

# Help Fresh Cows Navigate Transition

Lactipro<sup>®</sup> stabilizes rumen pH and promotes healthy rumen function

## Fresh cow challenges

The transition period is one of the most challenging phases of dairy production. During this time:

- The calorie needs of a lactating cow are significant. Within two days post-calving, the cow's energy needs more than double, resulting in metabolic stress.
- The cow's ability to handle this stress influences her production, health, ability to become pregnant again and longevity in the herd. More than 35% of dairy cows have at least one clinical disease event (metabolic or infectious) in the first 90 days in milk<sup>1</sup>.
- The transition to higher-carbohydrate rations after freshening allows the cow to increase her caloric intake. With the rapid introduction of starch and highly fermentable feedstuffs, fast-growing bacteria such as *Streptococcus* and *Lactobacillus* proliferate and produce lactic acid more quickly than it can be utilized by rumen microbes.
- Lactic acid is ten times the strength of other ruminal volatile fatty acids (VFAs). When too much lactic acid accumulates, rumen pH drops, which results in sub-acute rumen acidosis (SARA).
- SARA can result in damage to the rumen wall and papillae that absorb nutrients. It also may contribute to inconsistent eating behavior; lower milk and milk-fat production; and systemic inflammation that can cause lameness and laminitis.



## Benefits of *Megasphaera elsdenii*

*Mega e*<sup>®</sup> is a naturally occurring rumen microbe. *Mega e* preferentially consumes lactic acid as a substrate. Having a healthy population of *Mega e* helps cattle regulate rumen pH and maintain a functional rumen. However, *Mega e* is slow-growing and takes time to increase after cows are transitioned to higher-carbohydrate diets.

## Lactipro - a tool to increase beneficial rumen microbes

Lactipro contains the unique, patented strain of *Megasphaera elsdenii* NCIMB 41125, which was specifically selected because it

- ✓ Grows rapidly in the rumen and has a short doubling time.
- ✓ Is one of the hardiest *Mega e* strains.
- ✓ Thrives on all forms of lactic acid in the rumen, but also can use glucose and other carbohydrates if lactate levels are low.
- ✓ Produces beneficial butyric acid which promotes a healthy rumen environment.
- ✓ Is resilient at a wide pH range.
- ✓ Is compatible with ionophores and other feed additives.
- ✓ Demonstrates improvement in rumen fermentation in the presence of other bacterial direct-fed microbials and yeast additives.

Lactipro metabolizes lactic acid quickly and effectively in the rumen, providing benefits to the animal soon after application.

Two convenient formulations are available to best fit each herd's specific needs. LactiproFLX<sup>®</sup> is an easy-to-use capsule. LactiproNXT<sup>®</sup> is a concentrated 40mL/head drench. Both products have extended shelf life when stored in refrigeration.



<sup>1</sup>Armstrong, J, Caixeta, L, Omontese, B, 2019, *Managing and monitoring the health of transition dairy cows*, University of Minnesota Extension, accessed 1 June 2020, <<https://extension.umn.edu/dairy-milking-cows/transition-dairy-cows#fresh-cow-health-and-events-1741212>>.

# Trial: Lactipro positively impacts rumen pH and milk production

Sub-acute ruminal acidosis (SARA) in dairy cattle has animal health, economic and welfare implications. A study conducted at the University of Kentucky<sup>1</sup> evaluated the effects of an oral drench containing *Megasphaera elsdenii* NCIMB 41125 on reticulorumen pH of lactating dairy cows.

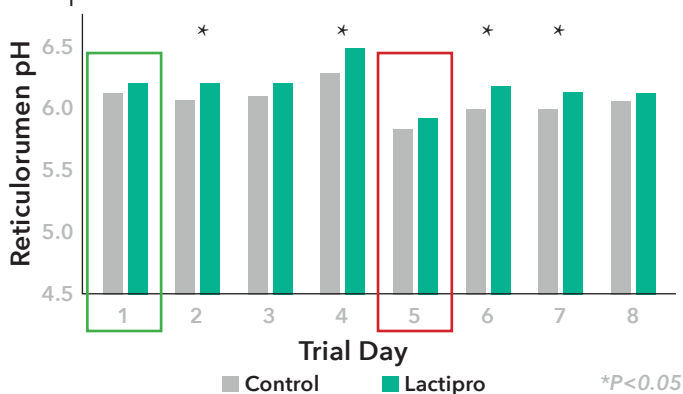
## Materials and Methods

- Eight mid-lactation ( $239 \pm 55$  DIM) Holstein dairy cows producing  $73.5 \pm 7.5$  lbs. of milk per day were enrolled.
- The crossover trial was divided into 2 experimental periods. Each period lasted 8 days with a 4-week washout interval between them.
- Each cow had a reticulorumen bolus that recorded rumen pH and temperature in 10-minute intervals.
- SARA was defined as reticulorumen pH  $< 5.6$ .
- Daily time and area under the curve (AUC) for SARA were calculated. AUC is a measure of intensity of SARA.

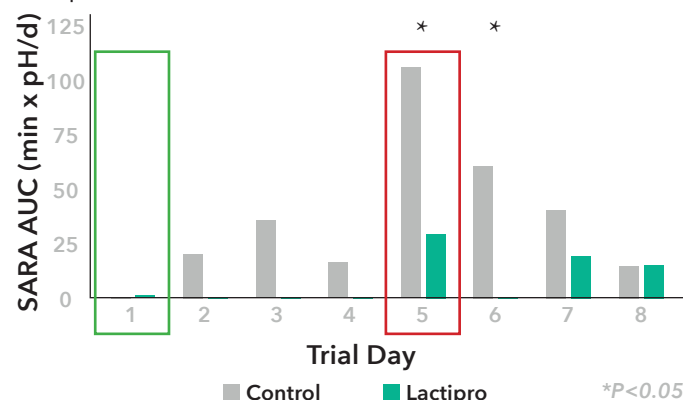
Cows were drenched on Day 1 (Control=distilled water, Treatment=Lactipro)

Feed was reduced to 50% of intake on Day 4; SARA challenge occurred on Day 5

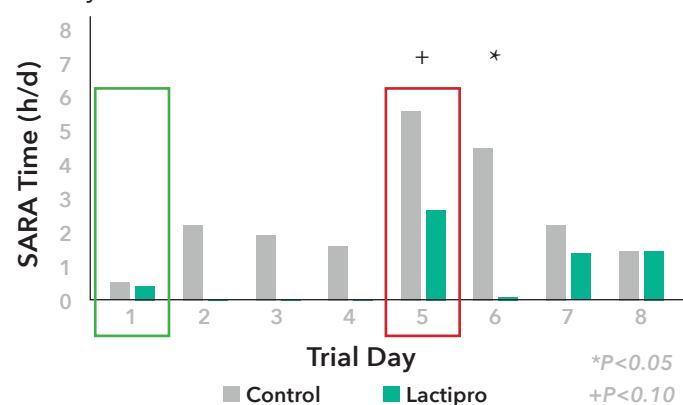
Cows administered Lactipro had **greater reticulorumen pH** on trial days 2, 4, 6, and 7 compared to control cows.



Cows administered Lactipro had **significantly less area under the curve (AUC)** on trial days 5 and 6 compared to control cows.

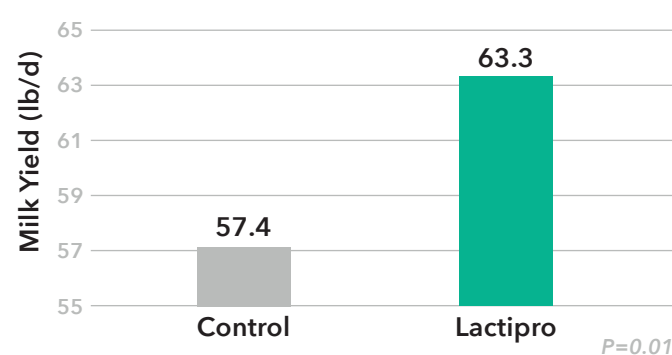


**SARA time was shorter** for cows treated with Lactipro on days 5 and 6 versus control cows. Lactipro cows had significantly better feed intake on day 6 than controls.



<sup>1</sup>Mazon, et al., 2020: Effects of *Megasphaera elsdenii* oral drench on reticulorumen pH dynamics in lactating dairy cows under subacute ruminal acidosis challenge. *Animal Feed Science and Technology*, 261 (2020) 114404.

Cows treated with Lactipro had **significantly greater milk yield** during the study compared to control cows.



## Conclusions

Lactipro positively affected reticulorumen pH dynamics. Cows receiving Lactipro had greater mean reticulorumen pH and experienced shorter and less intense SARA.



Complete trial report and data available upon request.

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## Lactipro® Trials Show Effects of *Mega e*® in Dairy Calves

The preweaning phase for dairy calves is a time of intense management and investment of labor, facilities, and feed resources. It is also, however, a short period relative to a dairy female's total herd life. The potential long-term impacts on growth, health and lifetime profitability can be highly influenced by the foundation laid in the first weeks of life.

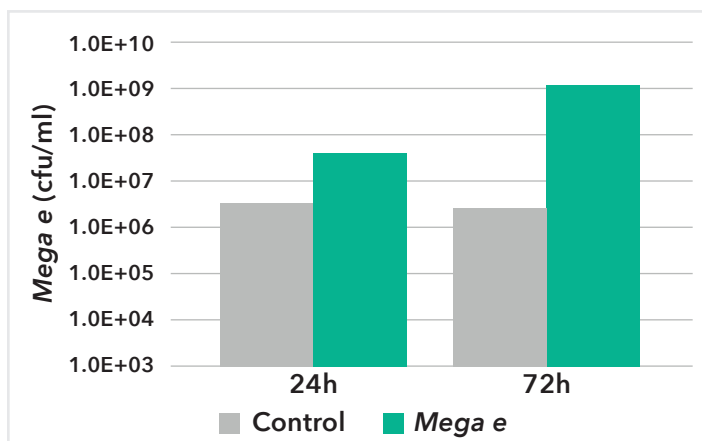
LactiproFLX® Calf is a natural, non-antibiotic supplement that increases levels of rumen-native *Megasphaera elsdenii* bacteria, or *Mega e*. Peer-reviewed studies and field trials have been conducted to evaluate the influence of *Mega e* administration early in life on the rumen characteristics, feed consumption, weight gain and transition to weaning of dairy calves.



### Rumen development advanced

*Mega e* is found naturally in the rumen, but its population grows slowly over time. Providing a viable population of *Mega e* with LactiproFLX Calf between 7 and 14 days of age provides a dramatic increase in *Mega e* numbers. As calves begin consuming grain, *Mega e* is present to readily consume lactate and convert it to butyrate, which plays a vital role in rumen growth and development.

In Study 1, 20 calves received Lactipro at 14 days of age and 20 did not. When measured 24 and 72 hours later, there were significantly higher levels of *Mega e* present in the rumens of treated calves. In fact, *Mega e* levels decreased slightly between 24 and 72 hours in the untreated controls but continued to grow in the treated calves.



Study 2 included 15 calves administered Lactipro at 14 days of age, compared to 15 untreated control calves. When all calves were weaned at 42 days of age, the **Lactipro calves had heavier rumens, wider rumen papillae, and greater papillae density** than their untreated herdmates.

### Study 2: Effect of Lactipro on rumen development of calves at 42 days of age

	Control	Lactipro	P-value
Reticulo-rumen weight, lbs.	2.31	2.58	0.01
Rumen wall thickness, cm	1.60	1.56	0.83
Papillae length, cm	1.34	1.62	0.18
Papillae width, cm	0.86	1.17	<0.001
Papillae density, number/cm <sup>2</sup>	87.1	97.6	0.02

The increase in rumen development indicates that calves given Lactipro are better prepared to be weaned and to transition to solid feed intake.

# Starter consumption and ADG increased; weaning recovery improved

In Study 3, 13 calves received Lactipro at 14 days of age, and their performance was compared to 13 untreated controls. The liquid diet of whole milk was offered *ad libitum*. All calves were weaned at 56 days of age, and their performance was tracked until 70 days of age. The calves administered Lactipro had significantly higher starter grain intake, bodyweight and average daily gain (ADG) at both checkpoints. Additionally, calves receiving Lactipro had significantly higher levels of  $\beta$ -hydroxybutyrate, an indicator of rumen development.

## Day 1-56 (Prewaning)

	Control	Lactipro	P-value
Initial body weight, lbs.	76	77	0.82
Whole milk intake, DM lbs./day	2.26	2.04	0.01
Starter DM Intake, lbs./day	0.22	0.31	0.001
Weaning body weight, lbs.	154	166	0.012
ADG, lbs./day	1.39	1.61	0.261
Feed:Gain	1.75	1.45	0.007
BHBA, d.21-56, mM	0.105	0.281	0.023

## Day 57-70 (Postweaning)

	Control	Lactipro	P-value
Starter DM Intake, lbs./day	3.22	3.81	0.027
Final body weight, lbs.	171	198	<0.0001
ADG, lbs./day	1.21	2.27	0.002
Feed:Gain	2.70	1.66	0.066

The calves administered Lactipro gained more weight, at a lower cost of gain, compared to the control animals. They consumed less milk, ate more starter grain, and gained more efficiently than the calves that did not receive Lactipro.

In the critical transition phase after weaning, the Lactipro group consumed much higher levels of starter grain, resulting in calves that were 27 pounds heavier by the end of the 70-day study.

## The bottom line

Choosing any additional feedstuff or supplement to enhance calf performance must be a justifiable financial investment. The performance data from Study 3 produces the following estimated return on investment for the first 70 days of life in calves given Lactipro.

	Control	Lactipro
Whole milk intake, DM lbs.	127	114
Prewaning DM starter intake, lbs.	12.3	17.4
Postweaning DM starter intake, lbs.	45.1	53.3
Total feed cost, \$/hd	160.43	146.70
Calf value, \$/hd	222.30	257.40
Net income, \$/hd	61.87	110.70
Net return vs. control, \$/hd	—	48.83

## Lactipro ROI: 25:1

## Assumptions

- Whole milk = \$1.20/lb, DM
- Starter feed = \$0.14/lb, DM
- Calf price = \$1.30/lb.

## References

**Study 1:** Hagg et al. The effect of *Megasphaera elsdenii* NCIMB 41125 on performance of pre-weaned dairy calves. Internal trial.

**Study 2:** Muya et al., 2015: Effect of *Megasphaera elsdenii* NCIMB 41125 dosing on rumen development, volatile fatty acid production and blood  $\beta$ -hydroxybutyrate in neonatal dairy calves. *Journal of Animal Physiology and Animal Nutrition* 99(5):913-8.

**Study 3:** Muya et al., 2017: Performance of Holstein calves having free access to milk and dosed with *Megasphaera elsdenii*. *Scientia Agricola* 74(3): 189-194.



## Objective

Evaluate the effect of LactiproFLX Calf on the performance of Holstein x Angus calves.

Weaning is recognized as one of the most stressful times in an animal's life. During this time, early life gains can be negated if not managed carefully. Launching beef on dairy calves successfully through the milk-feeding phase and weaning can set them up for improved health and feed efficiency.

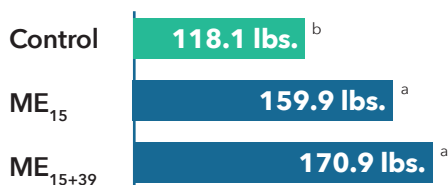
LactiproFLX Calf is a natural, non-antibiotic supplement that increases levels of rumen-native *Megasphaera elsdenii* bacteria, or *Mega e*®. Peer-reviewed studies and field trials have been conducted utilizing calves to evaluate the influence of *Mega e* administration early in life on rumen characteristics, feed consumption, weight gain, and transition to weaning.

## Materials and methods

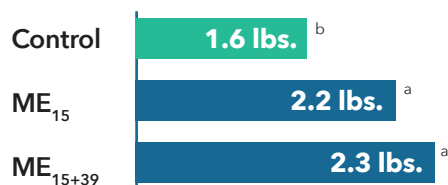
- Conducted at University of Kentucky Large Animal Unit.
- 31 Holstein x Angus calves enrolled in a 76-day randomized block trial containing 2 blocks. Calves were 8 days old +/- 2 days at trial start.
- Treatments
  - Control:** No LactiproFLX administration.
  - ME<sub>15</sub>:** Single administration of LactiproFLX on day 15 of study.
  - ME<sub>15+39</sub>:** LactiproFLX administered on day 15 and day 39 of study.
- Calves were individually housed and provided *ad libitum* access to water and pelletized calf starter.
- Calves received 7 L/d of milk replacer divided into two equal feedings until day 41.
- Milk replacer was reduced by 50% on day 42, and calves were weaned on day 56.
- Grain refusals were weighed daily to calculate individual grain intake.
- Individual body weights were measured weekly.
- Total weight gain, average daily gain, and total grain dry matter intake were calculated over 76 days.



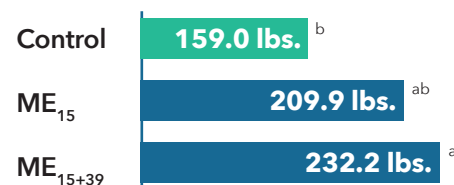
### Total weight gain



### Average daily gain



### Total grain dry matter intake



Bars with uncommon superscripts differ ( $p < 0.05$ ).

## Conclusion

Calves administered LactiproFLX Calf exhibited greater total weight gain, increased average daily gain, and consumed more total dry matter as grain. Overall, pre-weaning administration of LactiproFLX Calf improved performance of Holstein x Angus calves.



## LactiproFLX<sup>®</sup> Calf: Rumen Development Benefits for Preweaned Dairy Calves

*Launching dairy heifer calves successfully through the milk-feeding phase and weaning can set them up for a lifetime of health and improved productivity. LactiproFLX<sup>®</sup> Calf is a natural tool to fuel that healthy start.*

The rumen is the central powerhouse of every dairy animal. It's the critical "fermentation vat" where microbes develop and grow. These "good bugs" allow cattle to digest forages and grains, converting them to lean tissue and – as heifers eventually enter lactation – milk.

There is a long road of digestive development between the day a heifer calf is born and the day she enters the milking parlor.

- Initially, calves are born with a small and non-functioning rumen devoid of microbes. Within 24 hours, microbes start populating the rumen and the four-part ruminal digestive tract develops quickly.
- Central to this development is the production of volatile fatty acids (VFAs) in the rumen as it develops and digests feedstuffs.
- When absorbed through the rumen wall, the primary VFAs acetate, propionate and butyrate provide ruminant animals with 60-80% of their energy needs.

Butyrate is also key to rumen development because it stimulates the growth of epithelial cells that line the digestive tract. It promotes development of the finger-like papillae on the rumen wall surface, and villi in the small and large intestines. Both papillae and villi are essential for nutrient absorption. The more surface area these structures have, the more well-equipped the animal is to utilize feedstuffs.



### Shortening the path to rumen functionality

As calves transition to grain-based diets, the rumen can become overwhelmed with VFAs. When it can't process VFAs quickly enough, the pH in the rumen environment drops, creating the perfect environment for lactate – a strong organic acid – to take over. Left unchecked, lactate build-up can significantly reduce rumen pH and lead to:

- Bloat
- Slowed rumen function
- Decreased feed intake
- Suppressed immune function; and
- Death in some calves

LactiproFLX Calf helps minimize lactate build-up and the disruption it causes. Each LactiproFLX Calf capsule contains a large number of a patented strain of live anaerobic bacteria called *Megasphaera elsdenii*, or Mega e<sup>®</sup>. This naturally occurring ruminal bacteria thrives on lactate, which it converts to beneficial butyrate.

Mega e is native to the rumen, but its levels increase gradually over time. LactiproFLX Calf delivers a rapid population of Mega e to stimulate rumen development and to quickly consume lactate. With lactate levels in check, rumen pH remains stable, butyrate levels increase, and development and digestion can proceed without disruption.



## Heifer success requires healthy rumens

The U.S. dairy industry has grown increasingly cognizant of the importance of maximizing the quality of its replacement animals. Accelerated feeding programs have successfully focused on early life growth and development, which numerous studies have linked to greater lifetime milk production.

At the same time, weaning is recognized as one of the most stressful times in a dairy animal's life, and is a period in which early life gains can be negated if not managed carefully. Growing emphasis is being placed on healthy weaning – in terms of lungs, rumen function and digestive health – as the ultimate calf-rearing target.

A peer-reviewed study<sup>1</sup> of 30 preweaned Holstein calves showed that, compared to untreated controls, calves given Lactipro early in life:

- Consumed more starter feed
- Were heavier at weaning
- Had more advanced rumen development; and
- Produced higher levels of butyrate in the rumen

## Effects of Lactipro on preweaning performance and intake of calves weaned at 42 days of age

	Control	Lactipro	P-Value
Birth weight, lbs.	74	79	0.18
Weaning weight, lbs.	111	123	0.03
ADG, lbs./day	0.90	1.06	0.10
Starter DMI, lbs.	0.82	1.06	<0.001

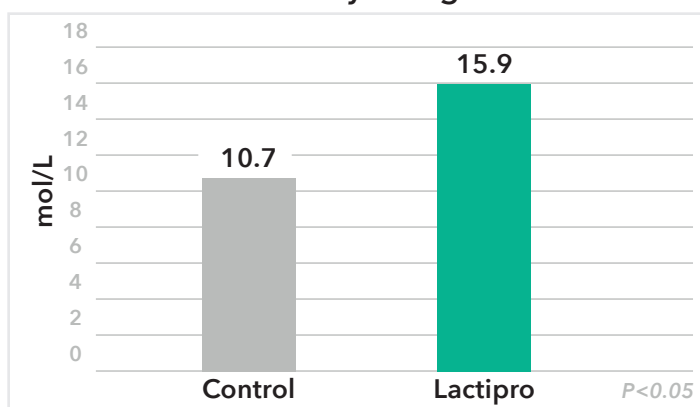
Calves drenched with Lactipro at 14 days of age **consumed more starter feed** and were **heavier at weaning** than calves that did not receive Lactipro.

## Effect of Lactipro on rumen development of calves at 42 days of age

	Control	Lactipro	P-value
Reticulo-rumen weight, lbs.	2.31	2.58	0.01
Rumen wall thickness, cm	1.60	1.56	0.83
Papillae length, cm	1.34	1.62	0.18
Papillae width, cm	0.86	1.17	<0.001
Papillae density, number/cm <sup>2</sup>	87.1	97.6	0.02

Calves drenched with Lactipro had **heavier rumens, wider papillae, and greater papillae density** than calves that did not receive Lactipro. The increase in rumen development indicates that calves given Lactipro are better prepared to be weaned and transition to solid feed intake.

## Effect of Lactipro on ruminal butyrate concentrations at 42 days of age



Calves drenched with Lactipro had **higher ruminal butyrate concentrations**. Butyrate has been shown to stimulate rumen development.

<sup>1</sup>Muya et al., 2015. Effect of *Megasphaera elsdenii* NCIMB 41125 dosing on rumen development, volatile fatty acid production and blood  $\beta$ -hydroxybutyrate in neonatal dairy calves. *Journal of Animal Physiology and Animal Nutrition* 99(5):913-8.

## A practical enhancement to the calf raiser's tool box

By promoting rumen development, LactiproFLX Calf sets calves up for more successful weaning as they transition from a liquid diet to an exclusively forage-and grain-based ration. As a practical, on-farm tool, it:

- **Delivers an immediate, live population of *Mega e*** that can begin proliferating more rapidly than the *Mega e* found naturally in the rumen.
- **Is compatible with ionophores, yeasts and other probiotics** that are often fed to preweaned calves in milk or starter grain.
- **Provides a non-antibiotic method of supporting rumen development** to promote calf health and optimize early life growth.
- **Is available in individually packaged capsules** that are sold in packages of 25 and offer months of refrigerated shelf life, making it practical for nearly any size herd or calf operation.
- **Can be applied at a flexible range of 7-14 days of age**, allowing administration to be combined with other calf-handling tasks such as disbudding, genomic sampling or collecting ear punches for BVD surveillance.



LactiproFLX Calf is brought to you by MS Biotec, experts in anaerobic fermentation and proprietors of the patented NCIMB 41125 strain of *Mega e*. Lactipro products are backed by 27 years of international research and use, and 10 years of manufacturing and distribution in the United States.

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