UNDERSTANDING THE MECHANISMS BEHIND XTRACT™

Code 6965

Effects on total and fat-corrected milk production and component yield

The demands of calving and early lactation on energy supply of the dairy cow.

Many high producing herds now average up to 11'000 liters of milk per annum. In the near future, improved genetics and management will provide the opportunity for many herds to average 13'000 liters of milk. It is mandatory to incorporate newer concepts of nutrition into nutritional programs in order to synchronise the balance between optimal levels of protein and energy.

Protein and energy are required for maintenance, growth, lactation and reproduction. Just after calving, cows undergo tremendous metabolic changes, i.e. shifting from a homeostatic to homeorhetic state to prioritise milk production. Demand for glucose becomes intense and gluconeogenesis is prominent. But most often, the animal is unable to meet the requirements of this new life period and falls into negative energy balance. In order to meet the demands of milk production, most animals use their own body reserves to "milk off their back."

Feed additives that benefit feed digestion and animal performance are one approach to meet this challenge and even have allow today's dairy operations to push peformance to the next level. **XTRACT™** is the result of an ambitious research program sponsored by Axiss France SAS and ADM Alliance in conjunction with a consortium of European and North American universities and trial centers. It is specially formulated to complement a balanced feeding program. In this technical piece, its effects on milk production and component yields by favouring rumen modification toward more energy supplying pathways.

Proposed mechanism for the increase of milk production from XTRACT™ supplemented diets

Previous studies have shown that **XTRACT™** modifies rumen metabolism with respect to both protein and energy. In the animal, Bach *et al*. (2004) characterised the changes in volatile fatty acid profile as a decrease in acetate, and increases in both propionate and butyrate (Table 1).

Table 1. Effects of the feeding of a combination of XTRACT™ versus control on rumen total and individual volatile fatty acids (VFA) in cannulated dairy cows.

	Control	XTRACT™	SEM	P-value
Total VFA, mM	145.9	149.2	5.52	0.65
VFA, mol/100 mol				
Acetate	57.0	55.2	0.27	0.01
Propionate	24.0	25.9	0.31	0.09
Butyrate	14.6	16.0	0.42	0.07
Isobutyrate	1.50	1.17	0.02	0.01
Valerate	1.25	1.24	0.03	0.85
Isovalerate	1.58	1.48	0.08	0.37
Acetate:Propionate	2.37	2.23	0.03	0.02

Bach et al., 2005.

A recent review of 20 published studies (Seymour et al., 2004) investigated the correlation between changes in VFA profiles and animal performance responses (dry matter intake, milk production, etc.). In this work, Seymour and his colleagues evaluated 20 research studies with 92 treatment means from the Journal of Dairy Science and the Journal of Animal Science from the years 2000-2002. All studies were conducted in Holstein cows in Latin quare or simple reversal design and included serial sampling of rumen fluid via cannula. Simple statistics, corelation, linear regression and mixed model analysis assessing the random effect of study were used to describe relationships between the rumen and production parameters.

The conclusions of the correlation between VFA profile and milk production are summarised in Table 2.

Table 2. Simple correlations among production and rumen volatile fatty acids.

Parameter	Acetate (mM)	Propionate (mM)	Butyrate (mM)
Milk production	-0.18	0.49	0.69

Seymour et al., 2004.

As illustrated in the summary table above, milk yield was most highly correlated with rumen concentration of butyrate (r = 0.60) and propionate (r=0.49), but negatively correlated with to acetate (r=-0.18). Van Soest (1982) stated that butyrate administration stimulates gluconeogenesis in ruminants even though butyrate itself cannot be converted to glucose. This might explain how concurrent increases in rumen butyrate and propionate by **XTRACT™** could lead to increased milk yield with butyrate acting as a source of energy and a lipid precursor while at the same time sparing propionate from oxidation, increasing its conversion to glucose for lactose synthesis.

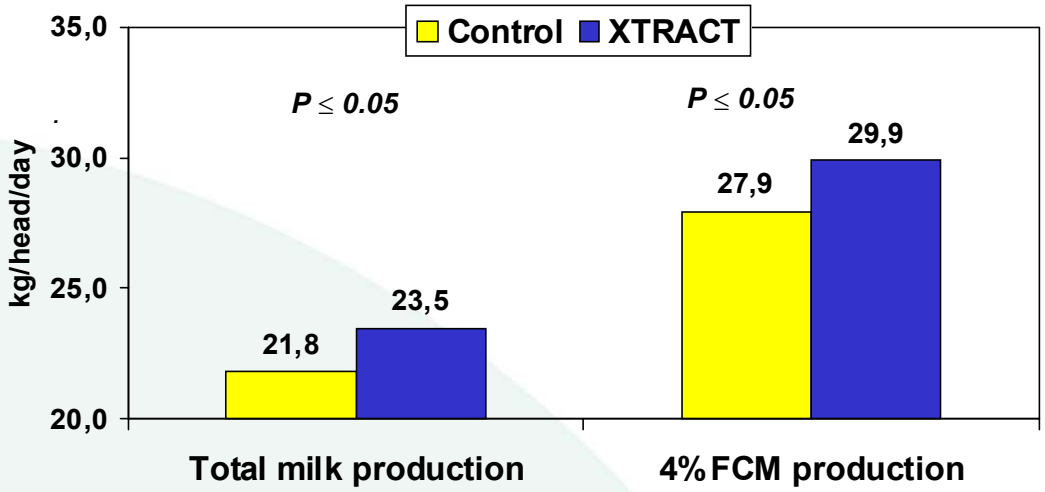
Lactation Research

Trial 03RUM029: Effects of the feeding of XTRACT™ in forage-based diets on total milk production, 4% FCM production, and milk component yield.

The effect of feeding **XTRACT™** in a forage-based diet (grass and grass silage) was conducted in a private farm with a Red Simmentaler cows in a switchback design over two 8-week periods (first 16 weeks lactation). A total of 32 cows of similar parity, milk production level, body condition, etc. was divided into two groups, a Control group fed a forage based diet and the Experimental group fed the same diet with **XTRACT™** at approximately 500 mg/head/day added into the protein concentrate.

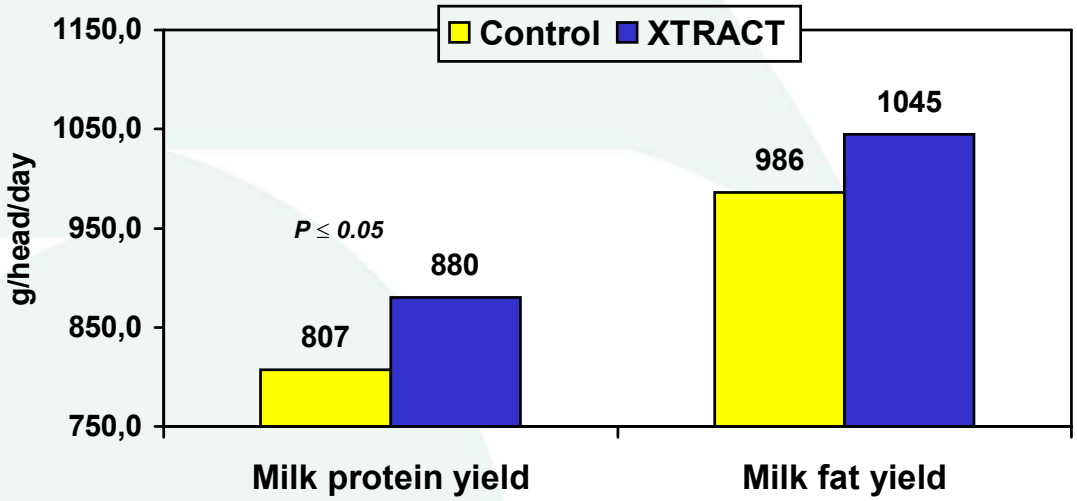
Figure 1. Off-on-off design using 32 Red Simmentaler cows fed a protein concentrate and forage-based diet with or without the supplementation of XTRACT™. Diets were fed In *over the first three weeks and samplings at morning and evening feedings on two days in the fourth week for total and fat-corrected milk production (2a) and protein and fat yield (2b).*

2a.



a,b: p≤0.05
Source: Private farm, Switzerland, 2004.

2b



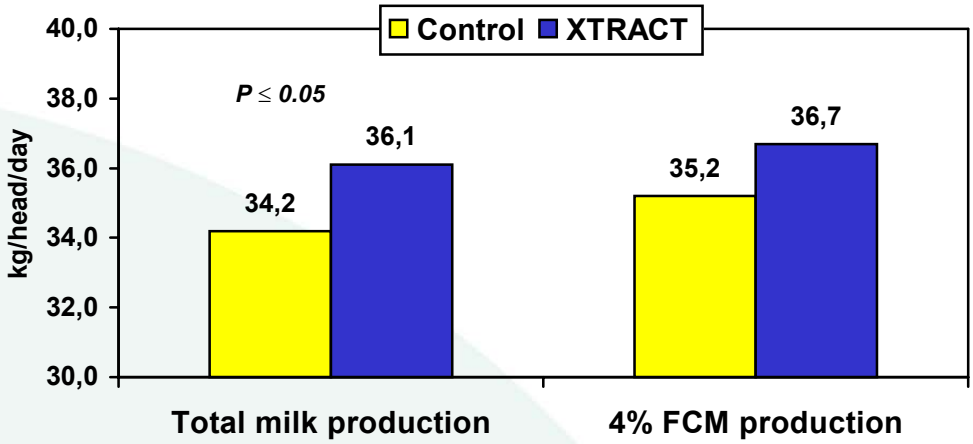
a,b: p≤0.05
Source: Private farm, Switzerland, 2004.

Results shown presented in Figures 2a and 2b are indicative the benefits of **XTRACT™** in forage-based feeding systems to date. In these trials, milk production improved by 1.7 litres milk/head/day (2.0 litres fat-corrected milk/head day) with significant benefits in milk component yields.
The return-on-investment for **XTRACT™** in these trials was calculated at **8-to-1.**

Trial 04RUM025-029: Effects of the feeding of XTRACT™ in TMR diets on total milk production, 4% FCM production, and milk component yield.
The effect of feeding **XTRACT™** in a TMR was conducted over an 8-week period in early lactation in 4 separate farm sites, totalling 173 cows. Cows were divided into two groups of similar parity, milk production level, body condition, etc. The control group fed the TMR and the Experimental group fed the same diet with **XTRACT™** at approximately 500 mg/head/day.

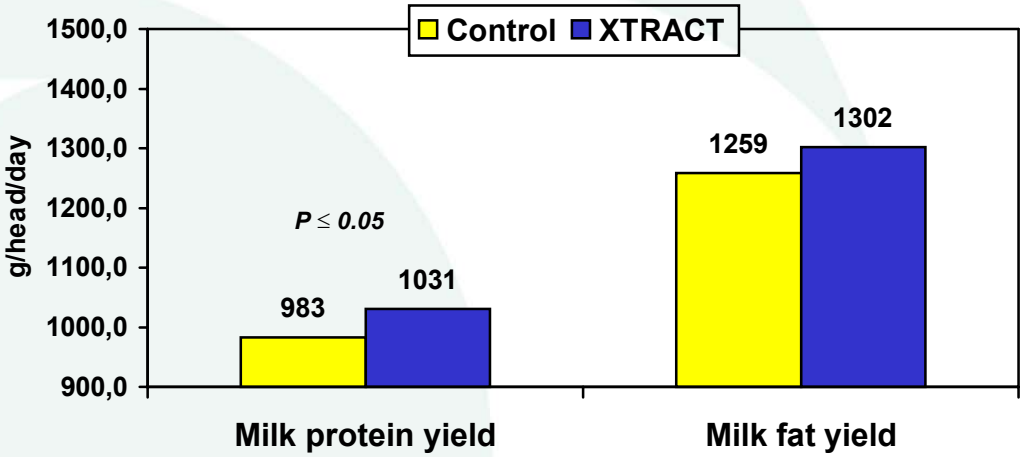
Figure 3. Head-to-head design with 173 Holstein cows in four different farm sites fed TMR with or without the supplementation of XTRACT™. The adaptation period included the first three weeks and samples taken at morning and evening feedings on two days in the fourth week for total and fat-corrected milk production

3a.



(3a) and protein and fat yield (3b).
a,b: p≤0.05
Source: ADM Alliance Nutrition, USA, 2004.

3b.



a,b: p≤0.05
Source: ADM Alliance Nutrition, USA, 2004.

In these trials, milk production improved by 1.9 litres milk/head/day (1.5 litres fat-corrected milk/head day) with significant benefits in milk component yields.
The return-on-investment for **XTRACT™** in these trials was calculated at **10-to-1.**

References are available upon request.

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