THE RUMENSIN® ADVANTAGE

Elanco Rumensin®

TRUSTED BY GENERATIONS

MADE IN USA

STANDING OUT IN THE CROWD, COMMITTED TO QUALITY

Elanco

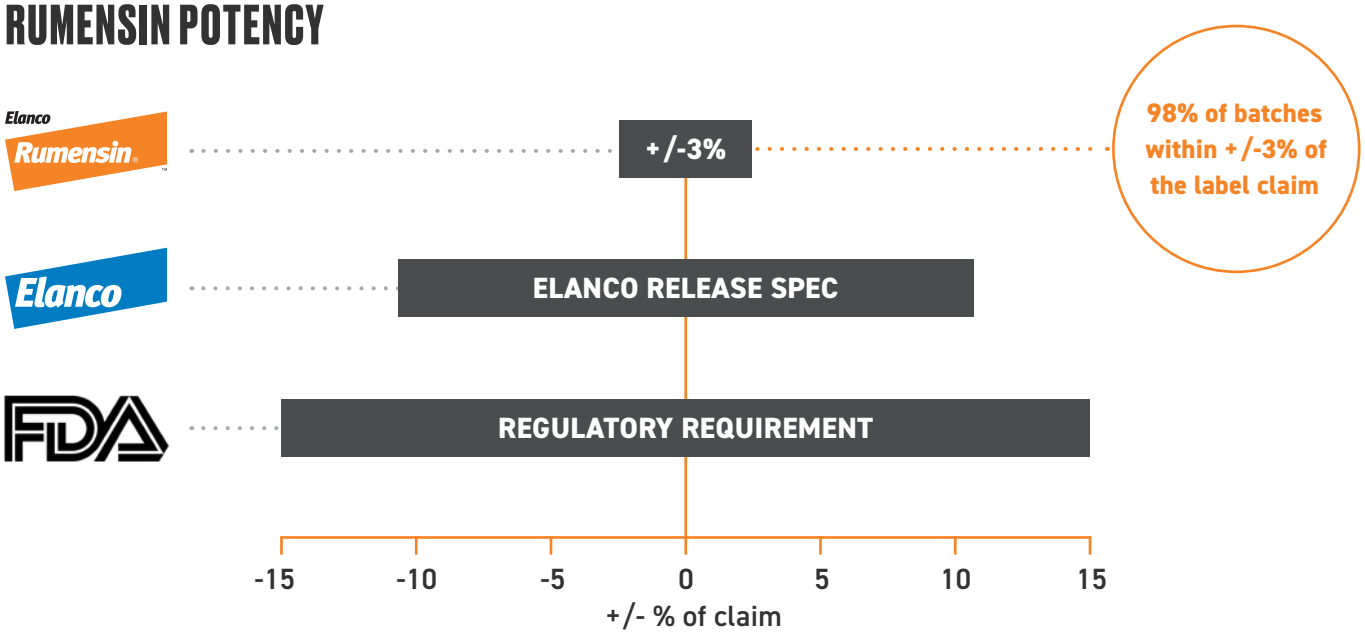
For more than 45 years, producers have trusted Rumensin to deliver consistent, dependable results that add more profit potential to the bottom line. Attention to detail sets Rumensin apart.

FOR QUALITY, CHOOSE RUMENSIN

CONSISTENT POTENCY, BATCH AFTER BATCH

Rumensin manufacturing processes are highly controlled and repeatable. The target potency for Rumensin is 90.7 g/lb of monensin. **Ninety-eight percent of Rumensin batches are within +/-3% of the designated target, far surpassing the broader +/-15% range allowed by the FDA** (Figure 1).[1]

FIGURE 1: RUMENSIN POTENCY



BASED ON 7 SAMPLES OF MONOVET,® ITS POTENCY VARIED BY 12%[2]

RESEARCH SUPPORTING APPROVAL:

Approval of Monovet did not require the same extensive studies and data that were required for Rumensin. Monovet's bioequivalence to Rumensin was approved on the basis of one small-pen feedlot study and an *in-vitro* dissolution study.[3]

PARTICLE SIZE COMPARISON

When randomly selected lots of Monovet were evaluated, they were found to be dustier and had more particle size variability than Rumensin.[2,4]

- Ninety-one percent of Rumensin particles are within the target range for adequate mixing (180 to 850 microns), compared to an average of 70% for Monovet (Table 1)
- Monovet has three times more dust particles (less than 180 microns in size) than Rumensin

TABLE 1: MORE RUMENSIN PARTICLES SUITABLE FOR ADEQUATE MIXING[5]

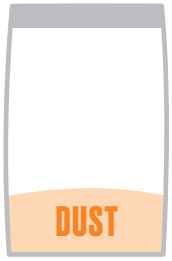
SIEVE ANALYSIS	PERCENTAGE OF PRODUCT RETAINED							
	Rumensin Average Batch[4]	Monovet Batch[2]	Monovet Batch[2]	Monovet Batch[2]	Monovet Batch[2]	Monovet Batch[2]	Monovet Batch[2]	Monovet Batch[2]
>850 microns	0%	0%	0%	0%	0%	0%	1%	0%
180 microns to 850 microns*	**91%**	**72%**	**61%**	**68%**	**54%**	**83%**	**74%**	**76%**
125 microns to 179 microns	5%	13%	20%	17%	22%	10%	15%	13%
<125 microns	4%	14%	19%	14%	24%	7%	10%	10%
Total dust	9%	28%	39%	32%	46%	17%	26%	24%

*Appropriate size for feed mixing.

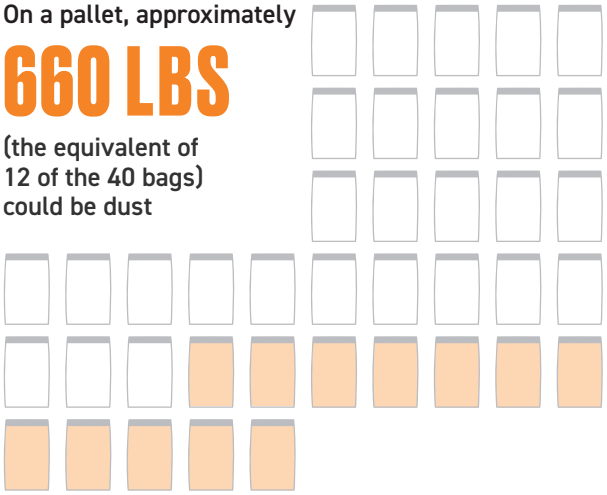
SUMMARY: **The differences in dust quantities between Monovet lots demonstrate variability in its manufacturing process.**

MONOVET CONTAINS 17% TO 46% DUST, AVERAGING 30%.[6]

A 55 lb bag of Monovet could contain more than **16 LBS OF DUST**



On a pallet, approximately **660 LBS** (the equivalent of 12 of the 40 bags) could be dust

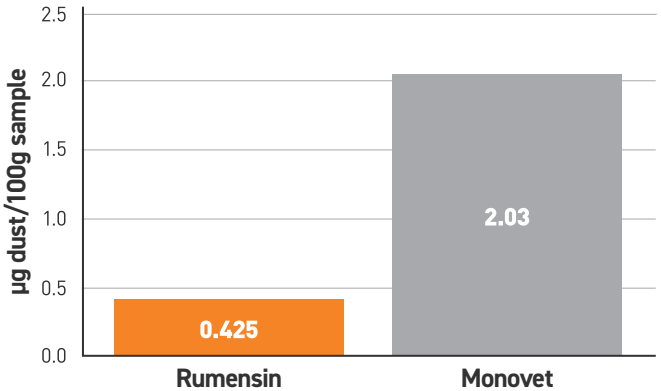


AIRBORNE DUST PARTICLE TEST

Monovet samples have nearly five times more airborne dust particles than Rumensin (Figure 2).[6]

- Dust particles that become airborne can be measured by a Huebach analysis
- Dust particles are collected by a stream of air moving across a rolling chamber filled with the sample

FIGURE 2



TRUE DIFFERENCES EXIST – DISSOLUTION

MORE RUMENSIN IS DISSOLVED

Dissolution studies are used to compare the physical and chemical differences between two products. These studies helped to determine the extent to which an active ingredient dissolves in a selected fluid, such as ruminal fluid or intestinal fluid. Rumensin had higher dissolution (i.e., more of the active ingredient was dissolved) than Monovet in both high-forage-diet (Figure 3) and high-concentrate-diet (Figure 4) simulated rumen fluid evaluations.[7] Secondly, an intestinal dissolution study was conducted comparing Rumensin to Monovet in simulated intestinal fluid (Figure 5).[8] This fluid was selected because the intestinal tract is where coccidia reside, and where monensin can have an impact on coccidia.

- The test statistics in both dissolution studies indicate that **Rumensin and Monovet are different**
- Data suggest that the active ingredient would be released more slowly and/or to a lesser extent from Monovet than from Rumensin in simulated ruminal fluid
- Results of the intestinal dissolution study show that **Rumensin dissolves quicker and/or to a greater extent** than Monovet in simulated intestinal fluid

FIGURE 3: MORE RUMENSIN DISSOLVED IN SIMULATED HIGH-FORAGE-DIET RUMEN FLUID[7]

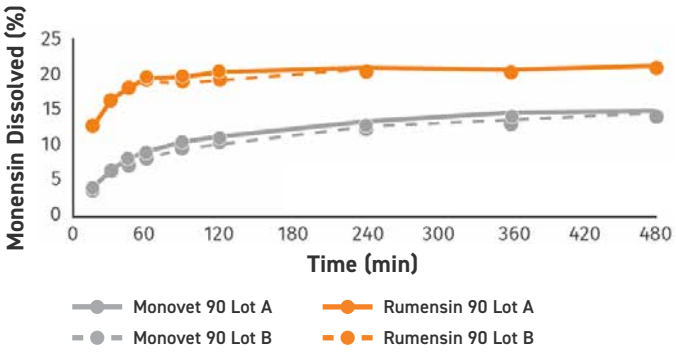


FIGURE 4: MORE RUMENSIN DISSOLVED IN SIMULATED HIGH-CONCENTRATE-DIET RUMEN FLUID[7]

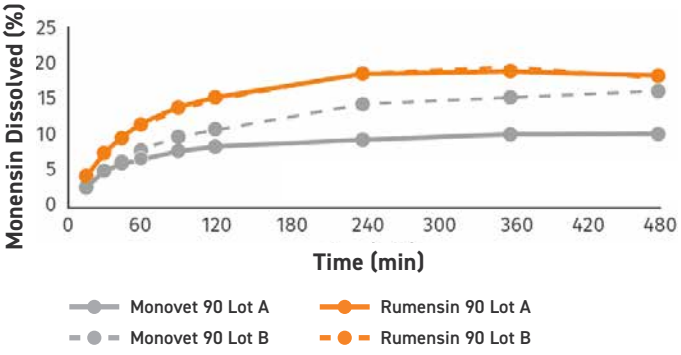
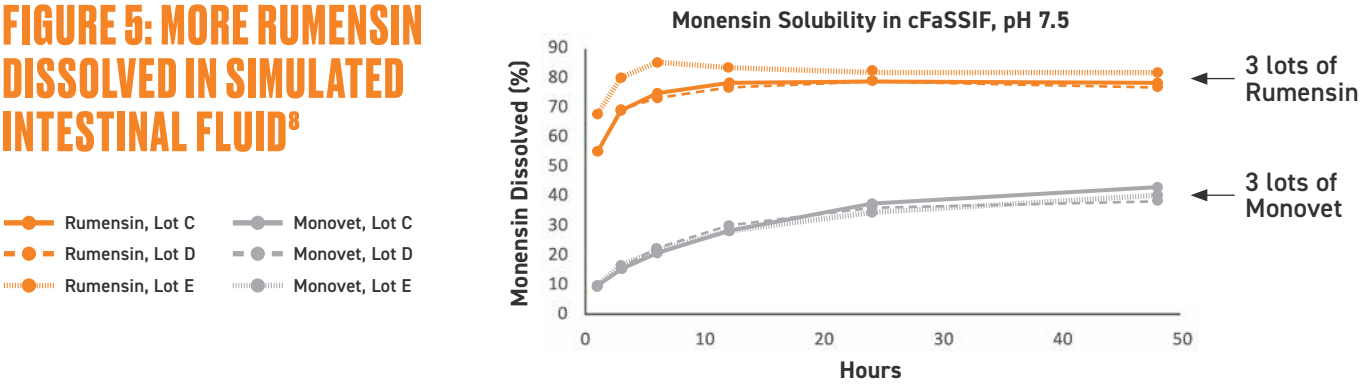


FIGURE 5: MORE RUMENSIN DISSOLVED IN SIMULATED INTESTINAL FLUID[8]



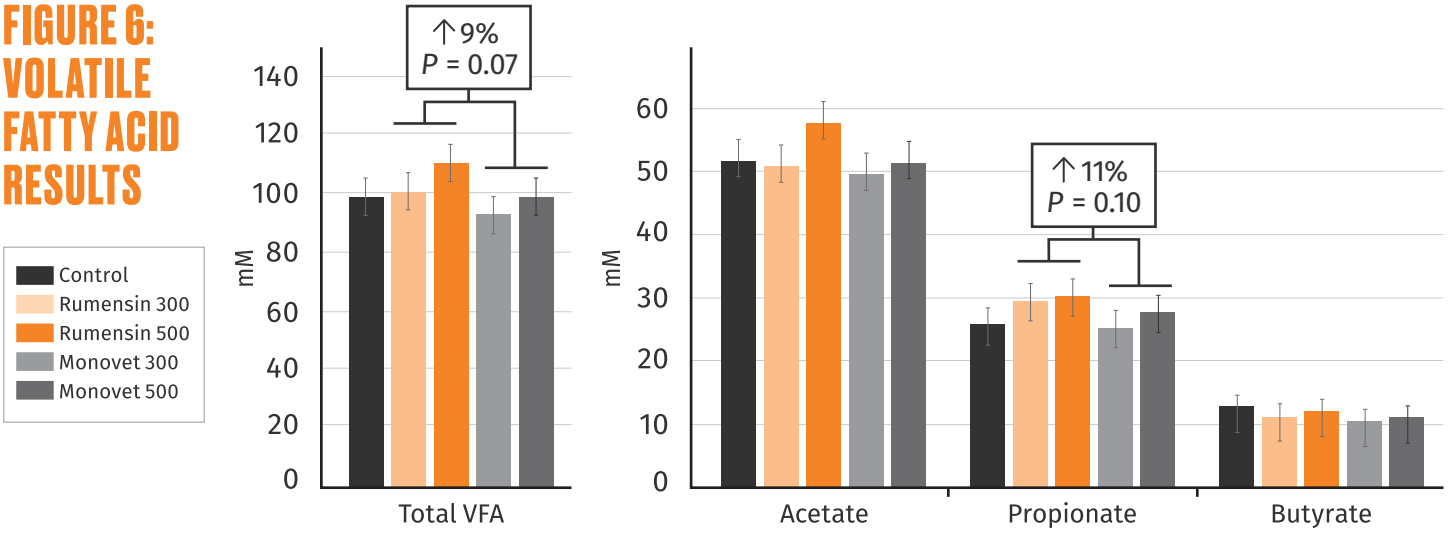
RUMENSIN AND MONOVET HAVE DIFFERENT TRENDS IN VFA SHIFTS AND MICROBIOME PROFILES

IN A STUDY CONDUCTED AT CLEMSON UNIVERSITY, ELANCO LOOKED AT THE EFFECTS OF DIFFERENT MONENSIN SOURCES ON FERMENTATION IN CONTINUOUS CULTURE.[9]

FINDINGS INCLUDE:

Rumensin tended to have greater total VFA and propionate concentration than Monovet (Figure 6).

FIGURE 6: VOLATILE FATTY ACID RESULTS



MICROBIAL COMMUNITY RESULTS

Microbial diversity patterns after feeding were different for Rumensin and Monovet at the 500 mg/d dose.

At 500 mg/d, Rumensin resulted in more similar microbial communities between replicates 4 hours after feeding vs. Monovet.

Rumensin resulted in a higher abundance of microbes known to produce succinate and lactate, whereas Monovet enriched succinate and butyrate producers.

ONLY RUMENSIN CONTAINS MICROTRACERS®

WHAT ARE MICROTRACERS?

- Very small metallic particles coated with food-grade dye and blended into Rumensin at low levels
- No impact on the feed, animals or environment
- Detected at the feed mill with an easy, quick test

WHY ARE MICROTRACERS USED?

- Accurately determine if Rumensin is present in feed
- Provide an estimated level of Rumensin
- Validate Rumensin is not present in feed
- Confirm proper feed mixing procedures

Elanco
Microtracer FS — Red/Natural Yellow (Rumensin)
Developer: water or 50% alcohol

Example of a Rumensin microtracer result.

Rotary Detector: a device used to conduct quick, on-site tests of microtracers and Rumensin in feed.

WHEN YOU CHOOSE RUMENSIN, YOU CAN TRUST THAT IT:

- Has far less variable potency than Monovet
- Has a particle-size distribution more suitable for feed mixing compared to Monovet's average of 30% dust
- Dissolves quicker and to a greater extent than Monovet in simulated ruminal and intestinal fluid
- Has different trends in VFA shifts and microbiome profiles than Monovet

The findings from more than 400 Elanco research studies have made it possible for producers to include Rumensin in ever-changing feed programs and management systems.

The label contains complete use information, including cautions and warnings. Always read, understand and follow the label and use directions.

Caution: Consumption by unapproved species or feeding undiluted may be toxic or fatal. Do not feed to veal calves.

Growing beef steers and heifers fed in confinement for slaughter:
For improved feed efficiency: Feed 5 to 40 g/ton of monensin (90% DM basis) continuously in a complete feed to provide 50 to 480 mg/hd/day.
For the prevention and control of coccidiosis due to *Eimeria bovis* and *Eimeria zuernii*: Feed 10 to 40 g/ton of monensin (90% DM basis) continuously to provide 0.14 to 0.42 mg/lb of body weight/day monensin, depending upon severity of challenge, up to a maximum of 480 mg/hd/day.

Growing beef steers and heifers on pasture (stocker, feeder, and slaughter) or in a dry lot, and replacement beef and dairy heifers:
For increased rate of weight gain: Feed 50 to 200 mg/hd/day of monensin in at least 1.0 lb of Type C Medicated Feed. Or, after the 5th day, feed 400 mg/hd/day every other day in 2.0 lbs of Type C Medicated Feed. The Type C Medicated Feed must contain 15 to 400 g/ton of monensin (90% DM basis). Do not self feed.
For the prevention and control of coccidiosis due to *Eimeria bovis* and *Eimeria zuernii*: Feed at a rate to provide 0.14 to 0.42 mg/lb of body weight/day monensin, depending upon severity of challenge, up to a maximum of 200 mg/hd/day. The Type C Medicated Feed must contain 15 to 400 g/ton of monensin (90% DM basis).
Type C free-choice medicated feeds: All Type C free-choice medicated feeds containing Rumensin must be manufactured according to an FDA-approved formula/specification. When using a formula/specification published in the Code of Federal Regulations (CFR), a Medicated Feed Mill license is not required. Use of Rumensin in a proprietary formula/specification not published in the CFR requires prior FDA approval and a Medicated Feed Mill License.

Dairy cows: For increased milk production efficiency (production of marketable solids-corrected milk per unit of feed intake):
Total Mixed Rations ("complete feed"): Feed continuously to dry and lactating dairy cows a total mixed ration ("complete feed") containing 11 to 22 g/ton monensin on a 100% DM basis.

Component Feeding Systems (including top dress): Feed continuously to dry and lactating dairy cows a Type C medicated feed containing 11 to 400 g/ton monensin. The Type C medicated feed must be fed in a minimum of 1 lb of feed/cow/day to provide 185 to 660 mg/hd/day monensin to lactating cows, or 115 to 410 mg/hd/day monensin to dry cows. This provides cows with similar amounts of monensin they would receive by consuming total mixed rations containing 11 to 22 g/ton monensin on a 100% DM basis.

Calves (excluding veal calves):
For the prevention and control of coccidiosis due to *Eimeria bovis* and *Eimeria zuernii*: Feed at a rate of 0.14 to 1.00 mg/lb of body weight/day, depending upon severity of challenge, up to a maximum of 200 mg of monensin/hd/day. The monensin concentration in Type C medicated feed must be between 10 and 200 g/ton.

Beef cows:
For improved feed efficiency when receiving supplemental feed: Feed continuously at a rate of 50 to 200 mg/hd/day of monensin. Cows on pasture or in dry lot must receive a minimum of 1.0 lb of Type C Medicated Feed per head per day. Do not self feed.
For the prevention and control of coccidiosis due to *Eimeria bovis* and *Eimeria zuernii*: Feed at a rate of 0.14 to 0.42 mg/lb of body weight/day, depending upon severity of challenge, up to a maximum of 200 mg/hd/day.

[1] Elanco Animal Health. Data on file.
[2] Elanco Animal Health. Data on file.
[3] FOI Summary, NADA 200-639.
[4] Elanco Animal Health. Data on file.
[5] American Feed Industry Association. Chapter 53: Microingredient Mixing. Feed Manufacturing Technology IV.
[6] Elanco Animal Health. Data on file.
[7] Elanco Animal Health. Data on file.
[8] United States Pharmacopeia and National Formulary. USP 42-NF 37: Update to Chapter <1236> Solubility Measurements. United States Pharmacopeia Convention, Inc. Rockville, MD. 2019; Supplement 2.
[9] Elanco Animal Health. Data on file.

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