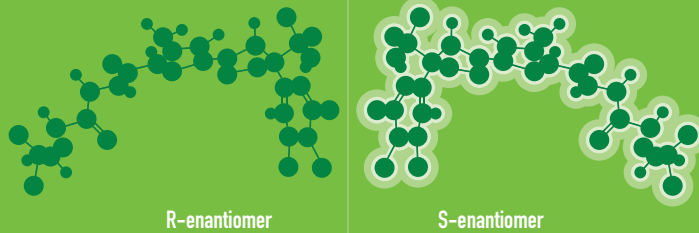


# GENTLE BY DESIGN



## What makes Credelio's active ingredient, Lotilaner so different?

The isoxazoline class of medications, used for control of ticks and fleas, are chiral molecules, meaning they start as a mixture of enantiomers. Enantiomers are molecules that share the same bond



Lotilaner (S-enantiomer) is 100 times more active than its R-enantiomer when measured in-vitro against *Ctenocephalides felis* and *R. sanguineus*.<sup>1</sup>

structure and 3D shape, but are mirror images of each other. Just because these two molecules might look like twins, it doesn't mean they have the same function.

## Think of your left and right hands as an analogy.

Your hands have the same shape and structure but are mirror images of each other. It is likely that one hand is more dominant than the other.

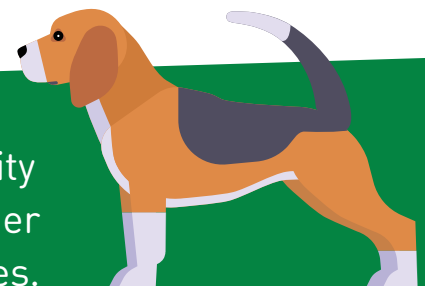


- Can you throw and catch a ball with the same accuracy with either hand?
- Can you write your name or draw a picture with the same level of detail with either hand?

While your left and right hands look like twins, your dominant hand functions at a much greater accuracy than its twin.

Elanco discovered that there was a difference in the activity between enantiomers — Lotilaner was the only enantiomer responsible for the powerful tick and flea killing properties.

Therefore, Credelio uses **only** the pure s-enantiomer Lotilaner as its active ingredient and removes the inactive part. **Lotilaner is Credelio's dominant hand.**



**INDICATIONS:** Credelio kills adult fleas and is indicated for the treatment and prevention of flea infestations (*Ctenocephalides felis*) and the treatment and control of tick infestations [*Amblyomma americanum* (lone star tick), *Dermacentor variabilis* (American dog tick), *Ixodes scapularis* (black-legged tick) and *Rhipicephalus sanguineus* (brown dog tick)] for one month in dogs and puppies 8 weeks of age and older, and weighing 4.4 pounds or greater.

**IMPORTANT SAFETY INFORMATION:** Lotilaner is a member of the isoxazoline class. This class has been associated with neurologic adverse reactions including tremors, ataxia, and seizures. Seizures have been reported in dogs receiving this class of drugs, even in dogs without a history of seizures. Use with caution in dogs with a history of seizures or neurologic disorders. The safe use of Credelio in breeding, pregnant or lactating dogs has not been evaluated. The most frequently reported adverse reactions are weight loss, elevated blood urea nitrogen, increased urination, and diarrhea. For full prescribing information see Credelio package insert.

# EXTRA PURIFIED

Credelio™  
(lotilaner)

It takes an extra purification step to isolate enantiomers. Some may argue it isn't necessary, that as long as you have the active molecule within the mixture, you are getting the same outcome.

**Elanco thinks differently.** Including the inactive member of a racemic mixture may seem trivial, but there have been cases where it has been linked to adverse consequences.<sup>2</sup> Even though all racemic mixtures may not cause issues, the FDA recommends removing the ineffective enantiomer when there is a recognized difference in potency or activity between the pair.<sup>2</sup>

Although not required, Elanco values the extra purification process for Credelio.

## Credelio's extra purification process offers 3 benefits:



1 Less potential for side effects<sup>2</sup>

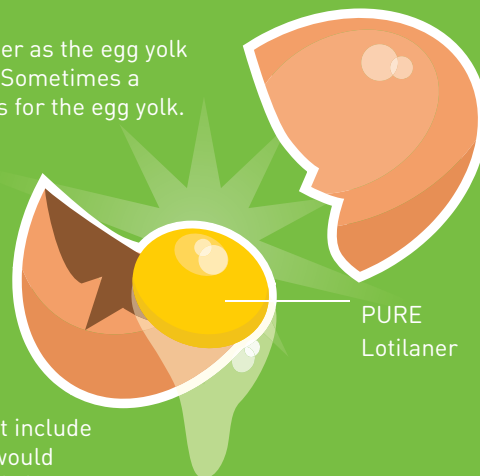


2 Less strain on the dog's system<sup>1</sup>

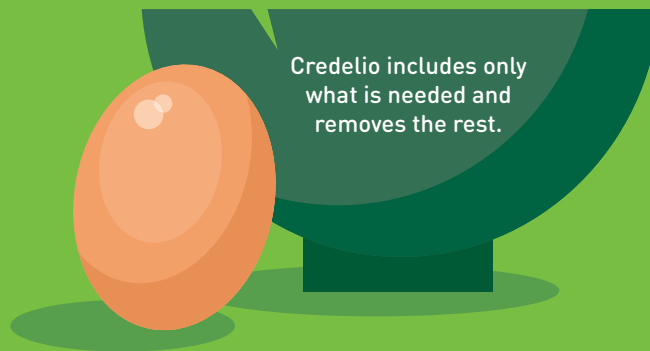


3 Better efficacy with the same dose of medication<sup>1</sup>

Think of Lotilaner as the egg yolk in a whole egg. Sometimes a recipe only calls for the egg yolk.



So, you wouldn't include the egg white, would you? That would change the final product.



**Credelio's extra purification** process removes the unnecessary enantiomer, and isolates Lotilaner for use in its final form – a small, tasty<sup>3</sup> chewable that is **gentle by design** – tough tick and flea protection that's gentle on dogs.

#### REFERENCES:

1. Toutain, C, Seewald W, Jung M. The intravenous and oral pharmacokinetics of lotilaner in dogs. *Parasites and Vectors*. 2017;10:522
2. Development of New Stereoisomeric Drugs.pdf <https://www.fda.gov/drugs/guidancecomplianceregulatoryinformation/guidances/ucm122883.htm>. Accessed 03/11/2019
3. Karadzovska D, Chappell K, Coble S, et al. A randomized, controlled field study to assess the efficacy and safety of lotilaner flavored chewable tablets (Credelio™) in eliminating fleas in client-owned dogs in the USA. *Parasites and Vectors*. 2017;10:528



# Credelio™

## (lotilaner)

Chewable Tablets

**For oral use in dogs**

**Caution:**

Federal law restricts this drug to use by or on the order of a licensed veterinarian.

**Description:**

CREDELIO (lotilaner) is a beef-flavored, chewable tablet for oral administration to dogs and puppies according to their weight. Each chewable tablet is formulated to provide a minimum lotilaner dosage of 9 mg/lb (20 mg/kg).

Lotilaner has the chemical composition of 5-[(5S)-4,5-dihydro-5-(3,4,5-trichlorophenyl)-5-(trifluoromethyl)-3-isoxazolyl]-3-methyl-N-[(2,2,2-trifluoroethyl)amino]ethyl]-2-thiophenecarboxamide.

**Indications:**

CREDELIO kills adult fleas and is indicated for the treatment and prevention of flea infestations (*Ctenocephalides felis*) and the treatment and control of tick infestations (*Amblyomma americanum* (lone star tick), *Dermacentor variabilis* (American dog tick), *Ixodes scapularis* (black-legged tick) and *Rhipicephalus sanguineus* (brown dog tick)) for one month in dogs and puppies 8 weeks of age and older, and weighing 4.4 pounds or greater.

**Dosage and Administration:**

CREDELIO is given orally once a month, at the minimum dosage of 9 mg/lb (20 mg/kg).

**Dosage Schedule:**

Body Weight	Lotilaner Per Chewable Tablet (mg)	Chewable Tablets Administered
4.4 to 6.0 lbs	56.25	One
6.1 to 12.0 lbs	112.5	One
12.1 to 25.0 lbs	225	One
25.1 to 50.0 lbs	450	One
50.1 to 100.0 lbs	900	One
Over 100.0 lbs	Administer the appropriate combination of chewable tablets	

CREDELIO must be administered with food (see **Clinical Pharmacology**).

Treatment with CREDELIO can begin at any time of the year and can continue year-round without interruption.

**Contraindications:**

There are no known contraindications for the use of CREDELIO.

**Warnings:**

Not for human use. Keep this and all drugs out of the reach of children. Keep CREDELIO in a secure location out of reach of dogs, cats, and other animals to prevent accidental ingestion or overdose.

**Precautions:**

Lotilaner is a member of the isoxazoline class. This class has been associated with neurologic adverse reactions including tremors, ataxia, and seizures. Seizures have been reported in dogs receiving isoxazoline class drugs, even in dogs without a history of seizures. Use with caution in dogs with a history of seizures or neurologic disorders. The safe use of CREDELIO in breeding, pregnant or lactating dogs has not been evaluated.

**Adverse Reactions:**

In a well-controlled U.S. field study, which included 284 dogs (198 dogs treated with CREDELIO and 86 dogs treated with an oral active control), there were no serious adverse reactions.

Over the 90-day study period, all observations of potential adverse reactions were recorded. Reactions that occurred at an incidence of 1% or greater are presented in the following table.

**Dogs with Adverse Reactions in the Field Study**

Adverse Reaction (AR)	CREDELIO Group: Number (and Percent) of Dogs with the AR (n=198)	Active Control Group: Number (and Percent) of Dogs with the AR (n=86)
Weight Loss	3 (1.5%)	2 (2.3%)
Elevated Blood Urea Nitrogen (BUN)	2 (1.0%)*	0 (0.0%)
Polyuria	2 (1.0%)*	0 (0.0%)
Diarrhea	2 (1.0%)	2 (2.3%)

\*Two geriatric dogs developed mildly elevated BUN (34 to 54 mg/dL; reference range: 6 to 31 mg/dL) during the study. One of these dogs also developed polyuria and a mildly elevated potassium (6.5 mEq/L; reference range: 3.6 to 5.5 mEq/L) and phosphorous (6.4 mg/dL; reference range: 2.5 to 6.0 mg/dL). The other dog also developed a mildly elevated creatinine (1.7 to 2.0 mg/dL; reference range: 0.5 to 1.6 mg/dL) and weight loss.

In addition, one dog experienced intermittent head tremors within 1.5 hours of administration of vaccines, an ear cleaning performed by the owner, and its first dose of CREDELIO. The head tremors resolved within 24 hours without treatment. The owner elected to withdraw the dog from the study.

In an Australian field study, one dog with a history of seizures experienced seizure activity (tremors and glazed eyes) six days after receiving CREDELIO. The dog recovered without treatment and completed the study. In the U.S. field study, two dogs with a history of seizures received CREDELIO and experienced no seizures throughout the study.

In three well-controlled European field studies and one U.S. laboratory study, seven dogs experienced episodes of vomiting and four dogs experienced episodes of diarrhea between 6 hours and 3 days after receiving CREDELIO.

**Post-Approval Experience (2023):**

The following adverse events are based on post-approval adverse drug experience reporting for CREDELIO. Not all adverse events are reported to FDA/CVM. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data.

The following adverse events reported in dogs are listed in decreasing order of reporting frequency:

Vomiting, diarrhea (with and without blood), lethargy, anorexia, seizure, pruritus, ataxia, urinary-related signs (polyuria, polydipsia, urinary incontinence, and inappropriate urination), and muscle tremor.

**Contact Information:**

To report suspected adverse events, for technical assistance or to obtain a copy of the Safety Data Sheet (SDS), contact Elanco US Inc. at 1-888-545-5973.

For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or <http://www.fda.gov/reportanimalae>.

**Clinical Pharmacology:**

Following oral administration of 43 mg/kg (approximately 1X the maximum labeled dose), peak lotilaner concentrations were achieved between 6 hours and 3 days in dogs 2 months of age and between 1 and 7 days in dogs 10 months of age. Dogs 2 months of age had a shorter elimination half-life (average of 9.6 days) than at 10 months of age (average of 28.4 days). Due to reduced drug bioavailability in the fasted state, CREDELIO must be administered with a meal or within 30 minutes after feeding.

**Mode of Action:**

Lotilaner is an ectoparasiticide belonging to the isoxazoline group. Lotilaner inhibits insect and acarine gamma-aminobutyric acid (GABA)-gated chloride channels. This inhibition blocks the transfer of chloride ions across cell membranes, which results in uncontrolled neuromuscular activity leading to death of insects and acarines. The selective toxicity of lotilaner between insects and acarines and mammals may be inferred by the differential sensitivity of the insects and acarines' GABA receptors versus mammalian GABA receptors.

**Effectiveness:**

In well-controlled European laboratory studies, CREDELIO began to kill fleas four hours after administration or infestation, with greater than 99% of fleas killed within eight hours after administration or infestation for 35 days. In a well-controlled U.S. laboratory study, CREDELIO demonstrated 100% effectiveness against adult fleas 12 hours after administration or infestation for 35 days.

In a 90-day well-controlled U.S. field study conducted in households with existing flea infestations of varying severity, the effectiveness of CREDELIO against fleas on Days 30, 60 and 90 compared to baseline was 99.5%, 100% and 100%, respectively. Dogs with signs of flea allergy dermatitis showed improvement in erythema, papules, scaling, alopecia, dermatitis/pyodermitis and pruritus as a direct result of eliminating fleas.

In a well-controlled laboratory study, CREDELIO killed fleas before they could lay eggs, thus preventing subsequent flea infestations for 30 days after the start of treatment of existing flea infestations.

In well-controlled laboratory studies, CREDELIO demonstrated > 97% effectiveness against *Amblyomma americanum*, *Dermacentor variabilis*, *Ixodes scapularis* and *Rhipicephalus sanguineus* ticks 48 hours after administration or infestation for 30 days. In a well-controlled European laboratory study, CREDELIO started killing *Ixodes ricinus* ticks within four hours after administration.

**Palatability:** In the U.S. field study, which included 567 doses administered to 198 dogs, 80.4% of dogs voluntarily consumed CREDELIO when offered by hand or in an empty bowl, an additional 13.6% consumed CREDELIO when offered with food, and 6.0% required placement of the chewable tablet in the back of the dog's mouth.

**Animal Safety:**

In a margin of safety study, CREDELIO was administered orally to 24 (8 dogs/group) 8-week-old Beagle puppies at doses of 43 mg/kg, 129 mg/kg, and 215 mg/kg (approximately 1, 3, and 5X the maximum labeled dose, respectively) every 28 days for eight consecutive doses. The 8 dogs in the control group (0X) were untreated. There were no clinically-relevant, treatment-related effects on clinical observations, physical and neurological examinations, body weights, food consumption, electrocardiograms, clinical pathology (hematology, clinical chemistries, coagulation profiles and urinalysis), gross pathology, histopathology, or organ weights. Blood concentrations of lotilaner confirmed systemic exposure of all treated dogs, although the exposure was less than dose proportional at 5X.

In a well-controlled field study, CREDELIO was used concurrently with other medications, such as vaccines, anthelmintics, antibiotics, steroids, NSAIDs, anesthetics, and antihistamines. No adverse reactions were observed from the concomitant use of CREDELIO with other medications.

**Storage Information:**

Store at 15-25°C (59 -77°F), excursions permitted between 5 to 40°C (41 to 104°F).

**How Supplied:**

CREDELIO is available in five chewable tablet sizes for use in dogs: 56.25, 112.5, 225, 450, and 900 mg lotilaner. Each chewable tablet size is available in color-coded packages of 1, 3 or 6 chewable tablets.

Approved by FDA under NADA # 141-494

Manufactured for:

Elanco US Inc  
Greenfield, IN 46140 USA  
Credelio.com  
Rev. date 02/2024

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