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The first product in a new category of parasite control.

Up to 100 to 150 days of parasite control with a single treatment.^{1,2}

LONGRANGE™ (eprinomectin) Extended-Release Injection offers an entirely new way to think about parasite control in cattle. Because of the unique THERAPHASE™ Technology used to develop this formulation of eprinomectin, a single treatment lasts up to 100 to 150 days¹ — long enough to break the parasite life cycle and effectively reduce parasite burdens on the pasture.^{3,4} This extended activity of LONGRANGE provides today's ultimate parasite solution.^{2,5-7}

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Indications²

LONGRANGE™ (eprinomectin), when administered at the recommended dose volume of 1 mL/110 lbs. (50 kg) of body weight, is effective in the control of the following internal and external parasites of cattle:

Gastrointestinal Roundworms

Cooperia oncophora – Adults and L₄

Cooperia punctata – Adults and L₄

Cooperia surnabada – Adults and L₄

Haemonchus placei – Adults

Oesophagostomum radiatum – Adults

Ostertagia lyrata – Adults

Ostertagia ostertagi – Adults, L₄ and inhibited L₄

Trichostrongylus axei – Adults and L₄

Trichostrongylus colubriformis – Adults

Lungworms

Dictyocaulus viviparus – Adults

Grubs

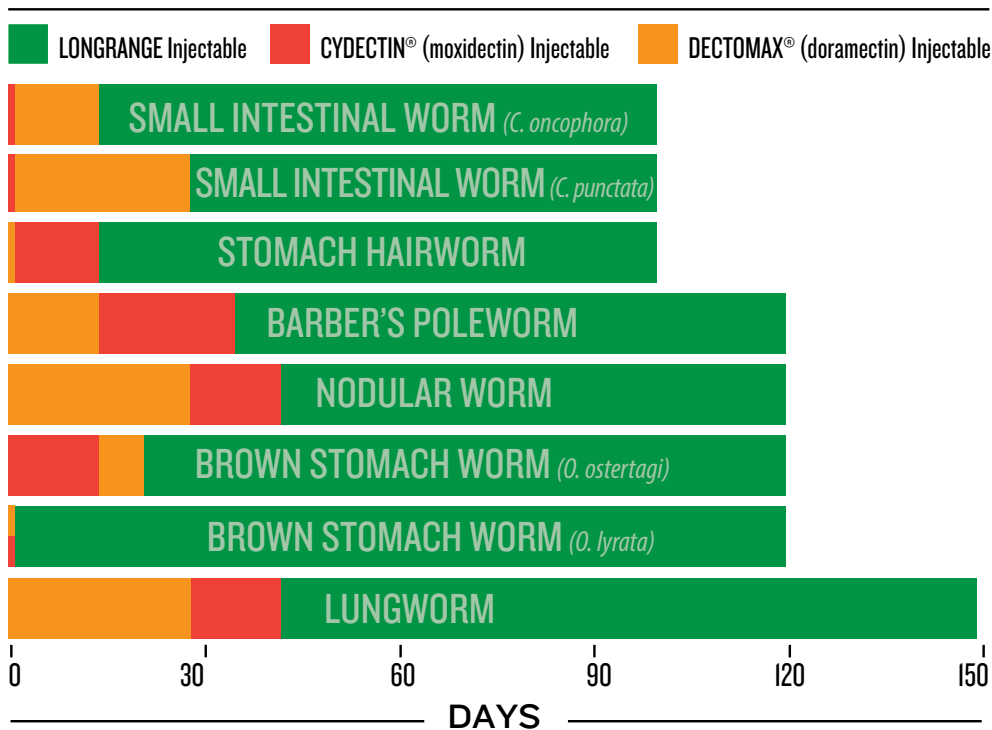
Hypoderma bovis

Mites

Sarcoptes scabiei var. *bovis*

Persistent activity

As shown in the graph below, other macrocyclic lactone cattle worming products do not approach the persistent activity of LONGRANGE against eight economically important species of parasites, and SAFE-GUARD® (fenbendazole) has not demonstrated persistent activity against cattle parasites.^{2,5-9}

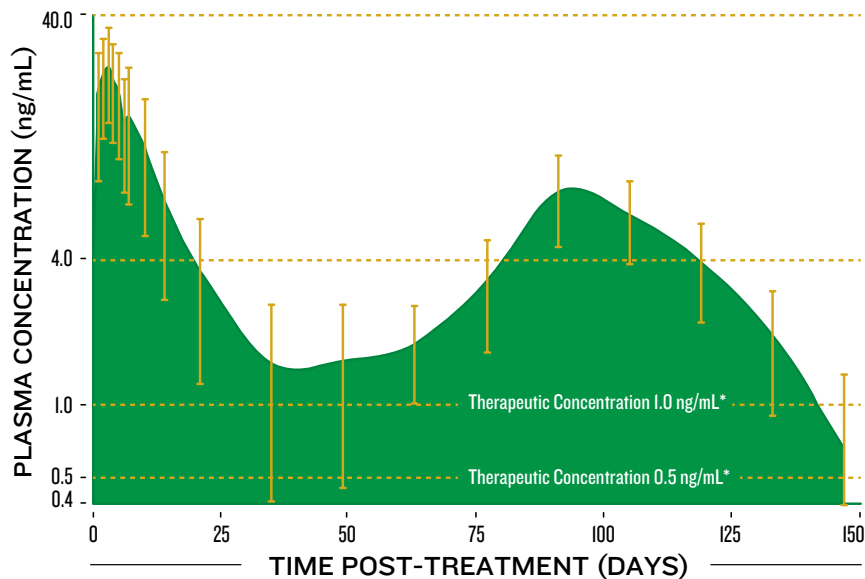


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Unique chemistry and pharmacokinetics²

LONGRANGE™ (eprinomectin) goes to work quickly and continues to provide control of susceptible parasites for an extended period. It is the only parasiticide that provides effective plasma concentrations with two peaks. The unique THERAPHASE™ Technology in LONGRANGE creates one initial therapeutic peak in the bloodstream shortly following injection. Systemic levels then begin to decline, but remain above the effective levels. Beginning around 70 days, the THERAPHASE matrix releases a second bolus of eprinomectin, creating a second peak of LONGRANGE plasma levels.

Pharmacokinetic studies of LONGRANGE in cattle indicate that effective plasma levels remain for an extended period of time (at least 100 days).²



*Plasma concentrations between 0.5 and 1.0 ng/mL would represent the minimal drug level required for optimal nematocidal activity.

The extended activity of LONGRANGE reduces parasite burdens in the herd as well as reducing levels on the pasture^{3,4}

Since 1949, we've known that if parasite burdens are controlled in the pasture, they will be controlled in the herd.¹⁰ For decades, producers have treated cattle with products that include avermectins, levamisoles and benzimidazoles, none of which have provided adequate control of parasite levels on the pasture without multiple treatments, necessitating extra handling of the cattle on pasture, increasing the level of stress in the cattle and creating more work and expense for the producer.

Parasites overwinter on the pastures, so they're already present when it's time for spring deworming. It takes about 100 days of continuous parasite control to reduce the parasite burden on pasture.^{3,4}

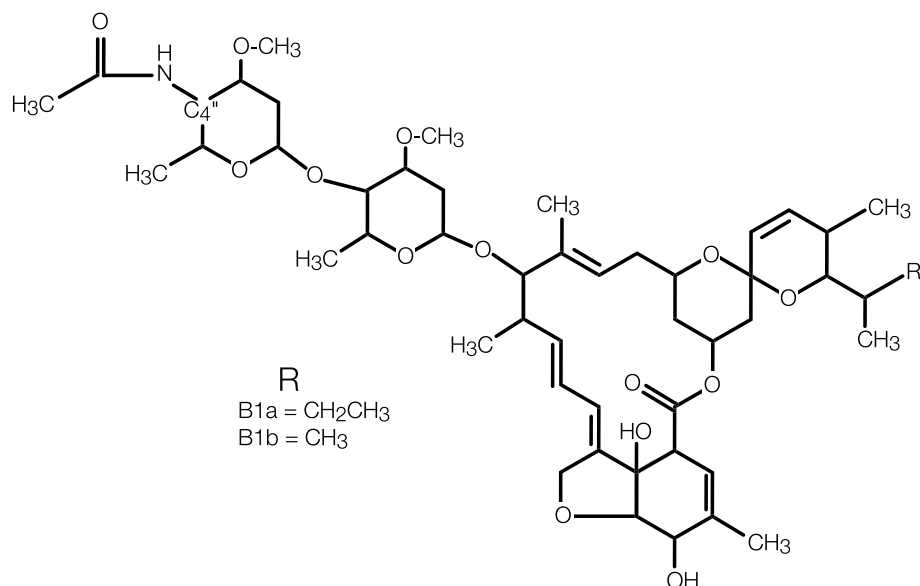
When used at turnout, LONGRANGE protects against infective larvae in the pasture longer than any other product on the market.^{1,5-7}

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

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LONGRANGE™ (eprinomectin) chemistry and mode of action

- The macrocyclic lactones have a unique mode of action²
- Compounds of this class bind selectively with high affinity to glutamate-gated chloride ion channels present in invertebrate nerve and muscle cells²
- This leads to an increase in the permeability of the cell membrane to chloride ions with hyperpolarization of the nerve or muscle cell, resulting in paralysis and death of the parasite²
- Compounds of this class may also interact in other ligand-gated chloride ion channels, such as those gated by the neurotransmitter gamma-aminobutyric acid (GABA)²



LONGRANGE™ (eprinomectin) ERI chemistry²

LONGRANGE is a ready-to-use, sterile, injectable preparation containing eprinomectin, a member of the macrocyclic lactone class of parasiticides. Each mL of LONGRANGE contains 50 mg of eprinomectin in a cosolvent system of N-methyl-2-pyrrolidone (30% v/v) and triacetin (qs), along with 50 mg of poly-lactide-co-glycolic-acid 75:25 (PLGA), a polymer that allows a slow release of eprinomectin from the formulation, thereby maintaining a prolonged duration of effectiveness. Butylated hydroxytoluene (0.2 mg/mL) acts as an antioxidant in the formulation.

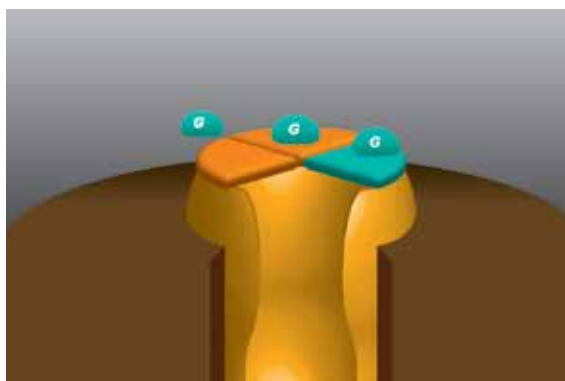
The chemical name of eprinomectin is 4''-deoxy-4''-epiacetyl-amino-avermectin B₁. It is a semi-synthetic member of the avermectin family of compounds, consisting of a mixture of two homologous components, B_{1a} and B_{1b}, which differ by a single methylene group at C₂₆.

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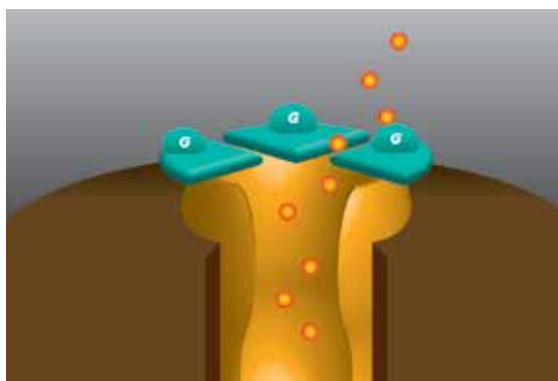
LONGRANGE™ (eprinomectin) mode of action²

The mode of action of macrocyclic lactones, including eprinomectin, has been studied extensively. These compounds bind selectively and with high affinity to the glutamate-gated chloride ion channels in invertebrate nerve and muscle cells. This mode of action is highly effective against nematodes, mites and grubs, making macrocyclic lactones a favored class of parasiticides for several decades.

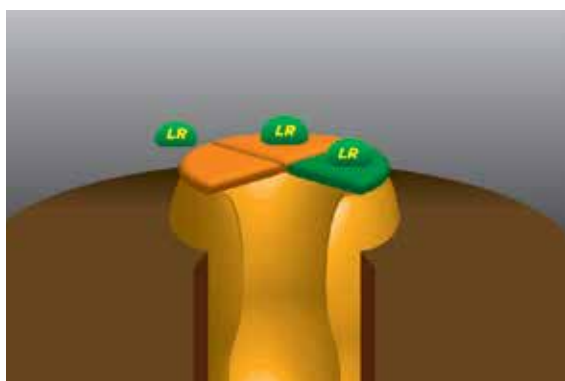
Mammals do not have glutamate-gated chloride ion channels. LONGRANGE has low affinity for mammalian ligand-gated channels and does not readily cross the blood-brain barrier. This accounts for the high margin of safety of LONGRANGE as well as other macrocyclic lactones.



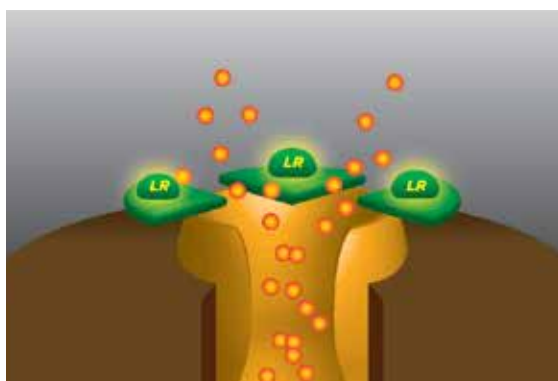
1) In normal parasite nerve and muscle cells, glutamate binds to specialized sites to open chloride ion channels in the cell membrane.



2) The channel opens selectively, allowing a controlled flow of chloride ions through the cell membrane.



3) LONGRANGE binds selectively and with high affinity to these glutamate receptor sites.



4) Once LONGRANGE is bound, the cell membrane becomes highly permeable to chloride ions, resulting in hyperpolarization of the cell. This mode of action effectively interferes with normal cellular function, resulting in paralysis and death of the parasite.

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The unique formulation and pharmacokinetics of LONGRANGE™ (eprinomectin)

- LONGRANGE is the only parasiticide with THERAPHASE™ Technology^{2,11}
- Effective plasma concentrations remain for an extended period of time (at least 100 days)²
- After subcutaneous (SC) injection, THERAPHASE Technology forms a PLGA matrix²
- The biodegradable matrix forms a gel that allows gradual release of eprinomectin²
- Because of this unique technology, LONGRANGE is the only parasite control product with two plasma peaks^{2,11}

The unique formulation and pharmacokinetics of LONGRANGE™ (eprinomectin)

LONGRANGE is the first injectable parasiticide product to offer persistent activity for 100 to 150 days.^{1,11} This extended duration of activity, provided by unique THERAPHASE™ Technology, helps break the parasite life cycle on the pasture.²⁻⁴

Unique THERAPHASE Technology

LONGRANGE is to be administered by SC injection in the shoulder area of cattle. After injection, the THERAPHASE Technology forms a polymeric poly-lactide-co-glycolic-acid (PLGA) matrix. The biodegradable matrix solidifies *in vivo* to form an *in situ* gel, which allows a gradual release of eprinomectin.

The rate-limiting step is diffusion of the drug through the THERAPHASE matrix. Because of its mechanism of release, absorption characteristics can be highly dependent on the injection technique used and the corresponding surface-to-volume ratio of the gel. For more information, refer to the Dosage and Safety section in this technical manual or the LONGRANGE prescribing information.

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

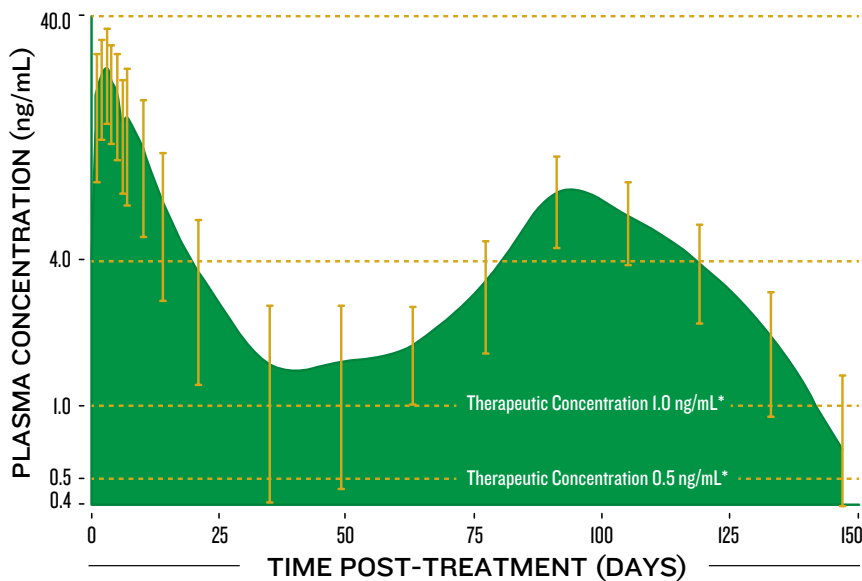
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LONGRANGE™ (eprinomectin) pharmacokinetics

The pharmacokinetic behavior and duration of exposure of parasites to effective dose concentrations is the key to obtaining optimal, persistent antiparasitic activity.² Plasma concentrations between 0.5 and 1 ng/mL represent the minimal drug level required for optimal nematocidal activity, while others have suggested minimum levels of 1 to 2 ng/mL.² Pharmacokinetic studies of LONGRANGE in cattle confirm that effective plasma levels persist for at least 100 days.²

Because of the unique THERAPHASE™ Technology that allows for gradual release of the active ingredient, LONGRANGE is the only parasiticide that provides peak plasma concentrations a second time after administration. Approximately 70 days after LONGRANGE is administered, plasma levels of eprinomectin reach their lowest point, then begin to increase again. This unique property of the THERAPHASE matrix that forms after injection of LONGRANGE is what allows active concentrations of eprinomectin to continue to work for at least 100 days.

Pharmacokinetic studies of LONGRANGE in cattle indicate that effective plasma levels remain for an extended period of time (at least 100 days).²



*Plasma concentrations between 0.5 and 1.0 ng/mL would represent the minimal drug level required for optimal nematocidal activity.

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Efficacy of LONGRANGE™ (eprinomectin) against adult nematodes

- A series of eight trials was conducted to examine the efficacy of LONGRANGE against adult nematodes¹²
- These trials were filed with the FDA CVM and reported in the Freedom of Information (FOI) summary¹²
- Based on the strength of the evidence, LONGRANGE was granted treatment and control claims for several parasite species^{2,12}



LONGRANGE™ (eprinomectin) adult parasite efficacy studies¹²

A series of eight dose confirmation studies was conducted with LONGRANGE at 1 mL/110 lbs. of body weight. These studies used artificially induced and naturally acquired parasite infections to examine the efficacy of LONGRANGE against various adult parasite species.

Results: LONGRANGE efficacy against adult parasites¹²

Parasite	FOI Study Designation							
	52001	52002	52003	45601	45602	45603	45604	45606
<i>Cooperia oncophora</i>	99.8	99.9	99.9	95.4	97.3	99.5	NA	NA
<i>Cooperia punctata</i>	99.8	99.9	NA	NA	99.7	NA	100	99.9
<i>Cooperia surnabada</i>	99.6	99.8	99.9	95.4	94.8	NA	NA	NA
<i>Cooperia pectinata</i>	NA	NA	NA	NA	NA	NA	100	NA
<i>Ostertagia ostertagi</i> L ₄ Inhibited	NA	100	NA	99.3	99.9	91.6	81.4	99.8
<i>Ostertagia ostertagi</i>	99.9	100	99.9	99.9	99.9	100	99.9	99.9
<i>Ostertagia leptospicularis</i>	NA	100	NA	NA	NA	NA	NA	NA
<i>Ostertagia lyrata</i>	NA	NA	98.7	NA	99.8	NA	NA	100
<i>Trichostrongylus axei</i>	100	100	NA	100	NA	NA	100	99.9
<i>Trichostrongylus colubriformis</i>	100	100	NA	100	NA	NA	NA	NA
<i>Dictyocaulus viviparus</i>	100	100	100	NA	NA	100	NA	NA
<i>Haemonchus contortus</i>	NA	100	NA	NA	NA	NA	NA	NA
<i>Haemonchus placei</i>	100	NA	NA	NA	99.9	NA	NA	NA
<i>Nematodirus helvetianus</i>	NA	100	100	NA	NA	NA	NA	NA
<i>Oesophagostomum radiatum</i>	100	100	100	NA	NA	NA	100	100
<i>Strongyloides papillosus</i>	NA	98.3	NA	NA	NA	NA	NA	NA
<i>Bunostomum phlebotomum</i>	NA	100	NA	NA	NA	NA	NA	NA

Efficacy = 100 [(geometric mean Control – geometric mean LONGRANGE)/geometric mean Control].
NA = Not Analyzed.

EFFICACY – ADULT NEMATODES

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LONGRANGE™ (eprinomectin) proved effective against several parasite species, both L₄ and adults. Based on the results of these studies and others, claims were granted to control the following internal and external parasites.^{2,12}

Gastrointestinal Roundworms

Cooperia oncophora – Adults

Cooperia oncophora – L₄

Cooperia punctata – Adults

Cooperia punctata – L₄

Cooperia surnabada – Adults

Cooperia surnabada – L₄

Haemonchus placei – Adults

Oesophagostomum radiatum – Adults

Ostertagia lyrata – Adults

Ostertagia ostertagi – Adults

Ostertagia ostertagi – L₄ and inhibited L₄

Trichostrongylus axei – Adults

Trichostrongylus axei – L₄

Trichostrongylus colubriformis – Adults

Lungworms

Dictyocaulus viviparus – Adults

Grubs

Hypoderma bovis

Mites

Sarcoptes scabiei var. *bovis*

Efficacy of LONGRANGE™ (eprinomectin) against developing nematodes¹²

- Three studies examined the efficacy of LONGRANGE against several species of nematodes in stages of larval development¹²
- These trials were filed with the FDA CVM and reported in the Freedom of Information (FOI) summary¹²
- Based on the results of these studies and others, LONGRANGE was granted claims for several species of developing L₄ nematodes^{2,12}

EFFICACY – DEVELOPING
L₄ NEMATODES

Efficacy of LONGRANGE™ (eprinomectin) against developing L₄ larvae¹²

A series of three dose confirmation studies was conducted to examine the efficacy of LONGRANGE at 1 mL/110 lbs. of body weight against developing L₄ stages of several nematode species. Artificially induced infections were timed so that larvae would be in developing L₄ stages at the time of treatment.

Results: LONGRANGE is effective against several species of developing L₄ nematodes¹²

Parasite	FOI Study Designation		
	52101	52102	52103
<i>Cooperia oncophora</i>	100	99.9	100
<i>Cooperia punctata</i>	100	100	NA
<i>Cooperia surnabada</i>	100	99.7	100
<i>Ostertagia ostertagi</i>	100	100	100
<i>Trichostrongylus axei</i>	100	100	NA
<i>Dictyocaulus viviparus</i>	NA	100	100
<i>Haemonchus contortus</i>	NA	100	NA
<i>Nematodirus helvetianus</i>	NA	100	100
<i>Oesophagostomum radiatum</i>	NA	100	100
<i>Ostertagia leptospicularis</i>	NA	100	NA
<i>Strongyloides papillosus</i>	NA	99.9	NA
<i>Trichostrongylus colubriformis</i>	NA	100	NA

Efficacy = 100 [(geometric mean Control – geometric mean LONGRANGE)/geometric mean Control].
NA = Not Analyzed.

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LONGRANGE™ (eprinomectin) proved effective against several species of developing nematodes. Based on the results of these studies and others, claims were granted to control the following internal and external parasites.^{2,12}

Gastrointestinal Roundworms

Cooperia oncophora – Adults

Cooperia oncophora – L₄

Cooperia punctata – Adults

Cooperia punctata – L₄

Cooperia surnabada – Adults

Cooperia surnabada – L₄

Haemonchus placei – Adults

Oesophagostomum radiatum – Adults

Ostertagia lyrata – Adults

Ostertagia ostertagi – Adults

Ostertagia ostertagi – L₄ and inhibited L₄

Trichostrongylus axei – Adults

Trichostrongylus axei – L₄

Trichostrongylus colubriformis – Adults

Lungworms

Dictyocaulus viviparus – Adults

Grubs

Hypoderma bovis

Mites

Sarcoptes scabiei var. *bovis*

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Efficacy of LONGRANGE™ (eprinomectin) against external cattle parasites^{13,14}

- A series of studies examined the effectiveness of LONGRANGE against *Hypoderma* and Sarcoptic mange^{13,14}
- In these studies, LONGRANGE demonstrated 100 percent efficacy against *Hypoderma*¹³
- In these studies, LONGRANGE demonstrated 100 percent efficacy against *Sarcoptes scabiei* var. *bovis* from day 28 on¹⁴



The efficacy of LONGRANGE™ (eprinomectin) against *Hypoderma* spp. (*Diptera: Oestridae*) in cattle¹³

Although sound management strategies have reduced the prevalence of *Hypoderma* spp., it is still present in many areas, and this parasite is responsible for substantial economic losses in the regions that continue to report its presence.

Three studies (two in the United States and one in Germany) examined the efficacy of LONGRANGE against naturally acquired first-, second- and third-stage larvae of *Hypoderma* spp. In each study, 30 cattle from herds with a history of *Hypoderma* infestation were placed in replicates of three on the basis of pretreatment anti-*Hypoderma* antibody titers. Animals in each replicate were randomly allocated to treatment with vehicle or LONGRANGE at 1 mL/110 lbs. body weight by SC injection on Day 0, and one was given LONGRANGE at 1 mL/110 lbs. body weight by SC injection once larvae had reached second and third instars.

Results: In these studies, LONGRANGE was 100 percent effective against *Hypoderma*¹³

LONGRANGE was 100 percent ($P < 0.05$) efficacious against first-, second- and third-stage larvae of *H. bovis* (two studies) and *H. lineatum* (one study).

Efficacy of LONGRANGE™ (eprinomectin) against natural infestations of first-, second- and third-stage larvae of *Hypoderma* spp.

Study ¹	Treatment	Larval stage	Prevalence ²	GM ³ (Range)	Efficacy ⁴ (%)	Probability ⁵
<i>Live Hypoderma lineatum</i> larvae						
1	Control		8/10	4.9 (0-26)	--	--
	LONGRANGE	L ₁	0/10	0	100	<0.05
	LONGRANGE	L ₂ /L ₃	0/10	0	100	<0.05
<i>Live Hypoderma bovis</i> larvae						
2	Control		10/10	12.3 (1-52)	--	--
	LONGRANGE	L ₁	0/10	0	100	<0.01
	LONGRANGE	L ₂ /L ₃	0/10	0	100	<0.01
3	Control		7/10	1.8 (0-9)	--	--
	LONGRANGE	L ₁	0/10	0	100	<0.05
	LONGRANGE	L ₂ /L ₃	0/9 ⁶	0	100	<0.05

¹Source of animals: Study 1 – Wyoming, USA; Study 2 – Rhine Palatinate, Germany; Study 3 – Wisconsin, USA.

²Prevalence: Number of cattle infested/Number of cattle in group.

³GM = Geometric mean live larval counts [based on transformation to the natural logarithm of (count + 1)].

⁴Efficacy = 100 x (GM Control – GM LONGRANGE/GM Control).

⁵Probability determined using the Wilcoxon rank sum test.

⁶One animal died of a lung hemorrhage on Study Day 42, prior to treatment.

Treatment and control of bovine sarcoptic mange (*Sarcoptes scabiei* var. *bovis*) using LONGRANGE injection¹⁴

The presence of *Sarcoptes scabiei* can result in reduced weight gain and lower feed conversion efficiency. Three studies (two in Germany and one in Austria) verified the efficacy of LONGRANGE against *S. scabiei*.

A total of 44 cattle (12 in one study and 16 in each of the other two studies) were experimentally infested with *S. scabiei*. Infestations were confirmed by skin scrapings before treatments were initiated. Replicates of two animals each were formed on the basis of pretreatment body weights. Within replicates, the animals were randomly allocated to treatment with vehicle or LONGRANGE, each administered at 1 mL/110 lbs. body weight by SC injection on Day 0.

Mite counts and lesion scores were evaluated weekly for 8 weeks after treatment. Live mites were counted in scrapings collected from 3 cm by 3 cm areas at the edges of active lesions. Where lesions regressed during the study, mites were collected from a 3 cm by 3 cm scraping of the area where active lesions had been present at the start of the study. Six sites were scraped on each animal at each weekly time point.

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When skin scrapings were taken, the mange lesions were assessed and scored as follows:
 0 = healthy skin; (+) = healing lesion, crusts detached easily but hair growth not complete; + = active lesion, extent of less than the palm of the hand; ++ = active lesion, extent of more than the palm of the hand; +++ = active lesion, extent of more than half of the body of the animal.

Results: From day 28 on, LONGRANGE™ (eprinomectin)-treated cattle had 100 percent reduction in *Sarcoptes scabiei* mites

From day 28 on, live mite counts, as confirmed by post-treatment skin scrapings, were reduced 100 percent in cattle treated with LONGRANGE compared with control animals.

Sarcoptes scabiei var. *bovis* mite counts¹⁴

Study	Study Day	Control (ERI vehicle)		LONGRANGE		Efficacy ⁴ (%)	Probability ⁵
		Prevalence ¹	GM ^{2,3}	Prevalence	GM		
<i>Live Sarcoptes scabiei</i> var. <i>bovis</i> mites							
1	-1	6/6	>276.2	6/6	>235.5	--	NS
	7	6/6	>303.9	2/6	0.6	>99	<0.05
	14	6/6	>385.1	1/6	0.1	>99	<0.05
	21	6/6	>336.9	0/6	0	100	<0.05
	28	6/6	>341.3	0/6	0	100	<0.05
	36	6/6	>323.7	0/6	0	100	<0.05
	42	6/6	>254.9	0/6	0	100	<0.05
	49	6/6	>255.1	0/6	0	100	<0.05
	56	6/6	>204.8	0/6	0	100	<0.05
2	-1	8/8	>311.0	8/8	>281.4	--	NS
	7	8/8	>398.0	0/8	0	100	<0.05
	14	8/8	>421.3	0/8	0	100	<0.05
	21	8/8	>487.3	0/8	0	100	<0.05
	28	8/8	>519.1	0/8	0	100	<0.05
	35	8/8	>547.4	0/8	0	100	<0.05
	42	8/8	>563.7	0/8	0	100	<0.05
	49	8/8	>545.2	0/8	0	100	<0.05
	56	8/8	>562.8	0/8	0	100	<0.05
3	-1	8/8	64.6	8/8	69.9	--	NS
	7	8/8	120.3	5/8	2.9	97.6	<0.05
	14	8/8	124.3	1/8	0.6	>99	<0.05
	21	8/8	177.7	1/8	0.2	>99	<0.05
	28	8/8	151.6	0/8	0	100	<0.05
	35	8/8	218.0	0/8	0	100	<0.05
	42	8/8	187.6	0/8	0	100	<0.05
	49	8/8	254.6	0/8	0	100	<0.05
	56	8/8	501.5	0/8	0	100	<0.05

¹ Prevalence: Number of cattle infested/Number of cattle in group.

² Geometric mean counts [based on transformation to the natural logarithm of (count + 1)].

³ Mean preceded by ">" had at least one animal with a site with more than 100 mites.

⁴ Efficacy = 100 x [GM Control (ERI vehicle) – GM LONGRANGE ERI/GM Control (ERI vehicle)].

⁵ Probability by Wilcoxon rank sum test.

NS = Not significant at $\alpha = 0.05$.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Results: Cattle treated with LONGRANGE™ (eprinomectin) had lower mange lesion scores¹⁴

In addition to demonstrating significant efficacy in the reduction of *Sarcoptes scabiei* counts, cattle treated with LONGRANGE also had lower mange lesion scores than control cattle.

Mange lesion scores of LONGRANGE-treated cattle at study Days 14 to 56 (Study 1), and Days 21 to 56 (Studies 2 and 3), were significantly ($P < 0.05$) lower than scores for control cattle.

No active lesions were observed on any treated animal from 5 weeks after treatment onwards to the end of the studies, whereas all control (vehicle-treated) cattle had active lesions throughout the study.

Mange lesion scores¹⁴

Study	Study Day	Mange lesion score (number of animals)		Probability ¹
		Control (ERI vehicle) (n = 6 or 8)	LONGRANGE (n = 6 or 8)	
1	-1	++ (6)	++ (6)	NS
	7	++ (6)	++ (6)	NS
	14	++ (4)/+++ (2)	(+) (5)/++ (1)	<0.05
	21	++ (3)/+++ (3)	(+) (6)	<0.05
	28	++ (2)/+++ (4)	(+) (6)	<0.05
	36	++ (2)/+++ (4)	(+) (6)	<0.05
	42	++ (2)/+++ (4)	(+) (6)	<0.05
	56	++ (1)/+++ (5)	(+) (6)	<0.05
2	-1	++ (8)	++ (8)	NS
	7	++ (7)/+++ (1)	++ (8)	NS
	14	++ (6)/+++ (2)	(+) (1)/++ (7)	NS
	21	++ (6)/+++ (2)	(+) (8)	<0.05
	28	++ (6)/+++ (2)	(+) (8)	<0.05
	35	++ (4)/+++ (4)	(+) (8)	<0.05
	42	++ (5)/+++ (3)	(+) (8)	<0.05
	56	++ (1)/+++ (7)	0 (7)/(+) (1)	<0.05
3	-1	++ (8)	++ (8)	NS
	7	++ (8)	++ (8)	NS
	14	++ (8)	+ (3)/++ (5)	NS
	21	++ (8)	0 (2)/(+) (4)/+ (2)	<0.05
	28	++ (8)	0 (5)/(+) (1)/+ (2)	<0.05
	35	++ (8)	0 (6)/(+) (2)	<0.05
	42	+ (1)/++ (7)	0 (6)/(+) (2)	<0.05
	56	+ (1)/++ (7)	0 (7)/(+) (1)	<0.05

0 = healthy skin.

(+) = healing lesion, crusts lifted and detached easily but hair growth not complete.

+ = active lesion, extent less than the palm of the hand.

++ = active lesion, extent more than the palm of the hand.

+++ = active lesion, extent more than half of the body of the animal.

¹ Probability from Wilcoxon rank sum test comparing LONGRANGE ERI to control (ERI vehicle).

NS = Not significant at $\alpha = 0.05$.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Results: In studies of *Sarcoptes scabiei*, cattle treated with LONGRANGE™ (eprinomectin) gained more weight¹⁴

In all three studies, cattle treated with LONGRANGE gained more weight than control cattle (55, 31 and 9 lbs., respectively). In two of the three studies, the difference in weight gain and final body weights was significantly ($P < 0.05$) different from control cattle.

Summary of body weight and weight gain data¹⁴

Study	Treatment (n)	Mean ¹ pre-infestation ² Body weight (lbs.)	Mean Day -1 Body weight (lbs.)	Mean Day 56 Body weight (lbs.)	Mean weight gain (lbs.) Day -1 to 56
1	Control (6)	275.4	355.3	398.6	43.34
	LONGRANGE (6)	274.6	350.2	448.8	98.56
	Probability ³	NS	NS	<0.05	<0.05
2	Control (8)	415.35	494.12	550.44	56.44
	LONGRANGE (8)	408.32	495.44	583.0	87.74
	Probability	NS	NS	<0.05	<0.05
3	Control (8)	291.72	406.56	535.7	129.14
	LONGRANGE (8)	280.94	400.18	538.34	138.16
	Probability	NS	NS	NS	NS

¹ Arithmetic means for Study 1; least squares means for Studies 2 and 3.

² Day -56 for Studies 1 and 2 or Day -58 for Study 3.

³ Probability values from mixed model analysis of variance comparing LONGRANGE ERI to Control.

NS = Not significant at $P \geq 0.05$.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

LONGRANGE™ (eprinomectin) 100-day persistent activity studies¹²

- Two studies examined the 100-day persistent activity of LONGRANGE against GI and pulmonary nematodes¹²
- These trials were filed with the FDA CVM and reported in the Freedom of Information (FOI) summary¹²
- Based on the results of these studies and others, LONGRANGE was granted 100-day persistent activity claims for multiple species^{2,12}

100-DAY PERSISTENT
ACTIVITY STUDIES

ACTIVITY

100-day persistent activity of LONGRANGE™ (eprinomectin) against gastrointestinal and pulmonary nematodes¹²

A series of two dose confirmation studies was conducted to examine the efficacy of LONGRANGE at 1 mL/110 lbs. against induced challenge with a variety of GI and pulmonary nematode species at 100 days after treatment.

Results: LONGRANGE is effective against several species at 100 days after treatment¹²

Parasite	FOI Study Designation	
	73701	73702
<i>Cooperia oncophora</i>	99.9	97
<i>Cooperia punctata</i>	99.9	99.6
<i>Cooperia surnabada</i>	99.9	NA
<i>Ostertagia ostertagi</i>	NA	99.7
<i>Trichostrongylus axei</i>	99.9	99.7

Efficacy = 100 [(geometric mean Control – geometric mean LONGRANGE)/geometric mean Control].
NA = Not Analyzed.

LONGRANGE proved effective at 100 days after treatment against several species. Based on the results of these studies and others, claims were granted to control the following parasites for 100 days.

LONGRANGE claims granted for parasites controlled for 100 days after treatment:^{2,12}

- Cooperia oncophora*
- Cooperia punctata*
- Trichostrongylus axei*

100-DAY PERSISTENT ACTIVITY STUDIES

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

LONGRANGE™ (eprinomectin) 120-day persistent activity studies¹²

- Eleven studies examined the 120-day persistent activity of LONGRANGE against GI and pulmonary nematodes¹²
- These trials were filed with the FDA CVM and reported in the Freedom of Information (FOI) summary¹²
- Based on the results of these studies and others, LONGRANGE was granted 120-day persistent activity claims for multiple species^{2,12}
- Several of the studies also showed an increase in average weight gain in groups treated with LONGRANGE versus control cattle¹⁵

120-DAY PERSISTENT
ACTIVITY STUDIES

120-day persistent activity of LONGRANGE™ (eprinomectin) against gastrointestinal and pulmonary nematodes¹²

A series of dose confirmation studies of LONGRANGE at 1 mL/110 lbs. was conducted to examine the efficacy of LONGRANGE against a variety of GI and pulmonary nematodes at 120 days after treatment. Different study protocols used single point challenge infections or natural infection by grazing contaminated pasture to gauge efficacy.

Results: LONGRANGE proved effective against a variety of species at 120 days after treatment¹²

Parasite	FOI Study Designation											
	73701	73702	47301	47302	47303	128701	73201	47201	47202	47203	47204	160101
<i>Cooperia oncophora</i>	97.9	99.1	99.7	70.1	NA	83	NA	99.9	99.9	NA	99.9	NS
<i>Cooperia punctata</i>	99.4	99.8	NA	69.5	99.8	78.1	95.8	NA	99.9	84.3	NA	29.1
<i>Cooperia surnabada</i>	99.5	NA	96.1	73.5	NA	86.9	NA	100	99.9	NA	98.6	29.6
<i>Ostertagia ostertagi</i> L ₄ Inhibited	NA	NA	NA	NA	NA	NA	NA	NA	99.9	NA	NA	NA
<i>Ostertagia ostertagi</i>	NA	99.8	99.9	99.4	99.9	97.1	99.9	99.9	99.9	99.8	99.9	97.4
<i>Ostertagia leptospicularis</i>	NA	NA	NA	99.3	NA	NA	NA	NA	99.9	NA	NA	NA
<i>Ostertagia lyrata</i>	NA	NA	NA	NA	NA	NA	NA	100	NA	99.5	NA	96.8
<i>Trichostrongylus axei</i>	84.3	99.5	NA	74.7	65.8	69.4	100	NA	99.8	99.8	NA	NS
<i>Dictyocaulus viviparus</i>	NA	NA	100	99.7	100	NA	NA	NA	100	NA	NA	NA
<i>Haemonchus placei</i>	NA	NA	NA	NA	92.4	NA	NA	NA	NA	98.8	NA	NA
<i>Nematodirus helvetianus</i>	NA	NA	99.1	84.8	NA	NA	NA	96.5	NA	NA	NA	21.9
<i>Nematodirus battus</i>	NA	NA	NA	NA	NA	13.6	NA	NA	NA	NA	NA	NA
<i>Oesophagostomum radiatum</i>	NA	NA	NA	99	99.6	NA	100	NA	100	98.5	NA	NA
<i>Bunostomum phlebotomum</i>	NA	NA	NA	99.8	NA	NA	NA	NA	NA	NA	NA	NA
<i>Trichuris ovis</i>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	94.8	NA

Efficacy = 100 [(geometric mean Control – geometric mean LONGRANGE)/geometric mean Control].

NA = Not Analyzed.

NS = Not Statistically Significant

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

LONGRANGE™ (eprinomectin) proved effective at 120 days after treatment against multiple species. Based on the results of these studies and others, claims were granted to control the following parasites for 120 days.

LONGRANGE claims granted for parasites controlled for 120 days after treatment:^{2,12}

Haemonchus placei

Oesophagostomum radiatum

Ostertagia ostertagi

Ostertagia lyrata

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

120-day weight gain results for LONGRANGE™ (eprinomectin)-treated cattle versus control cattle¹⁵

Summary of body weight and weight gain data.¹⁵

Study site	Treatment	Mean ¹ pretreatment body weight (lb) ²	Weight gain (lb) to Study Day 120 ²
Arkansas	Control	371.4	83.6
	LONGRANGE	372.7	125.6
	Probability ³	$P=0.59$	$P<0.05$
Idaho	Control	581.7	152.9
	LONGRANGE	581.7	171.9
	Probability	$P=0.98$	$P=0.16$
Louisiana	Control	558.1	202.2
	LONGRANGE	557.0	269.1
	Probability	$P=0.77$	$P<0.05$
Missouri	Control	400.6	106.7
	LONGRANGE	400.8	158.6
	Probability	$P=0.98$	$P<0.05$
Minnesota	Control	474.8	161.5
	LONGRANGE	471.0	175.8
	Probability	$P=0.11$	$P<0.05$
Oregon	Control	442.6	202.0
	LONGRANGE	439.8	266.4
	Probability	$P=0.60$	$P<0.05$
Wisconsin	Control	488.0	198.4
	LONGRANGE	488.2	246.8
	Probability	$P=0.85$	$P<0.05$

¹ Least squares mean rounded to one degree of precision post calculation.

² Pretreatment body weights were measured either on study days -5, -4, -3, -1 or 0.

³ Probability values were calculated by one-way analysis of variance. Non-significant probability values rounded to two degrees of precision.

At seven study sites, weight gain was measured before treatment and at study day 120. Across the sites, LONGRANGE-treated cattle gained more weight than control cattle. At six of the seven study sites, the difference in weight gain was statistically significant ($P>0.05$).

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

120-day LONGRANGE™ (eprinomectin) parasite control studies

Analysis of variance results for body weight gain

Combined data from seven trials¹⁶

Time Period	Treatment Group 1 ¹ Mean (lbs.)	Treatment Group 2 ² Mean (lbs.)	Weight Gain (lbs.)	P-value ³
0 to 28 Days	46.2	58.9	12.7	<0.0001
0 to 56 Days	85.3	109.9	24.6	<0.0001
0 to 84 Days	106.9	138.9	32	<0.0001
0 to 120 Days	151.1	190.2	39.1	<0.0001

¹ Treatment Group 1=Vehicle (Control).

² Treatment Group 2= Eprinomectin LAI.

³ P-value from ANOVA F-test

Bold: Significant at $\alpha=0.05$.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

LONGRANGE™ (eprinomectin) 150-day persistent activity studies¹²

- Three studies examined the 150-day persistent activity of LONGRANGE against GI and pulmonary nematodes¹²
- These trials were filed with the FDA CVM and reported in the Freedom of Information (FOI) summary¹²
- Based on the results of these studies and others, LONGRANGE was granted a 150-day persistent activity claim for cattle lungworm (*Dictyocaulus viviparus*)^{2,12}

150-DAY PERSISTENT
ACTIVITY STUDIES



150-day persistent activity of LONGRANGE™ (eprinomectin) against gastrointestinal and pulmonary nematodes¹²

A series of three dose confirmation studies of LONGRANGE at 1 mL/110 lbs. was conducted to examine the efficacy of LONGRANGE against a variety of GI and pulmonary nematodes at 150 days after treatment.

Results: LONGRANGE proved effective against cattle lungworms at 150 days after treatment¹²

Parasite	FOI Study Designation	
	135201	135301
<i>Cooperia oncophora</i>	NA	NA
<i>Cooperia punctata</i>	NA	NA
<i>Cooperia surnabada</i>	NA	NA
<i>Ostertagia ostertagi</i>	75.2	80.9
<i>Ostertagia lyrata</i>	NA	NA
<i>Trichostrongylus axei</i>	NA	NA
<i>Dictyocaulus viviparus</i>	100	97.7
<i>Haemonchus contortus</i>	NA	91.6
<i>Nematodirus helvetianus</i>	NA	NA
<i>Oesophagostomum radiatum</i>	NA	95.5
<i>Bunostomum phlebotomum</i>	NA	95.6
<i>Trichostrongylus colubriformis</i>	NA	NA

Efficacy = 100 [(geometric mean Control – geometric mean LONGRANGE)/geometric mean Control].
NA = Not Analyzed.

LONGRANGE proved effective at 150 days after treatment against *Dictyocaulus viviparus*. Based on the results of these studies, a claim was granted to control cattle lungworm for 150 days.

LONGRANGE claims granted for parasites controlled for 150 days after treatment:^{2,12}

Dictyocaulus viviparus

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

LONGRANGE™ (eprinomectin) dosing and safety



Administration and dosing²

LONGRANGE™ (eprinomectin) is labeled for subcutaneous (SC) injection in front of the shoulder at the recommended dose rate of 1 mL/50 kg of body weight (1 mL/110 lbs.), equivalent to 1 mg of eprinomectin per kg of body weight.

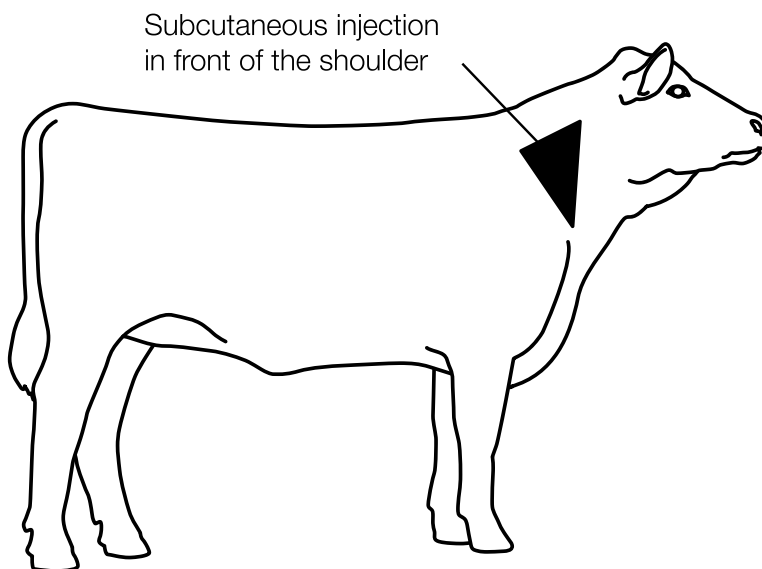
Each mL of LONGRANGE contains 50 mg of eprinomectin, sufficient to treat 110 lbs. (50 kg) of body weight. Doses larger than 10 mL should be divided between two injection sites to reduce potential site reactions and discomfort.

Do not administer with automatic dosing equipment.

Body Weight (lbs.)	Dose Volume (mL)
110	1
220	2
330	3
440	4
550	5
660	6
770	7
880	8
990	9
1,100	10

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Proper LONGRANGE™ (eprinomectin) injection site



LONGRANGE is to be given subcutaneously only. Animals should be appropriately restrained to achieve the proper route of administration. Inject under the loose skin in front of the shoulder (see illustration) using a 16 or 18 gauge, 1/2 to 3/4 inch needle.

Sanitize the injection site by applying a suitable disinfectant. Clean, properly disinfected needles should be used to reduce the potential for injection site infections.

50 mL bottle size: Use only polypropylene syringes. Not for use with polycarbonate syringe material. If syringe material is not known, contact the syringe manufacturer prior to use for identification. Do not use beyond 3 months after stopper has been punctured. Discard bottle after 15 stopper punctures.

250 mL and 500 mL bottle sizes: Use only automatic syringe equipment provided by Merial. To obtain compatible equipment, contact Merial at 1-888-637-4251 or your veterinarian. LONGRANGE should not be stored in automatic syringe equipment. Automatic syringe equipment should be thoroughly cleaned after each use. Discard bottle after one stopper puncture with draw-off spike.

No special handling or protective clothing is necessary.

LONGRANGE™ (eprinomectin) target animal safety²

Clinical studies have demonstrated the wide margin of safety of LONGRANGE. Overdosing with LONGRANGE at three to five times the recommended dose resulted in a statistically significant reduction in average weight gain when compared to the group treated with LONGRANGE at the recommended label dose. Treatment-related lesions observed in cattle treated with three and five times the labeled dose rate of LONGRANGE included swelling, hyperemia or necrosis in the subcutaneous tissue of the skin. No adverse reproductive effects were observed following administration of LONGRANGE at three times the recommended therapeutic dose to beef cows at all stages of breeding, pregnancy or nursing calves.

Not for use in bulls, as reproductive safety testing has not been conducted in males intended for breeding or that are actively breeding. Not for use in calves less than three months of age because safety testing has not been conducted in calves younger than three months.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

LONGRANGE™ (eprinomectin) packaging and storage



Packaging and storage



Packaging

LONGRANGE is available in three ready-to-use glass bottle sizes. The 50, 250 and 500 mL bottles contain sufficient solution to treat 10, 50 and 100 head of 550-lb. (250 kg) cattle, respectively. The 250 and 500 mL bottles are supplied in a removable plastic protector.

Case Quantities

LONGRANGE is packaged six or 12 bottles per case; 12 x 50 mL, 6 x 250 mL and 6 x 500 mL.

Storage

Store at or below 77 °F (25 °C) with excursions between 59-86 °F (15-30 °C). Protect from light.

To obtain a Material Safety Data Sheet (MSDS), contact Merial at 1-888-637-4251.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.



Bottle Protectors

All 500 and 250 mL bottles of LONGRANGE™ (eprinomectin) are manufactured with a bottle protector.



- Two-piece construction with locking threads can be opened and closed
- When the two “lock” symbols align, the threads are in a closed position
- Easy-to-handle ergonomic design
- Polypropylene material can be recycled
- Anti-roll designs help to stop rolling on a tabletop
- Bottom design includes a bottle hanger loop in the center
- Drop-testing program for 500 and 250 mL sizes*

***Merial advises customers to always handle the product with care because plastic bottle protectors can fail in high-impact situations.**

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Summary of LONGRANGE™ (eprinomectin)

LONGRANGE™ (eprinomectin) provides season-long parasite protection, lower parasite burdens on pastures and improved weight gain in cattle.^{2-4,14,15}

No other worming product on the market comes close to the level of persistent parasite control provided by LONGRANGE.^{1,2,11} With THERAPHASE™ Technology, LONGRANGE delivers parasite control for up to 100 to 150 days,¹ making LONGRANGE the ultimate parasite control solution for cattle.

Break the parasite life cycle with a single treatment¹⁻⁴

It takes about 100 days of continuous parasite control to break the parasite life cycle and begin to reduce the parasite burden on the pasture.^{3,4} Before the availability of LONGRANGE, multiple treatments with other products were required to reach a similar threshold of control. But with a single treatment solution provided by LONGRANGE, producers can save labor and reduce the stress and shrink that come from multiple handlings.

A single treatment that lasts all season means less labor for producers and less stress for cattle

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Don't let your clients leave their cattle's weight gain on the pasture¹⁷

Of all the animal health practices used for increasing production, treating beef cows for parasites gives the greatest economic return of up to \$201 per head, most of which results from reproductive gains.¹⁷ This includes improved reproduction and earlier calving, leading to earlier weight gain in the calves.¹⁷

Treating cattle for parasites can provide
a return of up to \$201 per head¹⁷

Persistent activity can lead to better weight and economic gains¹⁵

With THERAPHASE™ Technology, LONGRANGE™ (eprinomectin) has longer persistent activity against eight common parasites than any parasiticide on the market.^{2,11} Extended effective parasite control and less stress and handling provides better cattle weight gain. A seven-state study demonstrated that calves treated with LONGRANGE gained 45 percent of their baseline body weight, compared with 34 percent gained by control calves over a 120-day period.¹⁵

Tested throughout the United States and Europe¹²

Trials in the United States and Europe demonstrated significant efficacy of LONGRANGE against gastrointestinal and pulmonary nematodes.¹²

Persistent activity against eight economically important parasites^{2,9,12}

LONGRANGE is effective for at least 100 and up to 150 days against eight economically important species of parasites.^{1,9} A series of studies confirmed that LONGRANGE effectively breaks the parasitic life cycle and kills adult and larval parasites.^{3,4,12}

Effective against inhibited L₄ *Ostertagia*^{2,12}

In addition to a wide range of other gastrointestinal and pulmonary nematodes,^{2,12} LONGRANGE is effective against inhibited L₄ *Ostertagia*, which can emerge in great numbers causing severe clinical signs.

LONGRANGE™ (eprinomectin) is effective against external parasites^{13,14}

In a series of studies in the United States and Europe, LONGRANGE demonstrated 100 percent efficacy against *Hypoderma* spp. (*Diptera: Oestridae*) in cattle.¹³

LONGRANGE also controls mange. Three studies demonstrated 100 percent efficacy against *Sarcoptes scabiei* from day 28 on.¹⁴

In these studies, LONGRANGE was 100 percent efficacious against *Hypoderma* spp. and sarcoptic mange^{13,14}

LONGRANGE – the ultimate parasite solution

With its ease of administration at 1 mL/110 lbs. body weight and THERAPHASE™ Technology that delivers up to 100 to 150 days of parasite control in a single treatment, LONGRANGE is a true breakthrough in the fight against parasitism.¹ Try LONGRANGE with your clients, and see for yourself. It's a new category of parasite control that has the potential to make the same impact as IVOMEC® (ivermectin) did when it hit the market over three decades ago.

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

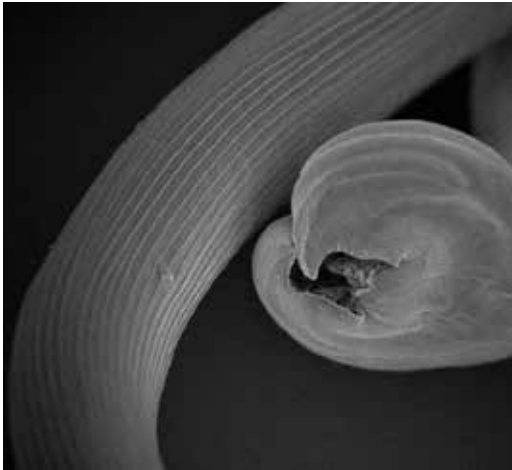
IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

IMPORTANT SAFETY INFORMATION: Do not treat within 48 days of slaughter. Not for use in female dairy cattle 20 months of age or older, including dry dairy cows, or in veal calves. Post-injection site damage (e.g., granulomas, necrosis) can occur. These reactions have disappeared without treatment.

Parasitology appendix

- Deworming is one of the most economically important decisions your clients make each season
- The following pages can be used as a discussion guide outlining the impact of various parasites on herd performance, as well as other helpful information about parasitism
 - Major cattle parasites: Page 61
 - Impact of parasitism: Page 63
 - The parasite life cycle: Page 64
 - Identifying parasitism: Page 65

Major cattle parasites



Common Name: Brown Stomach Worm

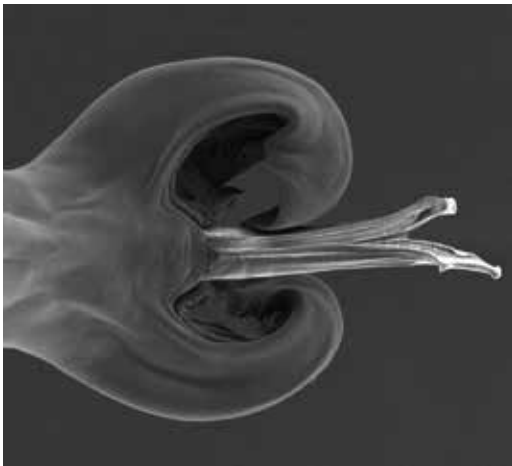
Scientific Name: *Ostertagia ostertagi*

Biology: Abomasum (True stomach)

LONGRANGE™ (eprinomectin) days of control: 120 days

Ostertagia is the most economically disruptive parasite in cattle.⁶

This worm also has a unique ability to penetrate the lining of the true stomach (abomasum) and become inhibited to survive during extreme weather conditions. When conditions improve, the larvae emerge, often in great numbers simultaneously, causing clinical disease.



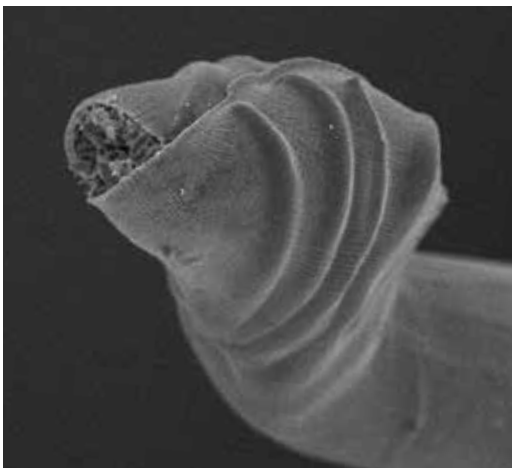
Common Name: Barber's Pole Worm or Red Stomach Worm

Scientific Name: *Haemonchus placei*

Biology: Abomasum (True stomach)

LONGRANGE™ (eprinomectin) days of control: 120 days

H. placei has a significant impact on cattle feed efficiency and performance.



Common Name: Stomach Hairworm

Scientific Name: *Trichostrongylus axei*

Biology: Abomasum (True Stomach)

LONGRANGE™ (eprinomectin) days of control: 100 days

Adult worms may penetrate the abomasal lining, causing irritation. Lesions may occur in these areas, causing diarrhea and reduced appetite.



Common Name: Cooperia, small intestinal worm

Scientific Name: *Cooperia oncophora*,
C. punctata, *C. surnabada*

Biology: Small Intestine

LONGRANGE™ (eprinomectin) days of control:
100 days

While they are found in great numbers, *Cooperia* are generally thought to contribute secondary effects to the more devastating parasites such as *Ostertagia*. However, some experts are beginning to attribute larger production issues to this parasite.



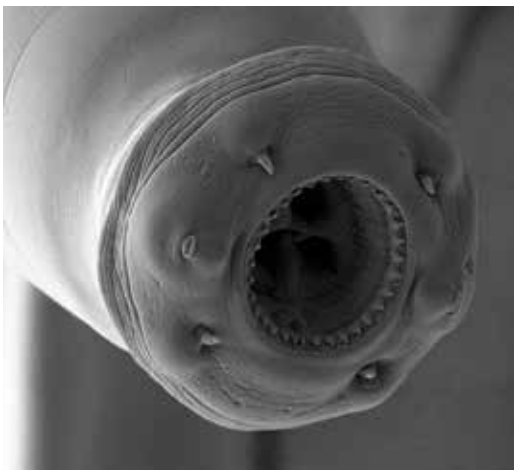
Common Name: Lungworm

Scientific Name: *Dictyocaulus viviparus*

Biology: Lungs, trachea, bronchi

LONGRANGE™ (eprinomectin) days of control:
150 days

Severe *D. viviparus* infections can lead to complications that can cause a mortality rate of 20 percent or more among affected animals.¹⁸ Larval lungworms irritate the bronchioles before eggs can be seen in nasal secretions or larvae appear in feces. Later, the adult worms irritate the trachea and bronchi. In both stages, increased respiratory secretion causes lung congestion.



Common Name: Nodular Worm

Scientific Name: *Oesophagostomum radiatum*

Biology: Intestinal walls

LONGRANGE™ (eprinomectin) days of control:
120 days

Infective larvae burrow into the intestinal wall, causing the formation of granulomas, which may reduce intestinal function. Adult worms are of greater concern for young animals.

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The impact of parasitism

Researchers at Iowa State University concluded that of all the pharmaceutical technologies examined, parasite control in cow herds had the greatest effect on breakeven prices – providing a value of up to \$201 per head, 70 percent of which is from reproduction. When compared with the second most important practice to a cow/calf herd – the use of growth-promoting implants – parasite control is almost six times more important to breakeven costs.¹⁷

Since parasites are generally out of sight, they can also be out of mind. It's important to remember that when left untreated, parasite infections in cattle can:

- Negatively impact the immune system¹⁹
- Suppress appetite and reduce feed intake²⁰
- Reduce weaning weights²¹
- Lower conception rates²²
- Alter carcass composition²³
- Decrease milk production²⁴

Of all the animal health practices used to increase production, treating beef cattle for parasites gives producers the greatest economic return¹⁷

Six of the seven top factors that influence your profitability are negatively affected by parasites (weaning weight, weaned calf crop, calf price, feed costs, cull cow weight, cull cow cost).²⁵

Parasite control can result in up to \$201 gain per head¹⁷

Some producers have a hard time believing that it is possible to improve financial gains to that extent; however, most of that figure is wrapped up in improved reproduction rates and improved weaning weights.¹⁷

Factors to consider^{26,27}

The level of parasite burden varies from location to location and animal to animal. However, here are some factors to consider as you evaluate the farm's deworming approach.

- **AGE:** Younger animals are more susceptible to clinical infection. While adult animals are less susceptible and may not demonstrate clinical signs when parasitized, a subclinical infection can negatively affect the health of that animal.
- **CLIMATE:** Warm and wet are ideal conditions for parasites. Hot and dry conditions reduce the risk of parasitic infections. Parasites can survive the cold (even Minnesota winters).¹⁷
- **CONDITIONS:** Heavily stocked pastures and/or limited acreage can result in higher parasite burden, particularly in mild, moist conditions. Increased precipitation can prolong parasite season on pasture.
- **TIMING:** Before LONGRANGE™ (eprinomectin), the only option was to strategically time multiple parasite treatments to get around 100 days of continuous parasite control, break the parasite life cycle and reduce the burden on pasture.^{3,4} But a single treatment with LONGRANGE lasts up to 100 to 150 days,¹ saving labor and stress to cattle from multiple handlings.

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

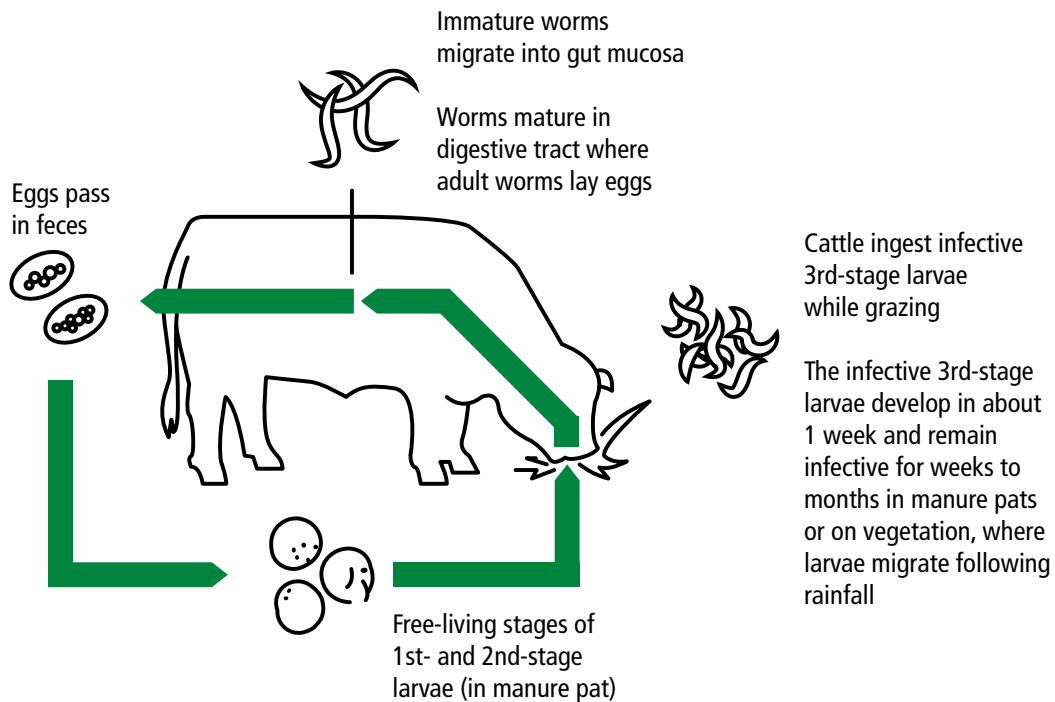
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The parasite life cycle^{20,28}

Understanding the life cycle of parasites can help you break the transmission cycle and protect your operation from economic loss.

Approximately 90 to 95 percent of parasites are on your pasture, while only 5 to 10 percent are in the animals at any given time. But parasites in the animal produce large numbers of eggs, which are passed onto the pasture, perpetuating parasitism in the herd.

Figure 1. Basic life cycle of common gastrointestinal nematodes of cattle



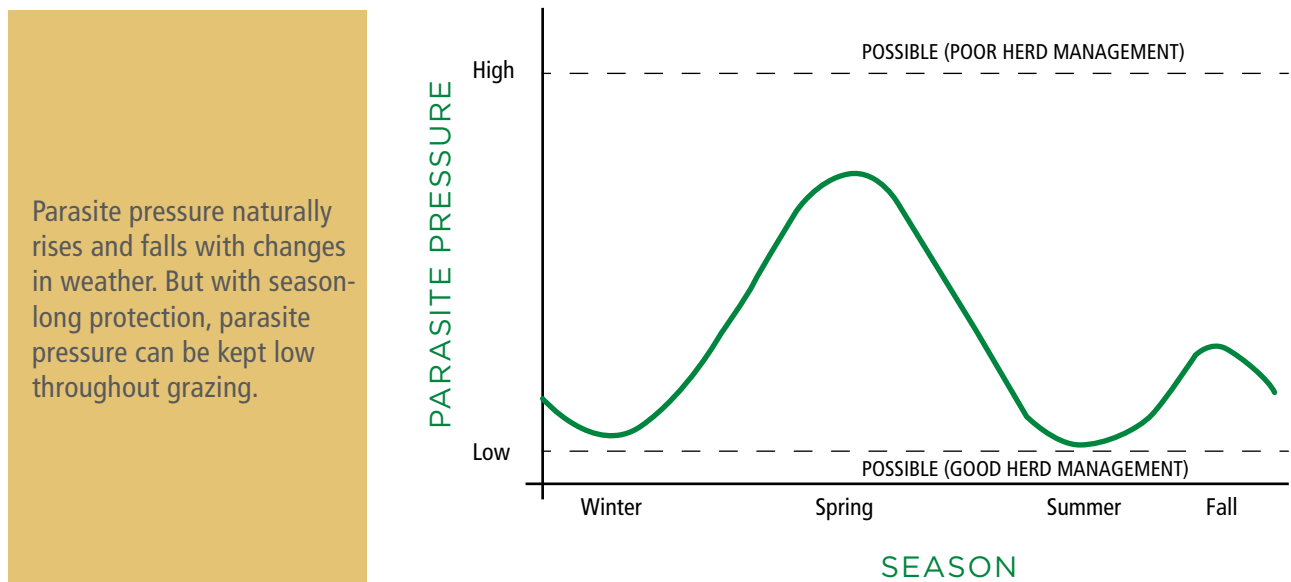
Identifying parasitism²⁰

The classic signs of severe parasitism include weight loss (or failure to gain), diarrhea, rough coat, bottle jaw and anemia. However, most cases of parasitism in cattle are subclinical.

In particular, adult cattle can be more resistant to the most severe effects of parasite infection. But the presence of parasites, even subclinical infections, can still have a significant impact on the performance of adult animals.

Using LONGRANGE™ (eprinomectin) as a spring deworming treatment provides coverage during the times when parasite transmission is highest and reduces the parasite burden on pasture. Refer to the chart below, outlining the natural course of parasite pressure during the season.²⁰

Figure 2: Seasonal parasite trends



LONGRANGE — the ultimate parasite solution

The ultimate goal of any parasite control program should be to allow your cattle the best performance possible while managing the persistent parasite threat on your pasture. LONGRANGE makes it possible with a single treatment that lasts up to 100 to 150 days.¹

¹ Dependent upon parasite species, as referenced in FOI summary and LONGRANGE product label.

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