

ALTOSID® IGR



FEED-THRU

Peaceful. Profitable. Horn Fly Protected.

Technical Information

Fly Control for Beef Cattle on Pasture



Horn Flies and Your Cattle



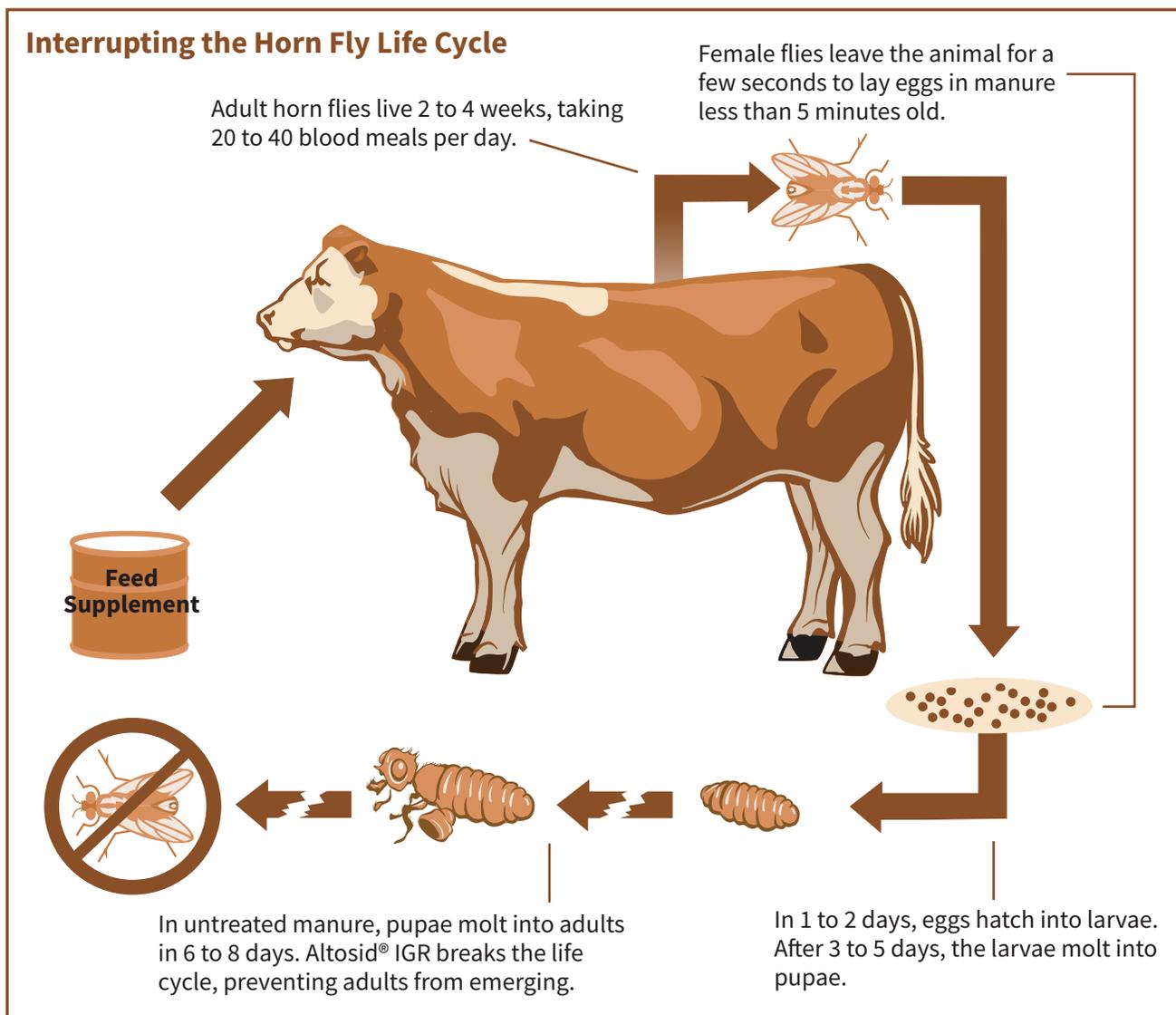
HORN FLY (*Haematobia irritans*)

- Small biting flies about half the size of house flies with gray coloring and 2 stripes on the thorax
- Feeds on blood of animals with piercing mouth parts, taking up to 40 blood meals a day, and costing North America \$1.5 billion per year.
- Female horn flies only leave their hosts to lay their eggs in freshly deposited cow manure
- Typically found congregating on the backs of cattle
- Known to cause reduced weight gain in beef cattle and affect overall productivity

Feed-Through Horn Fly Control

Altosid® IGR Feed-Thru controls horn flies by interrupting their life cycle, rather than through direct toxicity. Based on this mode of action, the EPA considers it to be a biochemical pesticide. Mixed into cattle feed, Altosid® IGR passes through the digestive system and into the manure, where horn flies lay their eggs.

Altosid® IGR is not like other feed-through products; it is classified as an insect growth regulator (IGR). The IGR in Altosid® IGR mimics naturally occurring insect biochemicals that are responsible for insect development. Through this mimicry, Altosid® IGR keeps the horn fly larvae from developing into adult flies that would otherwise emerge from the manure. It is able to exert this effect at very small concentrations and is therefore an ideal fly control choice for today's environmentally conscious producer.



Economic Impact of Horn Flies on Cattle

The horn fly, *Haematobia irritans*, is an obligate, bloodsucking parasite and one of the most important and economically damaging pests of range cattle in the United States.ⁱ The economic losses from horn flies cost the North American cattle industry over \$1 billion per year.ⁱⁱ These losses can be attributed to reduced weight gains, decreased feed efficiency and decreased milk yields caused by loss of blood and excessive energy expenditure to dislodge the flies. Implications are that total energy balance is altered when an animal is exposed to horn fly infestations, thereby resulting in decreased productivity.ⁱⁱⁱ The economic threshold for horn fly infestation is defined as *the number of horn flies per animal at which the value of the damage caused is equal to the cost of control.*^{iv} Based upon studies evaluating these production losses, the generally accepted economic threshold for infestations of horn flies is 200 flies per animal.^{iv} When adult horn fly counts reach this level, it is generally considered economically advantageous to begin a control program. Current control strategies for horn flies include mechanical, biological and chemical methods. Walk-through fly traps or dragging of pastures to disrupt manure pats can reduce horn fly populations in some environments. Predatory arthropods, such as beetles and mites, can also reduce horn fly populations in some habitats. Chemical control has been the most widely used horn fly control strategy. Techniques for application of insecticides to cattle include oral larvicides in mineral granules, mineral blocks, tubs or controlled-release boluses.

The major disadvantage of some horn fly control methods is that resistant populations of horn flies have developed. Ear tags became available in the late 1970s, and resistance became widespread throughout the U.S. by the mid-1980s^v and throughout Canada by 1991.^{iv} Resistance developed rapidly, due to widespread tagging using a single chemical family, the pyrethroids, against entire adult populations of horn flies. Continuous exposure to a single class of insecticides rapidly selects for flies with an innate tolerance to the insecticide, eventually leading to the failure of the insecticide to provide satisfactory control. Because of the horn fly's cross-resistance to active ingredients in traditional insecticides, resistance can occur in a single year.

Altosid® IGR contains the insect growth regulator (IGR) (S)-Methoprene which breaks the horn fly's life cycle and inhibits immature flies from developing into adults that bite. The administration of Altosid® IGR is an efficient and effective method for helping control horn flies throughout the fly season without worrying about resistance. There has not been a verified case of resistance to (S)-Methoprene since the technology was introduced in 1975^{vi}. The level of this ingredient found in the manure of treated cattle has no effect on beneficial insects, such as dung beetles and bees, and there are no harmful residues in meat or milk when used as directed. Supplements containing Altosid® IGR administered to cattle on a free-choice basis inhibited development of horn flies in cattle manure (*see following studies*). The results of these studies show a high degree of effectiveness against larval emergence and adult horn fly counts. Effectiveness at controlling horn fly populations well below 200 flies per animal was consistent among the various study locations across the U.S. Along with environmentally sound, dependable horn fly treatment, Altosid® IGR products provide two added benefits: improved performance and freedom from cross-resistance.

Chemical Characteristics

(S)-Methoprene belongs to the terpenoid class of compounds, as do natural products, such as essential oils and other plant-produced materials.

Chemical Name:	Isopropyl (2E,4E,7S)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate
Technical Name:	(S)-Methoprene
CAS Number:	65733-16-6
Empirical Formula:	C ₁₉ H ₃₄ O ₃
Properties:	Amber Liquid Slight Fruity Odor Soluble in Organic Solvents

Environmental Fate

Persistence and Movement in Soil: The half-life of (S)-Methoprene under aerobic conditions in sandy loam is approximately ten days when applied at the exaggerated rate of 1000 g/Ha. Most of the applied dose is converted rapidly to CO₂. (S)-Methoprene remains bound in the top few centimeters of the soil even after repeated washings with water. Thus, it should not persist, leach or contaminate groundwater.

Fate in Plants: When applied at the rate of 1000 g/Ha on alfalfa, (S)-Methoprene has a half-life of less than two days and less than one day on rice. It is metabolized rapidly, yielding products that are further degraded to normal plant nutrients.

Fate in the Food Chain: In a model ecosystem study, it was shown that (S)-Methoprene does not accumulate in the food chain. It was demonstrated that biodegradation and lack of persistence characterize methoprene in the environment.

Persistence in Water: In the field, (S)-Methoprene has a half-life of 30-45 hours in unsterilized pond water. If the water is exposed to sunlight, the half-life is significantly reduced.

Safety Studies

An extensive toxicological database has been generated to support EPA registrations of products containing (S)-Methoprene. (S)-Methoprene products exhibit a wide margin of reliability and no acute handling hazard by any exposure route.

Development/Reproductive Toxicity

Teratogenicity

(S)-Methoprene is not a teratogenic compound. The NOEL for maternal and embryotoxicity in rabbits was 200 mg/kg/day. The NOEL for reproductive effects in rats was 500 ppm.

Mutagenicity

(S)-Methoprene is not a mutagenic compound.

Acute, Subchronic and Chronic Toxicity of (S)-Methoprene in Animals:

Species	Study Type	Result
Rat	Oral LD50	> 34,600*
Dog	Oral LD50	> 5,000*
Rabbit	Dermal LD50	> 3,000*
Rat	Inhalation LD50	> 210 mg/l air
Dog	Inhalation LD50	No effect at 20-30 mg/kg*
Rabbit	Dermal Irritation	Non-irritating
Rabbit	Ocular Irritation	Non-irritating
Rat	90-Day Feeding	NOEL = 1,000 ppm
Dog	90-Day Feeding	NOEL = 500 ppm
Rabbit	30-Day Dermal	NOEL=0.1 ml/kg/day
Rat	21-Day Inhalation	NOEL > 20 mg/l (2,000 ppm)
Dog	28-Day Inhalation	NOEL > 0.0625 mg/kg/day
Rat	Chronic Feeding (2-year)	NOEL > 5,000 ppm
Mouse	Chronic Feeding (2-year)	NOEL > 2,500 ppm

*Highest dose tested

Metabolism in Cattle

Extensive laboratory and field experiments have shown that (S)-Methoprene is rapidly degraded by mammalian metabolic systems and readily converted to natural body constituents. When steers or cows are treated orally with (S)-Methoprene, the compound is excreted either unchanged or metabolized quickly and eliminated via urine, feces and expired breath. Chemical identification of (S)-Methoprene degradation products in milk and blood one week after the oral administration of radio-labeled (S)-Methoprene to a cow revealed that it was metabolized to simple acetates that are mostly incorporated into fatty acids, lactose and cholesterol. (S)-Methoprene metabolites were not detected in tissues. In a cow and growing steer, unmetabolized (S)-Methoprene was mainly excreted through feces, whereas up to 19.8% of the orally administered dose was excreted in urine as radioactive metabolite. The highest radioactivity was in bile, and the next highest was in the liver. All muscles of the cow had < 0.1 µg of the total radioactivity per gram.

Effects on Beneficial Insects

Residual insecticides, such as organophosphates, are toxic to beneficial insects, such as coprophagous flies and beetles, predaceous beetles, parasitic wasps and dung beetles. Altosid® IGR does not disrupt dung composition and does not harm beneficial insects.

Effects on Horses

Horses (1/dose group) have been experimentally dosed with (S)-Methoprene, as follows, without adverse clinical signs or loss of appetite. Accidental exposure to (S)-Methoprene via cattle feed would not be anticipated to pose any toxicological risk.

Dose*	Route	Timeframe
1 and 3 mg AI/kg	Oral Feed Supplement	14 Days
6 and 12 mg AI/kg	1 gal. H ₂ O via stomach tube	1 Day
6 mg AI/kg	Oral Feed Supplement	7 Days
12 mg AI/kg	Oral Feed Supplement	7 Days

*Active ingredient given per body weight of animal per dose

Regulatory Status of (S)-Methoprene

(S)-Methoprene is an insect growth regulator (IGR) with activity against fleas, mosquitoes, horn flies, ants, sciarid flies and stored product pests.

The active ingredient, (S)-Methoprene, was first registered by the EPA in 1975. (S)-Methoprene was classified as the first biochemical pesticide and therefore is currently regulated by the Biopesticide Division of the EPA.

(S)-Methoprene has completed an extensive reregistration process, resulting in the publication by the EPA of the Reregistration Eligibility Document (RED) in 1991.

In June 2003, the Environmental Protection Agency (EPA) announced that (S)-Methoprene is exempt from the requirement of a tolerance in or on all food commodities when used to control insect larvae. The EPA granted the exemption because a thorough risk analysis showed residue tolerances are not necessary to protect human health or the environment.

After discussions between the EPA and FDA, it was decided that feed-through uses of (S)-Methoprene in cattle feed to control horn flies should be regulated by the EPA. Altosid® IGR Feed-Thru was the first (S)-Methoprene cattle product registered by the EPA in 1975.

Regulatory Status of Altosid® IGR Feed-Thru

The following excerpt from the 2015 Feed Additive Compendium summarizes the regulatory status of the use of (S)-Methoprene in cattle feed.

FDA Status: No feed mill license required. Product is a food additive. 40 CFR 180.1033 (EPA) (S)-Methoprene is exempted from the requirement of a tolerance in or on all food commodities when used to control insect larvae. When used in medicated feeds, medicated feed application requirement is determined by regulatory status of the drug.

EPA Status: Product is a pesticide when used in non-medicated feeds. EPA registration is required for feeds offered for sale except when custom-blending per the provisions of 40 CFR 167.3. In medicated feeds, the product is a feed additive and no EPA registration is required when the source of (S)-Methoprene is an EPA-registered product.

Pest Management Regulatory Agency (PMRA) Status

Similar to the U.S. EPA registration, the Pest Management Regulatory Agency, the regulatory agency in Canada, has approved the Altosid® 2% MUP product on January 4, 2016. CFIA (Canadian Feed Ingredient Association) will regulate the end-use feeds containing Altosid® IGR.

Feed Additives That Control Immature Horn Flies in Cattle Manure^{vii}

Trade Name	Altosid® IGR Feed-Thru	Rabon™ Oral Larvicide
Manufacturer	Central Garden and Pet	Bayer Animal Health
Active Ingredient	(S)-Methoprene	Tetrachlorvinphos
% Active in Concentrate	0.4, 1.0, 2.0, 10.5	7.76, 97.3
Classification	Terpenoid ester	Organophosphate insecticide
Mode of Action	Insect Growth Regulator	Cholinesterase inhibitor
Activity	Stops pupal development	Kills larvae
Product Forms	Meal, liquid micro-emulsion, granule, dry powder	Granulated material, meal
Administration	Mineral, block, tub, top-dress, liquid feed	Mineral, block, tub, top-dress, liquid feed
Dosage	0.8 - 1.5 mg of active/100 lbs. of body weight	70 mg of active/100 lbs. of body weight
Cattle Age Restrictions	None	None

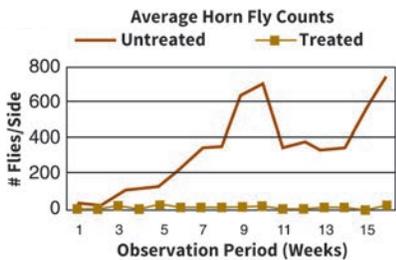
Efficacy Summaries

Horn fly control by feeding of Altosid® IGR to cattle was evaluated in Illinois, Kentucky, North and South Carolina and Texas. A number of cattle supplements containing 0.02%, 0.01% and 0.005% Altosid® IGR were administered on a free-choice basis to evaluate inhibitory effects on the development of adult horn flies in fecal pats.

Illinois

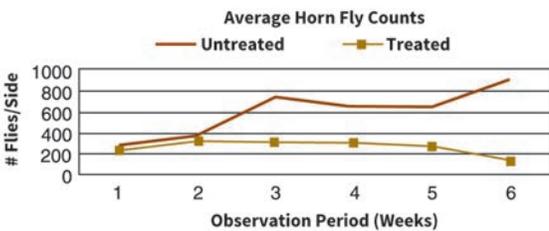
The chart below represents the average number of adult horn flies per side when animals were fed 0.02% Altosid® IGR Mineral.

The chart below shows that adult horn fly counts on cattle treated on a free-choice basis with 0.02% Altosid® IGR Granular Cattle Supplement as part of a mineral mix resulted in a 95% reduction of horn flies over untreated herds. Further, horn fly development was effectively reduced in feces from cattle fed 0.02% Altosid® IGR Granular Cattle Supplement.



South Carolina

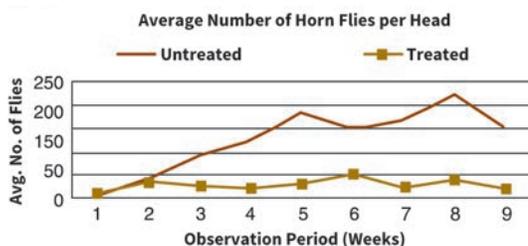
Adult horn fly counts remained fairly constant throughout the treatment period on treated cattle, while counts on untreated cattle steadily increased.



The chart above represents the average number of adult horn flies per side after cattle received a 0.02% Altosid® IGR Granular Cattle Supplement.

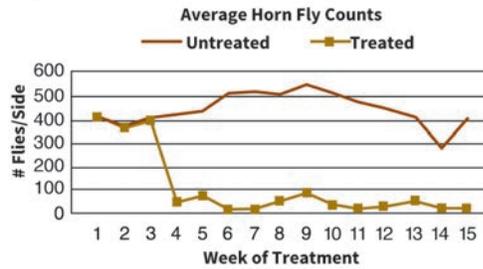
Kentucky

The chart below represents the effectiveness of (S)-Methoprene against horn flies when cattle are given 0.02% Altosid® IGR Granular Cattle Supplement.



Texas

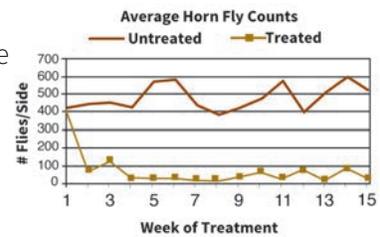
A custom liquid feed formulated using Altosid® IGR 1% Liquid to provide 0.00125% (S)-Methoprene was offered to cattle. Within four weeks of the start of the trial, the horn fly population was greatly reduced and remained below the economic threshold through the conclusion of the study.



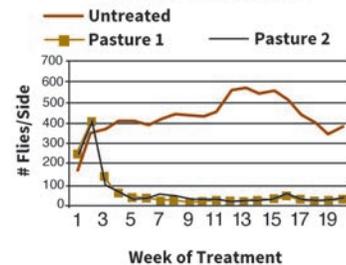
The chart above represents the average number of adult horn flies per side.

North Carolina

The chart to the right represents the average number of adult horn flies per side when animals were fed a 0.01% Altosid® IGR Mineral Block.

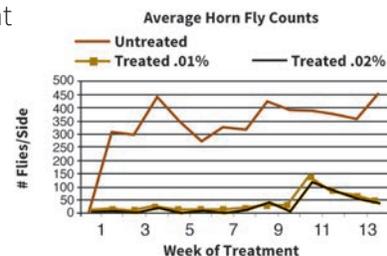


Average Horn Fly Counts



The chart to the left represents the average number of adult horn flies per side when animals were fed a 0.005% Altosid® IGR Mineral Tub.

The chart to the right represents the average number of adult horn flies per side when animals were fed a 0.02% and a 0.01% Altosid® IGR Mineral.



Altosid® IGR Products for Horn Fly Control

Altosid® products are registered for cattle (beef and dairy) for continuous feeding during the fly season to prevent the breeding of horn flies in the manure of treated cattle at the level 1.13 mg/cwt/day.

Custom Blending Products	% (S)-Methoprene	Product Description
Altosid® Cattle Custom Blending Premix EPA Reg. #2724-473	10.5	For mixing into custom-blended medicated feeds or custom-blended pesticide feeds, per EPA guidelines (blend on order, no floor stocking)
Altosid® IGR Custom Blend 2% EPA Reg. #2724-841-89459	2.0	For mixing into custom-blended medicated feeds or custom-blended pesticide feeds, per EPA guidelines (blend on order, no floor stocking)
Altosid® IGR 1% Liquid EPA Reg. #2724-505	1.0	Intended for custom blending into liquid cattle feed supplements

Manufacturing Use Products	% (S)-Methoprene	Product Description
Altosid® IGR CP-10 EPA Reg. #2724-367	10.5	For mixing into EPA-registered products, such as Altosid® Premix 0.04% or Altosid® IGR 0.005% Tubs
Altosid® IGR 2% MUP EPA Reg. #2724-840-89459	2.0	For mixing into EPA-registered products, such as Altosid® IGR 0.02% or 0.01% Granules or Blocks

End Use Registered Products	% (S)-Methoprene	Product Description
Altosid® IGR Premix EPA Reg. #2724-474	0.4	Feed concentrate to mix with free-choice-fed minerals or mixed-ration feeds, custom blending
Altosid® IGR Granules EPA Reg. #2724-372	0.02	EPA-registered granules fed at a consumption rate of 2 oz. per 1,000 lb. animal per day
Altosid® IGR Tub or Block EPA Reg. #2724-373	0.02	EPA-registered mineral or protein tubs or blocks fed at a consumption rate of 2 oz. per 1,000 lb. animal per day
Altosid® IGR Tub or Block EPA Reg. #2724-492	0.01	EPA-registered mineral or protein tubs or blocks fed at a consumption rate of 4 oz. per 1,000 lb. animal per day
Altosid® IGR Granules EPA Reg. #2724-494	0.01	EPA-registered granules fed at a consumption rate of 4 oz. per 1,000 lb. animal per day
Altosid® IGR Tub or Block EPA Reg. #2724-495	0.005	EPA-registered tubs or blocks for mineral or protein supplementation at a consumption rate of 8 oz. per 1,000 lb. animal per day
Altosid® IGR Tub or Block EPA Reg. #2724-787	0.0025	EPA-registered tubs or blocks for mineral or protein supplementation at a consumption rate of 16 oz. per 1,000 lb. animal per day

Horn flies are a serious threat to beef cattle — and your bottom line. To find out just how much of a threat, fill out the worksheets below. You'll see the advantages of adding Altosid® IGR Feed-Thru for horn fly prevention and the kind of return you can expect on your Altosid® IGR Feed-Thru investment.

Weaning Weights (Cow/Calf)

Weaning weights of calves on cows with an Altosid® IGR horn fly control program are higher by an average of 14 lbs., or 4.3 percent^{viii}, due to increased availability of cow's milk.

Figure the value of weaning weight loss due to horn flies

- A. Fill in your average adjusted weaning weight per head..... _____ lbs.
- B. Potential weight loss per head per season.....0.043 x A = _____ lbs.
- C. Fill in the total number of head weaned per year in your herd..... _____
- D. Potential weight loss per season for your herd.....B _____ x C _____ = _____ lbs.
- E. Fill in the sale price of weaned calves in \$/hundredweight..... \$ _____
- F. Total value of herd weight loss.....0.01 x D _____ x E _____ = \$ _____

Figuring the return from using Altosid® IGR

- G. Number of cows in your herd (from line C)..... _____
- H. Herd cost per day to use Altosid® IGR.....0.04 x G = \$ _____
(Average cost of Altosid® IGR is 3 to 5 cents per head per day)
- I. Fill in the number of days cows will be on Altosid® IGR..... _____
- J. Your Altosid® IGR horn fly control program cost per season.....H _____ x I _____ = \$ _____
- K. Return on investment in Altosid® IGR per season.....F _____ - J _____ = \$ _____ ROI

Net herd season savings..... _____

Stocker Cattle

Studies have shown stocker cattle can incur a 14 percent^{viii} reduction in average daily gain over a 120-day fly period. That can translate into a reduction in average daily gain of 0.2 lb. per day.

Figure the value of stocker cattle weight loss due to horn flies

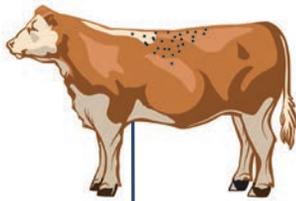
- A. Fill in your average stocker weight per head at season end..... _____ lbs.
- B. Potential weight loss per head per season.....0.14 x A = _____ lbs.
- C. Fill in the total number of head in your stocker cattle herd..... _____
- D. Potential weight loss per season for your herd.....B _____ x C _____ = _____ lbs.
- E. Fill in the sale price of stocker cattle in \$/hundredweight..... \$ _____
- F. Total value of herd weight loss.....0.01 x D _____ x E _____ = \$ _____

Figuring the return from using Altosid® IGR

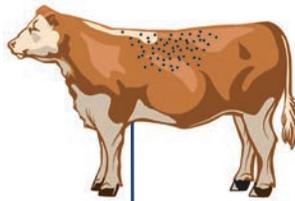
- G. Number of cows in your herd (from line C)..... _____
- H. Herd cost per day to use Altosid® IGR.....0.04 x G = \$ _____
(Average cost of Altosid® IGR is 3 to 5 cents per head per day)
- I. Altosid® IGR horn fly control program cost per 120-day fly season.....120 x H _____ = \$ _____
- J. Return on investment in Altosid® IGR per season.....F _____ - I _____ = \$ _____

Net herd season savings..... _____

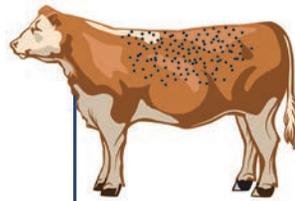
Add Value to Your Cattle with Altosid® IGR



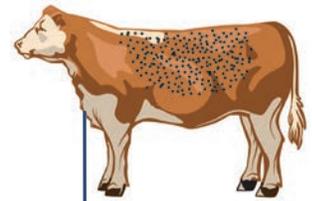
Excellent



Good



Average to Below



Unacceptable

\$1 Billion per Year Cost of Horn Flies to North American Cattle Industry

The economic losses from horn flies cost the North American cattle industry over \$1 billion per year.^{ix} These losses can be attributed to reduced weight gains, decreased feed efficiency and decreased milk yields caused by loss of blood and excessive energy expenditure to dislodge the flies.^x

Build a Season-Long Horn Fly Control Program

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Effective and Sound

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No Effects on Beneficial Insects

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For more information, visit www.AltosidIGR.com or call 1-800-347-8272.



Peaceful. Profitable. Horn Fly Protected.

References:

- i Bay, D.E., Harris, R.L., Introduction to Veterinary Entomology, Stonefly Publishing, Bryan, Texas, 1988.
- ii http://www.csress.usda.gov/nea/biotech/pdf/highlights_2002_no3.pdf
- iii Byford, R.L., Craig, M.E., Crosby, B.L., A Review of Ectoparasites and Their Effect on Cattle Production, J. Anim. Sci., 1992, 70:597-602.
- iv Mwangala, F.S., Galloway, T.D., 1993, Susceptibility of horn flies, *Haematobia irritans* (L.) (Diptera: Muscidae) to pyrethroids in Manitoba, Can., Entomol. 125: 47-53.
- v Kunz, S.E., Schmidt, C.D., 1985, The pyrethroid resistance problem in the horn fly, J. Agric. Entomol. 2: 358-363.
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- vii Bennett, K. (ed), Compendium of Veterinary Products, Port Huron: North American Compendiums, 1991.
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- ix http://www.csress.usda.gov/nea/biotech/pdf/highlights_2002_no3.pdf
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- xi P. G. Koehler, J. F. Butler and P. E. Kaufman. Pub# ENY-285 (IG137), Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Revised: December 2005. www.edis.ifas.ufl.edu/ig137.

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CTL 16-001

FOR CATTLE PRODUCTIVITY AND BETTER RETURN ON YOUR INVESTMENT, USE ALTOSID® IGR FEED-THRU

Helps control horn flies in areas
populated by cattle

Works as a feed-through, passing into
manure where horn flies lay eggs

Use Altosid® IGR 30 days before fly emergence,
until 30 days after the first frost



Peaceful. Profitable. Horn Fly Protected.

For more information,
visit www.AltosidIGR.com or call 1-800-347-8272.