For commercial livestock health

Healthy Start® improves rumen function in University of Pennsylvania study

A research study was conducted at the University of Pennsylvania by William Chalupa to evaluate the effect of **Healthy Start®** on rumen function. Rumen cannulated sheep were fed either a high roughage, high grain or a high sugar diet in order to select microbial population producing elevated proportions of acetate, propionate or butyrate. Rumen fluid was obtained two hours after feeding and was used as inoculum in batch fermentation systems. Fermentations with each source of inoculum were conducted on three different days for either 2 or 6 hours (short-term fermentation) or for twenty hours (short and long fermentation) in order to determine effects of **Culbac®** on rate and total microbial metabolism. Microorganisms producing elevated levels of butyrate appeared to be less responsive to **Culbac®**, but trends were similar to those observed with acetate and propionate-producing microbes. This discussion will be limited to High grain (propionate) and High roughage (acetate) data.

In this study, **Culbac®** increased total gas production in both the short-and long-term fermentations, with most of the increase as carbon dioxide. Production of methane and hydrogen was not greatly affected.

Culbac® increased VFA production in both the acetate and propionate fermentations. Data on molar distribution of VFAs indicated that propionate was increased to a greater extent than acetate. This occurred in both the short-and long-term fermentations. In many instances, this increase was significant at ($P<.05$).

Lactic acid production measured as mMoles was significantly decreased for both acetate and propionate fermentations. This occurred in both the short-and long-term fermentations.

Supplementing **Culbac®** to microorganisms producing elevated levels of acetate and propionate increase rate and total fermentation activity. Because **Culbac®** -supplemented cultures decreased proportions of methane and increased proportions of propionate, the efficiency of producing VFAs from digested carbohydrate was improved. Fermentation efficiency improvements were noted in both short-and long-term fermentations, and were significant at ($P<.05$).

By stimulating acetate and propionate production, and by decreasing lactate production, **Culbac®** products have a large impact on ruminate production.

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Effect of Culbac® on Propionate Producing Bacteria (In Vitro)

	Short-Term (3 hr.)		Long-Term (20 hr.)	
	Control	**Culbac®**	**Control**	**Culbac®**
Gas Volume, cc	42	60[a]	122	133[a]
Gas mMoles				
Carbon Dioxide	1.69	2.50[a]	4.68	5.14[a]
Methane	0.17	0.17	0.75	0.77
Hydrogen	0.026	0.035	0.022	0.032
VFAs, mMoles				
Acetate	0.67	1.09[a]	2.37	2.46
Propionate	0.53	1.03[a]	1.54	1.88[a]
Butyrate	0.25	0.30[a]	0.89	1.02[a]
Valerate	0.017	0.027[a]	0.172	0.221[a]
TOTAL	1.48	2.45[a]	5.18	5.78[a]
Lactate, mMoles	0	-0.45[a]	0	-0.79[a]
Fermentation Efficiency, %	82.2	84.2[a]	80.8	82.3[a]

Effect of Culbac® on Acetate Producing Bacteria (In Vitro)

	Short-Term (3 hr.)		Long-Term (20 hr.)	
	Control	**Culbac®**	**Control**	**Culbac®**
Gas Volume, cc	30	44[a]	81	102[a]
Gas mMoles				
Carbon Dioxide	1.12	1.67[a]	2.84	3.66[a]
Methane	0.23	0.30[a]	0.80	0.88[a]
Hydrogen	0.007	0.005	0.008	0.008
VFAs, mMoles				
Acetate	0.89	1.23[a]	2.10	2.56[a]
Propionate	0.43	0.71[a]	0.97	1.44[a]
Butyrate	0.14	0.18[a]	0.45	0.59[a]
Valerate	0.025	0.025[a]	0.090	0.11[a]
TOTAL	1.56	2.21[a]	3.95	5.03[a]
Lactate, mMoles	-0.05	-0.37[a]	-0.25	-0.84[a]
Fermentation Efficiency, %	77.8	79.4[a]	77.6	79.3[a]

Culbac® improves fermentation efficiency in ruminants.

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