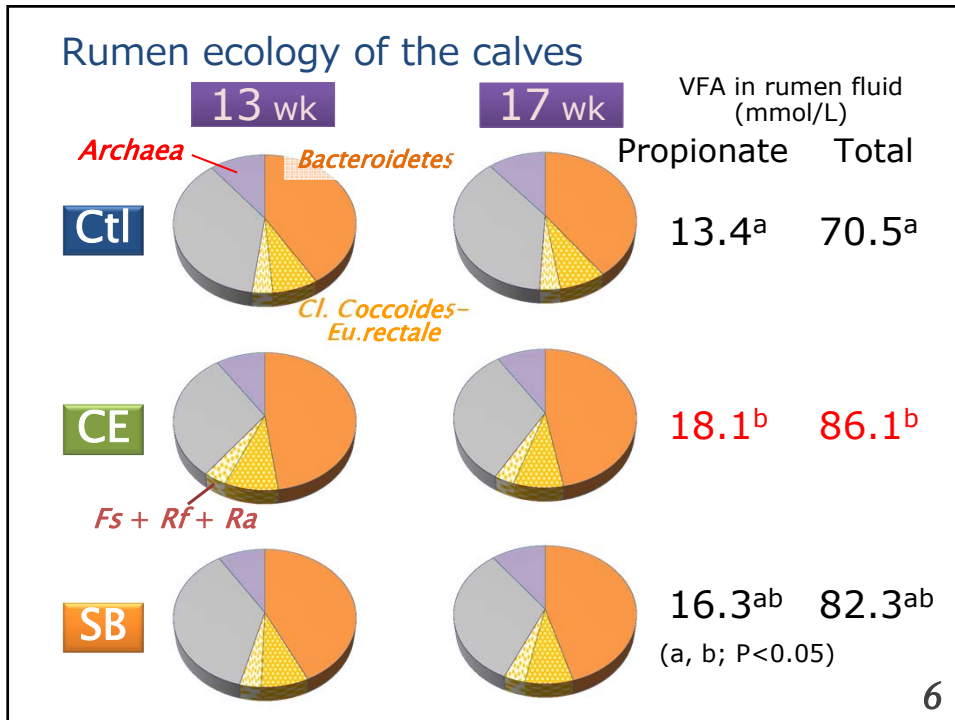
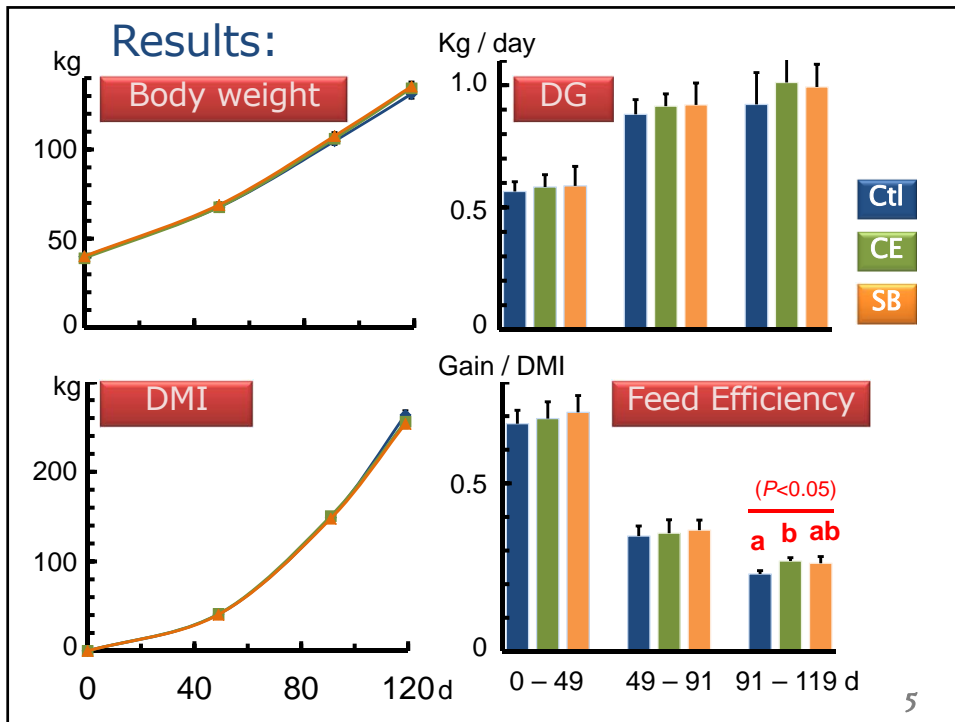
Sequence-specific cleavage of SSU rRNA with RNase H



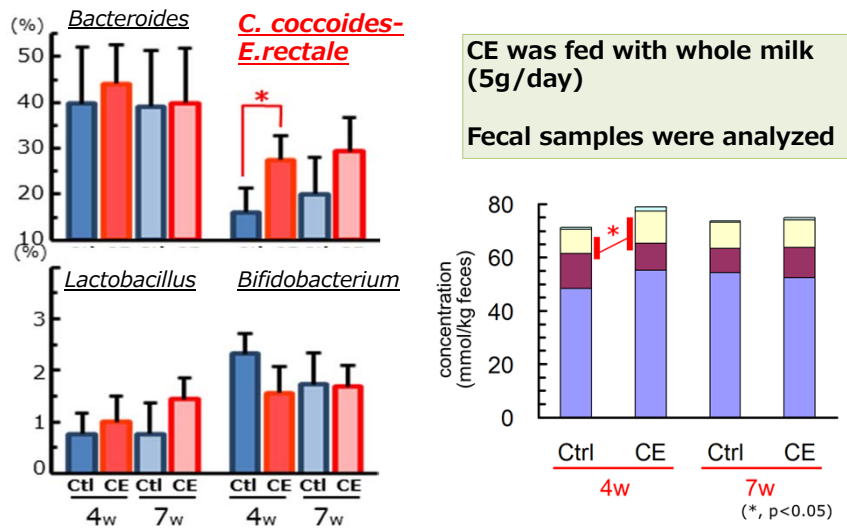
Phylogenetic tree & probes for rumen bacteria

[Uyeno et al., *J Appl Microbiol* (2007)]





Another feeding trial (preweaned period):



7

Possible mechanism of CE administration for healthy growth of calves

