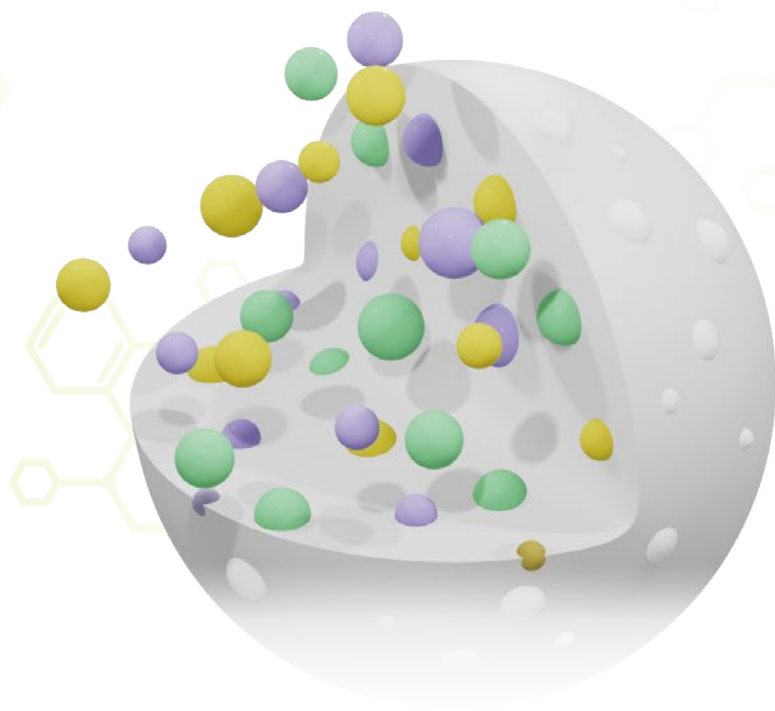


What is
JMT?

MORNINGBIO's JMT (Joint Matrix-coating Technology) is a protection technique of key nutrients without waste, ensuring higher intestinal availability.

Our matrix-coated products effectively deliver key nutrients into the small intestine and prevent damage or loss of nutrients by thermal and physical impacts.



Contact us now for expert advice
morningbio@mbiok.co.kr | www.mbiok.co.kr



HEAD OFFICE

Floor 4, Jeongwoo Plaza, 70 Buldang23-ro, Seobuk-gu, Cheonan, Chungnam, R.O.K
Tel +82-41-578-0604 Fax +82-41-578-0605

SAMEUN FACTORY

28, Gunsam-gil, Jiksan-eup, Seobuk-gu, Cheonan, Chungnam, R.O.K

SANDONG FACTORY

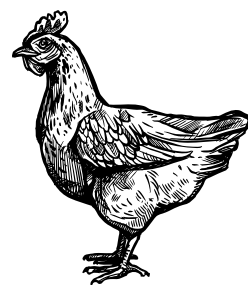
271-20, Sandong-ro, Eumbong-myeon, Asan, Chungnam, R.O.K

MORNINGBIO PRODUCT CATALOGUE

YOUR ULTIMATE SOLUTION FOR ANIMAL NUTRITION



ABOUT US



MORNINGBIO is an innovative, science-based developer and manufacturer of feed additives with its headquarters in South Korea.

Since 2004, we have developed numerous products for swine, poultry and ruminant with our own technology called JMT (Joint Matrix-coating Technology).

MORNINGBIO has grown into a global business providing high quality, research-based feed additives for international feed mill and farm customers.

Our product line includes: Coated Organic Acids, Omega-3, Zinc Oxide, Omega-7, Vitamin C, Glucose, L-Lysine, Methionine and Threonine etc.

MORNINGBIO is an ISO 9001, ISO 14001 and FAMI-QS certified company, our quality assurance policy guarantee total customer satisfaction for our top quality products and services.



SWINE PRODUCTS

PROCID
Rumen Protected Organic Acids

REI3
Reproduction Efficiency
Improvement Omega-3

MZINC
Protected Zinc Oxide

TOLEIC
Protected
Special Fatty Acids



RUMINANT PRODUCTS

PROCID
Rumen Protected Organic Acids

MAT C
Rumen Protected Vitamin C
MAT G
Rumen Protected Glucose

MATRIXIN
Rumen Protected L-Lysine

MATONIN
Rumen Protected DL-Methionine

REI3
Rumen Protected Omega-3



POULTRY PRODUCTS

PROCID
Protected Organic Acids

SRCa
Slow Release Calcium



Description

Composition

Dosage

Benefits

Feeding Trial Result

PROCID

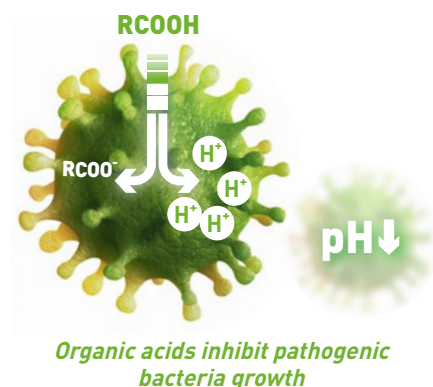
Protected Organic Acid

Protected organic acids to promote gut health for optimal performance of swine

- Gut microflora in livestock has a great influence on growth performance and productivity.
- PROCID is manufactured with JMT (Joint Matrix-coating Technology), allowing more effective delivery of undissociated organic acids into the small intestine.
- Organic acids released into the small intestine improve the intestinal microflora by lowering intestinal pH and inhibit pathogenic bacterial growth.

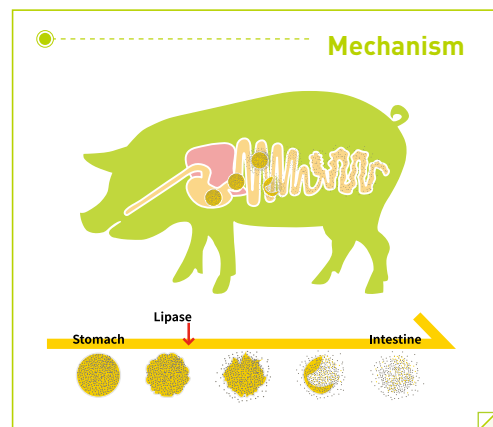
- Fumaric acid** 100,000 IU/kg
- Malic acid** 100,000 IU/kg
- Citric acid** 100,000 IU/kg
- Energy** 6,600 kcal/kg

40 %



- 1.0 ~ 3.0 kg/ton of compound feed

- Improves gut health by inhibiting growth of pathogenic bacteria and creating a favorable environment for beneficial bacteria in the small intestine.
- Increases villus height and enhances absorption rate of nutrients in the small intestine.
- Strengthens the immunity response.
- Improves the carcass traits.



Lactating sow

Devi, Subramaniam Mohana et al. R. Bras. Zootecnia., 45 (2016): 39-47.

- Loss of weight and back fat ▼

Lactating piglet

Dankook University, Republic of Korea, 2015

- Daily weight gain ▲
- Fecal *Lactobacillus* ▲

Weaning piglet

Lei, Xin Jian et al. Animal Feed Science and Technology 224 (2017): 46-51.

- Growth performance ▲
- Diarrhea ▼

Growing pig

Upadhaya, S D et al. Journal of Applied Animal Research 44 (2015): 238-42.

- Daily weight gain ▲
- Digestibility ▲
- Feed efficiency ▲
- Fecal *Lactobacillus* ▲

Finishing pig

Upadhaya, S D et al. Asian-Australas J Anim Sci. 27,11 (2014): 1600-7.

- Daily weight gain ▲
- Meat quality ▲
- Ammonia & acetic acid emission ▼
- Fecal *Lactobacillus* ▲
- Fecal *E. coli* ▼

REI3

Reproduction Efficiency Improvement Omega-3

Protected omega-3 product optimizing the productivity of lactating sows and weaning piglets

Description

Composition

Dosage

Benefits

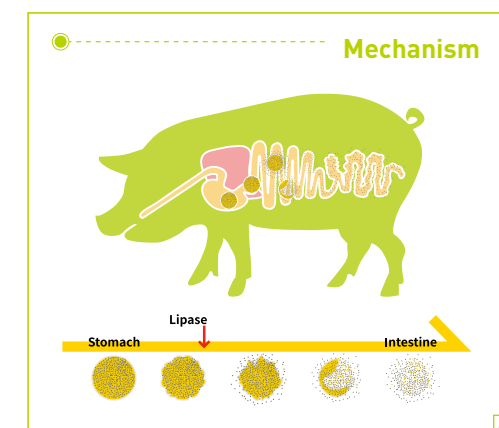
- Omega-3 fatty acid in swine feed is often insufficient, so supplying additional omega-3 fatty acid is highly recommended.
- REI3 is a protected source of omega-3 fatty acids manufactured by JMT (Joint Matrix-coating Technology), allowing more significant release of essential nutrients into the small intestine.
- The unique JMT (Joint Matrix-coating Technology) prevents the risk of rancidification of omega-3 fatty acids, an active ingredient that is hard-to-handle.

- Omega-3 fatty acid (ALA, EPA, DHA)** 164 g/kg
- Vitamin A** 100,000 IU/kg
- Vitamin E** 100 IU/kg
- Energy** 7,600 kcal/kg

ALA	EPA	DHA
a-linolenic acid	Eicosapentaenoic acid	Docosahexaenoic acid
C18:3	C20:5	C22:6

- Weaning piglets** 1.0 ~ 3.0 kg/ton of compound feed
- Lactating sows, Boars** 2.0 ~ 5.0 kg/ton of compound feed

- Precursors of bioactive substances such as Pg, Tx, and Lt.
- Improves reproductive performance of sows.
- Shortens estrus cycle in sows and improves fertility rate.
- Increases the number of weaning piglets and bodyweight at weaning.
- The improved balance of ω -6: ω -3 ratio promotes the immune system and anti-inflammatory effect.
- REI3 is matrix-coated with refined fish oil, so there is no concern about palatability or odor.



Lactating piglet

Yin, Jia et al. Animal science journal 88,11 (2017): 1744-1752.

ω -6: ω -3	20:1	15:1	10:1
Initial weight, kg	1.367	1.368	1.436
Weaning weight, kg	7.248 ^b	7.426 ^b	7.845 ^a
ADG, g/day	210 ^b	216 ^{ab}	229 ^a

^{a,b}Means in same row with different superscripts differ (P < 0.05).

^a Dietary treatments were different ratios of ω -6: ω -3 polyunsaturated fatty acid (PUFA), including 20:1, 15:1 and 10:1. ADG, average daily gain.

REI3 improves the growth performance of lactating piglets.



Description

Composition

Dosage

Benefits

Feeding Trial Result

MZINC

Protected Zinc Oxide

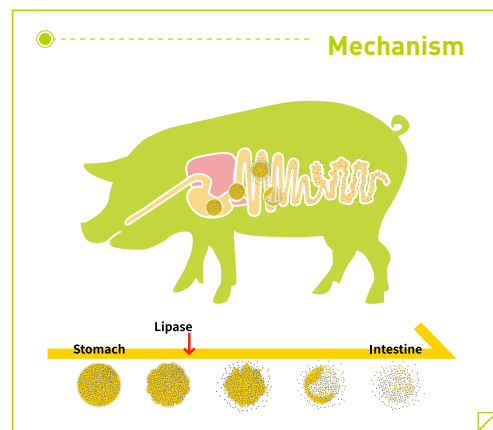
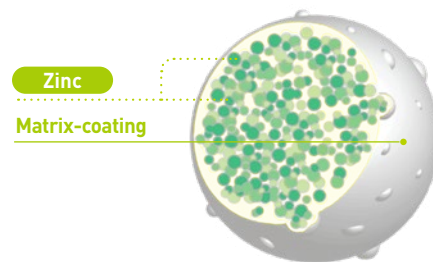
Protected zinc oxide for preventing diarrhea and improving immune system

- For economical and environmental benefits, it is recommended to use protected zinc oxide with excellent bioavailability.
- Manufactured with JMT (Joint Matrix-coating Technology), allowing more effective delivery and absorption of ZnO into the small intestine.
- It is available to reduce 80 ~ 90% of ZnO excretion in feces and use a lower dose of coated ZnO (Reduced by 10 ~ 50 times).

- **Zinc Oxide** 50%
- **Vitamin E** 900 IU/kg
- **Energy** 4,600 kcal/kg

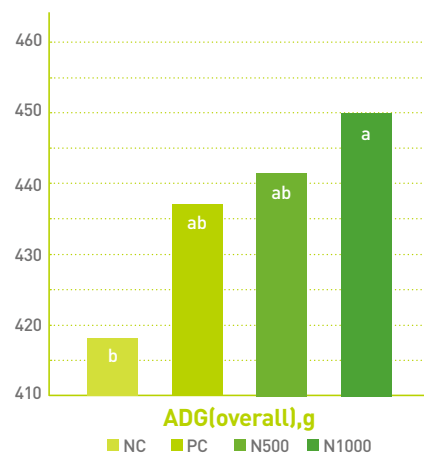
- 0.5 ~ 1.0 kg/ton of compound feed

- Prevention of diarrhea in piglets.
- Increases villus height and width and improves nutrient absorption rate.
- Anti-inflammatory effect.
- Boosting the immune response.
- Matrix-coating prevents antagonism between zinc and minerals in feed.
- Environmental benefits with low dosage.



Weaning piglet

- Lei, Xin Jian and In Ho Kim. Animal Feed Science and Technology (2018): 117-125
- 192 weaning piglets, 500 ~ 1,000g of MZINC addition per ton of feed



ITEMS	NC	PC	N500	N1000
wk3				
ADG,g	340 ^b	360 ^{ab}	363 ^a	370 ^a
ADFI,g	515	540	533	537
G/F	0.641	0.668	0.681	0.689
wk6				
ADG,g	493 ^b	520 ^{ab}	532 ^{ab}	574 ^a
ADFI,g	804	847	831	847
G/F	0.614	0.614	0.640	0.677
Overall				
ADG,g	416 ^b	439 ^{ab}	447 ^{ab}	466 ^a
ADFI,g	660	693	682	692
G/F	0.631	0.633	0.655	0.674

• ^{a,b}Means in same row with different superscripts differ (P < 0.05).
• Dietary treatments were as follow: [1]positive control(PC):NC+2,500g/ton conventional zinc oxide; [2] N500:NC+500g/ton MZINC; [3] N1000:NC+1,000g/ton MZINC

MZINC improves growth performance of weaning piglets.

TOLEIC

Protected Special Fatty Acids

Palmitoleic acid(C16:1) promotes insulin sensitivity, glucose uptake and growth performance in piglets.

Description

- By supplementing TOLEIC, piglets get sufficient palmitoleic acid which is typically contained in colostrum or sow milk, but not in milk replacer or pre-starter feed.
- TOLEIC is the refined and highly concentrated fatty acids product, obtained from fish oil through esterification, purification, and molecular distillation processes.
- Manufactured with JMT (Joint Matrix-coating Technology) that protects the special fatty acids against rancidification and helps the active ingredient reach the small intestine in an intact form.

Composition

- **Omega-3 & Omega-7 fatty acids**
- **Energy** 7,200 kcal/kg

Dosage

- 3.0 ~ 10.0 kg/ton of compound feed

Benefits

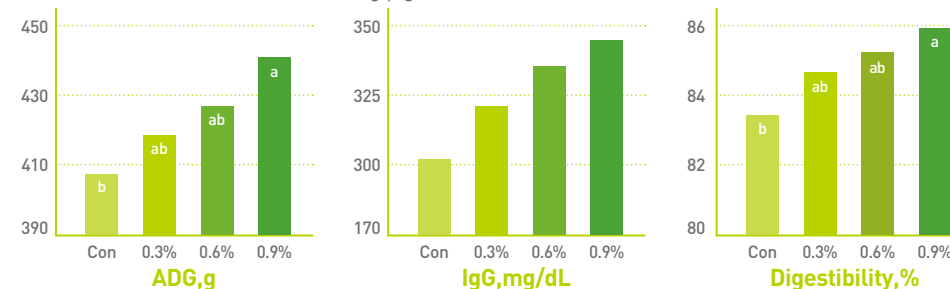
- Palmitoleic acid maintains litter uniformity by increasing insulin sensitivity and glucose uptake capacity.
- Improves daily weight gain and feed conversion rate.
- DHA & EPA help to improve immunity system and anti-inflammatory effects.



Feeding Trial Result

Weaning piglet

- Dankook University, Republic of Korea, 2018
- 200 weaning piglets, Treated TOLEIC 0.3, 0.6, 0.9% in feed



• ^{a,b}Means in same row with different superscripts differ (P < 0.05).

TOLEIC improves ADG, digestibility, and immunity substance(IgG) production.



Description

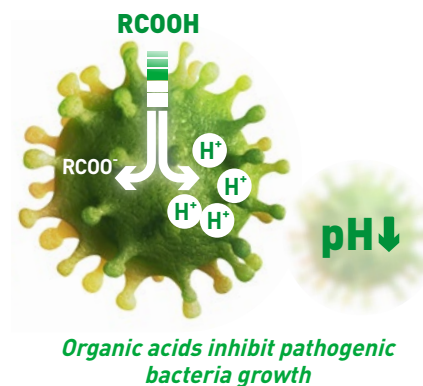
PROCID

Rumen Protected Organic Acids

Protected organic acids improving gut health and growth performance in cattle

- Organic acids kill pathogenic bacteria in the gut and provide a good environment for beneficial bacteria, thereby promoting optimal growth and productivity.
- JMT (Joint Matrix-coating Technology) allows effective delivery of protected organic acids with a high rate of rumen bypass and intestinal release.
- PROCID is an alternative to AGP (antibiotic growth promoter) due to its antibacterial activity, inhibiting pathogenic bacterial growth.

- Fumaric acid
 - Malic acid
 - Citric acid
 - Energy 6,600 kcal/kg
- 40 %



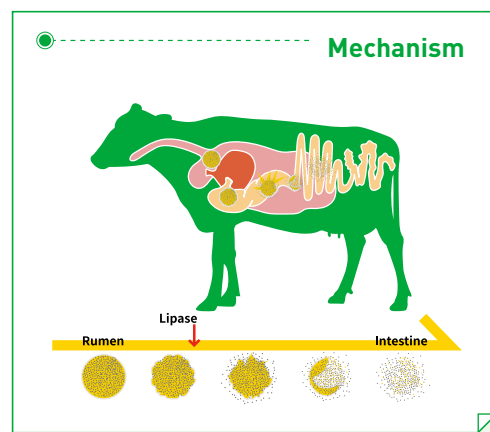
- 0.5 ~ 2.0 kg/ton of compound feed

Composition

Dosage

Benefits

- Inhibits the growth of pathogenic bacteria in the small intestine.
- Maintains gut health by retaining a good microflora in the gut.
- Increases villus height in the small intestine.
- Enhances digestibility of nutrients.
- No concern about acidosis in rumen as it is protected by Matrix-coating.



- Difference in antimicrobial effect between dissociated and undissociated form of organic acid
- Dankook University, Republic of Korea, 2011

Category	Type of acid	MIC of organic acid in undissociated form	MIC of organic acid in dissociated form
<i>E.coli</i> K88	Malic acid	0.90	250
	Fumaric acid	2.00	600
	Citric acid	0.02	430
<i>S.Typhimurium</i> KCCM 40253	Malic acid	0.01	480
	Fumaric acid	10.00	750
	Citric acid	3.62	500

Feeding Trial Result

MAT C

Rumen Protected Vitamin C

Protected vitamin C improving meat quality and relieving heat stress in cattle

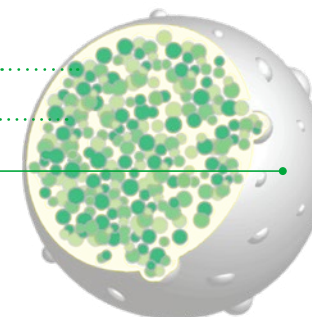
Description

- Supplying vitamin C in cattle promotes fat differentiation and relieves heat stress.
- MAT C is rumen-protected vitamin C supplement manufactured by JMT (Joint Matrix-coating Technology).
- Matrix-coated vitamin C bypasses the rumen without nutrient loss and is released into the small intestine under the action of digestive enzyme lipase.

Composition

- Vitamin C 40%
- Vitamin E 1,500 IU/kg
- Energy 6,500 kcal/kg

Vitamin C
Matrix-coating



Dosage

- 1.0 ~ 3.0 kg/ton of compound feed
- 30 ~ 90 g/head/day

Benefits

- Increases the number of adipocytes and stimulates adipocyte differentiation in 12 ~ 18 month-aged cattle.
- Improves meat quality (Marbling score ↑).
- Prevents fat oxidation and stabilizes the meat color.
- Stimulates biosynthesis of collagen.
- Reduces heat stress.
- Vitamin C & E have antioxidant effect for body cells.

Feeding Trial Result

- Carcass score of steer fed with protected vitamin C
- Jeonbuk University, Republic of Korea, 2015 (Treated MAT C 50 g/head/day for 3 months before sale)

	Control	MAT C	SEM	P-value
Carcass weight (kg)	445.83	455.17	8.07	0.601
Back fat thickness (mm)	12.42	12.50	0.55	0.946
Rib eye area (cm ²)	90.08	94.33	2.02	0.337
Yield index	64.66	64.94	0.53	0.816
Yield grade (A:B:C,%)	0:75:25	17:67:17	-	-
	Control	MAT C	SEM	P-value
Marbling score	5.08	6.33	0.39	0.135
Meat color	4.83	5.00	0.08	0.317
Fat color	3.00	3.00	0.00	-
Texture	1.42	1.17	0.11	0.317
Maturity	2.17	2.67	0.11	<0.05
Quality grade(1++:1+:1:2,%)	0:42:50:8	33:50:0:17	-	-



Description

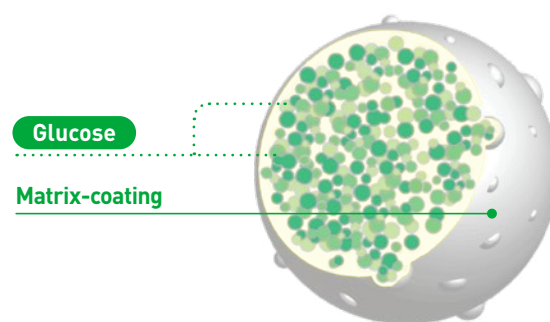
MAT G

Rumen Protected Glucose

Protected glucose for energy-deficient cattle

- MAT G is rumen-protected glucose supplement manufactured by JMT (Joint Matrix-coating Technology).
- Matrix-coated glucose bypasses the rumen without nutrient loss and is released into the small intestine under the action of digestive enzyme lipase.
- Supplying additional glucose prevents ketosis, fatty liver, and energy-deficiency during lactation period.

- **Glucose** 40%
- **Vitamin C** 1.5%
- **Vitamin E** 500 mg/kg
- **Energy** 6,600 kcal/kg



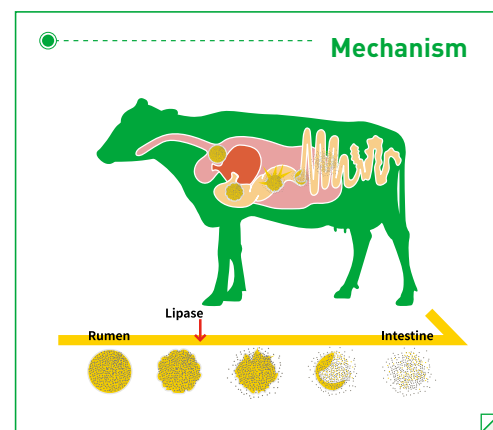
- 1.0 ~ 5.0 kg/ton of compound feed
- 100 ~ 250 g/head/day

Composition

Dosage

Benefits

- By supplying sufficient glucose, cattle gain additional energy during lactation.
- Milk yield & Lactation peak ↑
- Prevention of metabolic diseases such as ketosis and fatty liver.
- No risk of acidosis in rumen due to matrix-coating technology.
- Improves meat quality in beef cattle.



○ Feeding trial by Korea Livestock Cooperative, 2013

Category	Rib eye area	Backfat thickness	Marbling score	Grade 1 or higher
Compound feed(a)	86cm ²	15mm	5.3	82.1%
Protected glucose(b)	87cm ²	14mm	5.7	92.3%
Variation(b-a)	+1cm ²	-1mm	+0.4	+10.2%

In beef cattle, MAT G improves the marbling score and beef quality grade.

Feeding Trial Result

MATRIXIN

Rumen Protected L-Lysine

Highly efficient rumen protected lysine source for optimal production performance of cows

Description

- Lysine is so essential in cattle feed that since lysine-deficient diet has a negative impact on growth performance and productivity.
- MATRIXIN is a protected lysine which is designed to prevent the loss of high-quality amino acid.
- JMT (Joint Matrix-coating Technology) results in an elevated level of rumen bypass, providing high lysine content to be absorbed and available in the small intestine.

Composition

- **L-Lysine HCl** 40%
- **Energy** 7,100 kcal/kg

Dosage

- 0.5 ~ 3.0 kg/ton of compound feed
- 20 ~ 50 g/head/day
- High producing cow: Feed 20 ~ 50 g per head /day at least from 2 weeks before delivery to 90 ~ 100 days of lactation period

Benefits

- Optimizes the balance between methionine and lysine in feed ingredients.
- Increases milk yield, fat and protein percentages.
- Extends the lactation period.
- Improves meat quality and yield.
- Provides limiting amino acids to maximize protein synthesis.
- No negative effect on the other feed ingredients.
- No negative effect on palatability.

Feeding Trial Result

○ Jeonbuk University Feeding Trial (Lysine and Methionine Ratio 3:1)

Farm located in Anseong, Gyeonggi province / 33 dairy cows

- Control : 12 kg TMR + 14 kg concentrated feed

- Treatment : Control+MATRIXIN (Protected L-Lysine) 80%+MATONIN(Protected methionine) 20%, 50 g/head/day

	Control	Treatment	P-value
Milk Fat, %	3.67	4.02	0.125
Milk Protein, %	3.36	3.94	<0.05
Milk Yield, kg/head/day	32.33	40.84	<0.05

Protected amino acid increases milk fat by 9.5% and milk protein by 17.3%.



Description

MATONIN

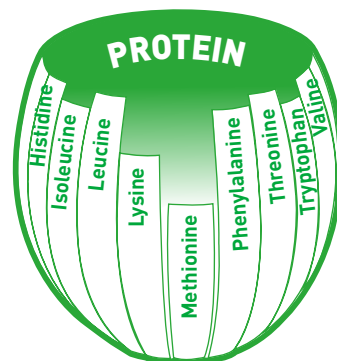
Rumen Protected DL-Methionine

Rumen-protected DL-Methionine improving growth performance and productivity in cattle

- Methionine is so essential in cattle feed that methionine-deficient diet has a negative impact on growth performance and productivity.
- MATONIN is manufactured with JMT (Joint Matrix-coating Technology), allowing more effective delivery of DL-Methionine into the small intestine bypassing the rumen.
- Designed to release active ingredients in the cow's small intestine under the action of digestive enzyme lipase.

- **DL-Methionine** 40%, 60%
- **Energy** 7,300 kcal/kg, 6,600 kcal/kg

- 0.5 ~ 3.0 kg/ton of compound feed
- 20 ~ 50 g/head/day



Methionine is one of the representative limiting amino acids

- Increases protein synthesis.
- Improves body weight gain and feed efficiency.
- Improves meat quality and yield.
- Increases intramuscular fat.
- Enhances EMA (eye muscle area) during growing & fattening period.
- Stable at feed pelletizing process.
- With unique protection technology, MATONIN has no negative effect on palatability.
- No adverse effect on the other feed ingredients.

○ MATONIN rumen bypass rate (%)

Ruminant nutrition research center at Jeonbuk University, Republic of Korea

Table 1
In vitro rumen culture fluid pH

Incubation(h)	Control (Rearing calf TMR)	Control+ MATONIN(0.3%)
0	6.89±0.01	6.89±0.01
3	6.79±0.02	6.79±0.01
6	6.72±0.01	6.74±0.01
9	6.68±0.01	6.65±0.03
12	6.64±0.01	6.63±0.01
24	6.56±0.01	6.57±0.01

Table 2
In vitro total gas emission in rumen (ml)

Incubation(h)	Control (Rearing calf TMR)	Control+ MATONIN(0.3%)
0	-	-
3	12.0±2.83	11.7±1.53
6	35.0±1.00	33.7±0.58
9	53.7±0.58	51.3±2.08
12	66.7±9.07	60.7±1.15
24	77.0±1.00	73.0±1.73

Table 3
In situ rumen bypass rate

Culturing Time(h)	MATONIN
24	79.7±5.4

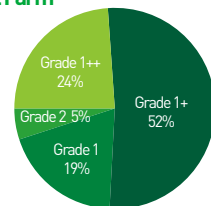
"No side effect on ruminant microorganism's proper pH and gas generation during fermentation"

Rumen bypass rate : 80%

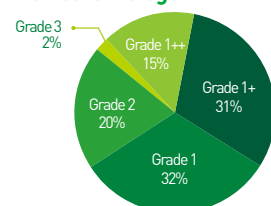
○ Local farm Trial

Farm located in Jeonbuk province, Republic of Korea, 123 cows (Treated MATONIN 25g/head/day)

Imsil Farm



Domestic Average



• Source: Korea Institute for Animal Products Quality Evaluation

REI3

Rumen Protected Omega-3

Protected omega-3 product to support herd health, fertility and milk production

Description

- REI3 is a protected source of omega-3 fatty acids manufactured by JMT (Joint Matrix-coating Technology), allowing rumen bypass and intestinal release of key nutrients more efficiently.
- Due to its unique coating technology, the risk of rancidification of omega-3 fatty acids is prevented, ensuring better stability and digestibility.
- REI3 contains alpha-linolenic acid from linseed oil, DHA, and EPA from fish oil, the precursors of bioactive substances such as Pg, Tx, and Lt.

Composition

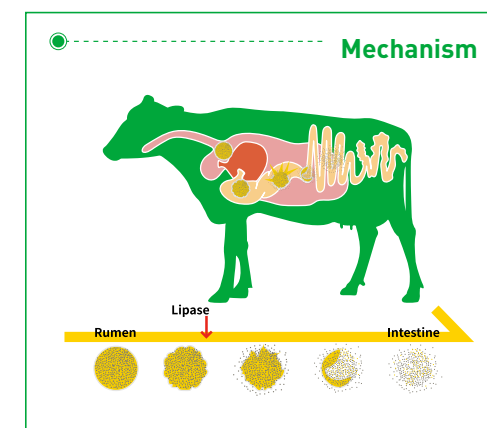
- **Omega-3 fatty acid (ALA, EPA, DHA)** 164 g/kg
- **Vitamin A** 100,000 IU/kg
- **Vitamin E** 100 IU/kg
- **Energy** 7,600 kcal/kg

Dosage

- 2.0 kg/ton of compound feed
- 10 ~ 20 g/head/day

Benefits

- Effectively delivers key nutrients and is slowly released into the small intestine.
- JMT (Joint Matrix-coating Technology) improves palatability and shelf life by suppressing fish odors and rancidification.
- The improved balance of ω -6: ω -3 ratio enhances the ability of immune system and anti-inflammatory effect.
- Increases the activity of progesterone, a pregnancy hormone.



○ Milk fat content measured in dairy cow fed with REI3

Farm located in Cheongwon, Chungbuk province
- 50 dairy cows / Treated REI3 100g per head

Item, %	D-1	W1	W2	W3	W4	W-1
Total fat	3.60	3.79	4.96	4.52	3.78	3.24
C18:1	26.42	28.06	27.06	25.4	26.42	26.29
C18:2	3.20	3.07	3.35	3.25	3.25	3.28
C18:3						
C20:5	1.11	1.60	1.02	1.15	2.16	1.77
C22:6						

- Abbreviation: D-1, a day before treat; W1, a week after treat; W2, two weeks after treat; W3, three weeks after treat; W4, four weeks after treat; W-1, a week after finishing the treat

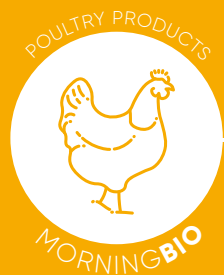
REI3 increases milk fat up to 37.8%.

Feeding Trial Result



12_13

RUMINANT PRODUCTS



Description

Composition

Dosage

Benefits

Feeding Trial Result

PROCID

Protected Organic Acid

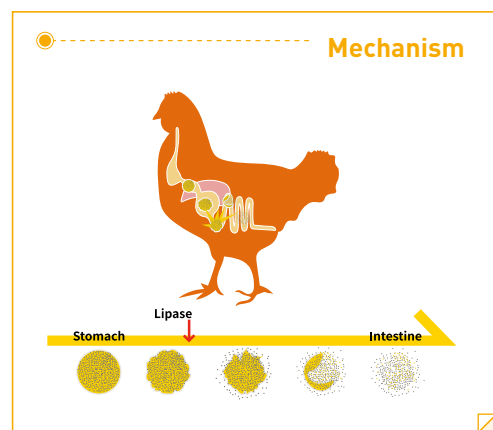
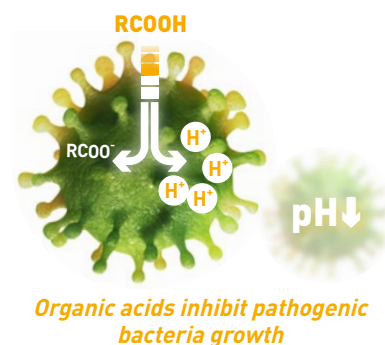
Protected organic acids to promote gut health for optimal growth performance of poultry

- Supplementing protected organic acid is highly recommended in poultry, as unprotected organic acids are mostly dissociated in proventriculus and gizzard.
- PROCID is manufactured with latest JMT (Joint Matrix-coating Technology), delivering organic acids into the small intestine properly without nutrient loss.
- Organic acids released into the small intestine act as AGPs (antibiotic growth promoters).

- Fumaric acid**
- Malic acid**
- Citric acid**
- Energy** 6,600 kcal/kg

- 0.5 ~ 2.0 kg/ton of compound feed

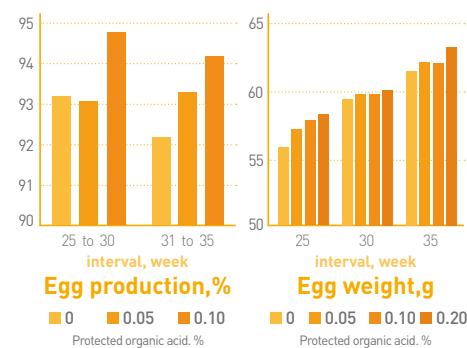
- Increases the villus height and nutrients absorption rate.
- Inhibits pathogenic bacteria by lowering pH in the small intestine.
- Enhances absorption capacity and digestibility of nutrients.
- Improves gut health by creating a favorable environment for beneficial microbiota in the small intestine.
- No negative effect on palatability.



Layer

Lee, Sang In et al.
Turk J Vet Anim Sci. (2015) 39: 520-527.

- Dankook University, Republic of Korea
- 144 layers / Treated PROCID 0%, 0.05%, 0.10%, 0.2% in feed

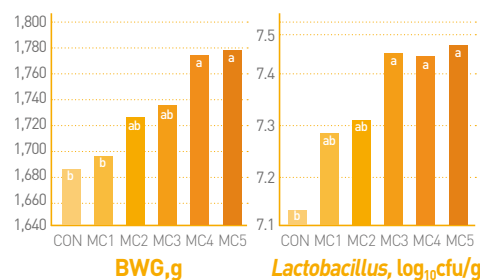


PROCID improves egg production.

Broiler

Nguyen, D.H., et al. Poultry Science 97,12 (2018):4351-4358.

- Dankook University, Republic of Korea
- 816 broilers / Treated PROCID 200 ~ 600 g/ton of feed



^{a,b}Means in same row with different superscripts differ (P < 0.05).

Significantly increases productivity by 5% with PROCID treatment of 500 ~ 600 g/ton

Improves gut health by increased fecal *Lactobacillus* (124%†)

SRCa

Slow Release Calcium

Slow release calcium supplement for healthy eggshell

Description

- Protected calcium is absorbed and released slowly by vegetable fat coating.
- Synergistic effect on calcium absorption and availability by adding vitamin D₃
- Designed to provide calcium consistently throughout dusk and dawn when the eggshell formation process is active.

Composition

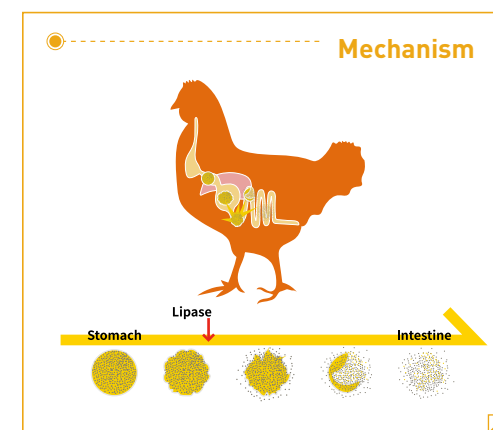
- CaCO₃** 45%
- Vitamin D₃** 500,000 IU/kg
- Vitamin E** 50 IU/kg

Dosage

- Laying hens** 3.0 ~ 5.0 kg/ton of compound feed
- Breeding birds** 5.0 ~ 10.0 kg/ton of compound feed

Benefits

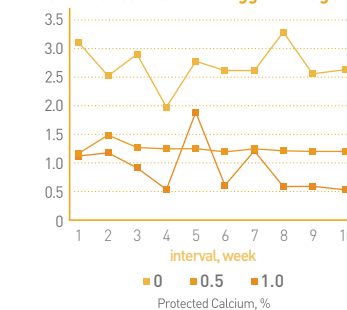
- Increases eggshell strength & thickness.
- Increases egg weight.
- Improves haugh unit.
- Improves bone health.
- Includes vitamin D₃ (calcium availability ↑)



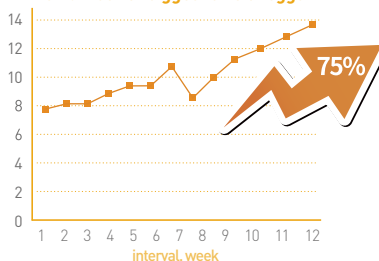
Layer

- Dankook University, 144 layers / 10 weeks / 5 kg (EP1), 10 kg (EP2) per ton of poultry feed

The influence of SRCa to egg breakage rate



The number of biggest size of eggs



“Treatment SRCa 5 kg : Egg breakage rate decreased by 52% in average
Treatment SRCa 10 kg : Egg breakage rate decreased by 64% in average”



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POULTRY PRODUCTS