

# Controlling Disease-Carrying and Blood-Feeding Flies in Dairy Calf Hutches, Heifer Drylots and Milking Cow Barns

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Fly pests of dairy calves, heifers and milking cows

**Stable Fly** (*Stomoxys calcitrans*)

**House Fly** (*Musca domestica*)

## Importance

Stable flies (both males and females) [Fig. 1.] subsist mainly on the blood of cattle and many other warm-blooded animals, including humans; they are very aggressive biters of newborn calves, growing heifers, and milking cows [Figs. 3–5].

Stable flies are known to reduce average daily weight gains of growing calves and heifers by up to 17 percent (Catangui et al., 1997) and reduce milk production of milking cows by up to 20 percent (Gerry et al., 2007). Stable flies appear to injure dairy cattle through direct blood loss, the wasting of energy by trying to ward off and avoid painful and irritating bites, and reduced or irregular feed consumption. Milking cows in free stall barns being attacked by stable flies tend to bunch together to defend themselves from the biting pests;

Stable flies subsist mainly on the blood of cattle and many other warm-blooded animals, including humans; they are very aggressive biters of newborn calves, growing heifers, and milking cows.



**Fig. 1.** Stable fly adult (about a quarter-inch long) (Photo: Dr. Mike Catangui)



**Fig. 2.** House fly adult (about a quarter-inch long) (Photo: Dr. Mike Catangui)

this bunching behavior can exacerbate heat stress during hot summer days.

In contrast to stable flies, house flies [Fig. 2.] cannot bite dairy cattle by virtue of their soft sponge-like mouthparts; their main role on dairy farms appears to be as vectors or carriers of microorganisms (bacteria, viruses, protozoans, worm eggs) that can cause diseases on dairy cattle and in human farm workers. The causative bacterium of cryptosporidiosis (*Cryptosporidium parvum*) had been conclusively shown to be vectored by house flies from contaminated farm substrates to humans and animals (Graczyk et al., 1999). Numerous house flies can alight and feed on the bodily secretions and excretions of farm



**Fig. 3.** Stable flies feeding on blood from the legs of a newborn calf. (Photo: Dr. Mike Catangui)

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A successful fly control program needs to target both the larval (maggot) and adult stages of flies.



**Fig. 4.** Stable flies resting on a calf pen wall after feeding on blood from the legs of a newborn calf. The brown spots are digested calf blood excreted by the stable flies. (Photo: Dr. Mike Catangui)



**Fig. 5.** Stable flies feeding on blood from the legs of a milking cow. (Photo: Dr. Mike Catangui)

animals, then on the water and feed provided to calves [Fig. 6], heifers and milking cows. House flies can migrate in both directions: from the farm to nearby neighborhoods or from outside breeding sites into the dairy farm. Farm vehicle traffic may also inadvertently facilitate house fly migration in both directions.

### Breeding sites

Commonly called maggots, the larval stages of stable flies can proliferate in plant materials that are provided to calves as bedding. Examples of bedding materials are wheat straws, oat straws, almond shells, rice hulls, oat hulls, sunflower hulls, corn stalks, wood shavings and others; they are highly attractive breeding sites for flies once they start fermenting and decaying over time. Figures 7–8 show numerous stable fly larvae and pupae in fermenting wheat straw used as bedding in a calf hutch. House flies appear to prefer to breed in fermenting feed; [Fig. 9] shows house fly maggots in this medium. Both fly species can complete their life cycles within 3–4 weeks on dairy farms during the summer months.

### Controlling adult flies

House fly baits [Fig. 13] [Table 1] can be used in exterior areas close to calf hutches and dairy barns to lure and kill house flies. Liquid or sprayable baits are available for applications on vertical surfaces, ceilings, or areas where solid baits are not practical. [Note: Solid baits are designed for use against house flies and not for stable flies; stable flies feed on the blood of dairy cattle and other animals.]

To quickly reduce adult house fly and stable fly numbers, on-animal sprays can be used to directly spray the flies that are feeding upon, or resting on or adjacent to the animals [Figs. 3–6]. On-animal sprays are quick knock-down and low-residue insecticides that can either be water-based [Table 2], oil-based [Table 3] or aerosol [Table 5]. Spray applications can be made using ordinary sprayers or recommended hand-held or tractor-mounted equipment [Table 10]. A few insecticides are labeled for use through automatic misting systems that are hardwired in the barn [Table 4].

During cleanout or when the calf hutches or barns are empty of animals for a period of time, longer-lasting empty-barn residual insecticides [Table 8] can be applied on

the interior and exterior surfaces of the empty structures. These residual insecticides cannot be applied directly on the animals; they are to be applied on empty or vacated hutches and barns. The animals can be brought back immediately in the treated barns or hutches after the spray droplets have completely dried up.

Parasitic wasps [Table 7] [Fig. 10] and fly traps [Table 9] are important components of a complete integrated pest management program (IPM) for dairy cattle. Releasing parasitic wasps augment natural parasitism rates already occurring in nature; fly traps provide long-lasting background control of active insects.

### Controlling fly larvae in breeding sites

A successful fly control program needs to target both the larval (maggot) and adult stages of flies. The straw beddings [Figs. 3, 5, 7, 8], for example, can be treated with larvicides [Table 6] before the calves are placed inside the hutches. Larvicides are a group of insecticides specifically labeled to control the larval stages of insects; adulticides are aimed at the adult insects. Larvicides will effectively nullify the straw beddings as breeding sites for house flies and stable flies. Other potential fly breeding sites in and around the hutches and barns can also be treated with larvicides.

Elector<sup>®</sup> PSP is a contact larvicide that impairs the nervous system of the fly larva; mortalities are observed within 48 hours after application. The active ingredient in Elector<sup>®</sup> PSP (spinosad) is of natural origin; it is derived from the fermentation of a soil actinomycete (a group of soil bacteria) called *Saccharopolyspora spinosa*.

Tekko<sup>™</sup> 10 (novaluron), Neporex<sup>®</sup> 2 SG (cyromazine), and NyGuard<sup>®</sup> IGR Concentrate (pyriproxyfen) contain so-called insect growth regulators (IGRs) that disrupt the molting process of insects. The effects of insect growth regulators can be better visualized in the pupal stage of the treated flies. **Figure 11** shows deformed house fly pupae caused by an insect growth regulator. These deformed pupae were collected from manure that was treated with novaluron (Tekko<sup>™</sup> 10). **Figure 12** shows deformed or abnormal pupae collected from manure treated with cyromazine (Neporex<sup>®</sup> 2 SG). Deformed or affected pupae cannot transform into normal flies, thereby causing mortalities in the treated fly populations.



Fig. 6. House flies on feed bunks of dairy calves. (Photo: Kim Holt)



Fig. 7. Stable fly larvae in fermenting wheat straw bedding in a calf hutch. (Photo: Dr. Mike Catangui)



Fig. 8. Stable fly pupae in fermenting wheat straw bedding in a calf hutch. (Photo: Dr. Mike Catangui)



Fig. 9. House fly larvae and pupa in fermenting feed. (Photo: Dr. Mike Catangui)

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Certain larvicides containing the insect growth regulator (IGR) diflubenzuron (ClariFly<sup>®</sup> Add-Pack Fly Control for Calves, Sav-A-Caf elim-A-fly<sup>™</sup> Add-Pack with ClariFly<sup>®</sup> Larvicide, and JustiFly<sup>®</sup> Feedthrough) can be fed to the calves (feedthrough larvicides) through the milk, milk replacer or feed ration [Table 6]. The active ingredient is not digested but excreted as a larvicidal treatment on potential fly breeding sites such as the straw beddings and organic matter in and around the hutches. Diflubenzuron is a chitin synthesis inhibitor; treated larvae are not able to form new exoskeleton normally after molting.

Literature Cited

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Gerry, A. C., N. G. Peterson, and B. A. Mullens. 2007. Predicting and controlling stable flies on California dairies. (<http://ucce.ucdavis.edu/files/repositoryfiles/8258-54311.pdf>)

Graczyk, T. K., M. R. Cranfield, R. Fayer, and H. Bixler. 1999. House flies (*Musca domestica*) as transport hosts of *Cryptosporidium parvum*. *American Journal of Tropical Medicine and Hygiene* 61(3):500-504.

**Fig. 13.** House fly baits can be used in exterior areas close to calf hutches and dairy barns to lure and kill house flies. Solid baits like these are designed for use against house flies not stable flies, which feed on the blood of cattle and other animals.



**Fig. 10.** Parasitic wasps used for biological control of flies in dairy farms. (Photo: Dr. Mike Catangui)



**Fig. 11.** Deformed house fly pupae caused by novaluron (a chitin synthesis inhibitor IGR) beside four normal pupae at right. (Photo: Dr. Mike Catangui)



**Fig. 12.** Deformed house fly pupae caused by cyromazine (a molting disruptor IGR). (Photo: Dr. Mike Catangui)

## Solid Baits for House Fly Control

**Golden Malrin<sup>®</sup> Fly Bait**  
(methomyl; Starbar)



**QuikStrike<sup>®</sup> Fly Bait**  
(dinotefuran; Starbar)



**QuickBayt<sup>®</sup> Fly Bait**  
(imidacloprid; Bayer)



**Zyrox<sup>®</sup> Fly Granular Bait**  
(cyantraniliprole; Syngenta)



**Technical Services**  
AmerisourceBergen

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**Integrated Pest Management**

**Table 1.**

<b>HOUSE FLY BAITS</b>					
<b>MFR.</b>	<b>BRAND NAME</b>	<b>ACTIVE INGREDIENT</b>	<b>FORMULATION</b>	<b>TARGET FLY SPECIES*</b>	<b>RATE</b>
<b>BASF</b>	<b>PT® Alpine® Pressurized Fly Bait</b>	dinotefuran (1.0%)	pressurized liquid bait (ready-to-use)	house fly (see label for others)	See label for directions
<b>BAYER</b>	<b>QuickBayt® Fly Bait</b>	imidacloprid (0.5%) + (Z)-9-tricosene (0.1%)	solid bait	house fly	1.5 oz. per 250 sq. ft.
	<b>QuickBayt® Spot Spray</b>	imidacloprid (10.0%) + (Z)-9-tricosene (0.1%)	sprayable bait	house fly	16 oz. per 1 gal. water
<b>ELANCO</b>	<b>Agita® 10 WG</b>	thiamethoxam (10.0%)	sprayable bait	house fly	See label for directions
<b>MGK</b>	<b>Decimari™ Fly Bait</b>	clothianidin (0.50% + pyriproxyfen (0.05%))	solid bait	house fly	See label for directions
<b>STARBAR</b>	<b>Golden Malrin® Fly Bait**</b>	methomyl (1.000%) + (Z)-9-tricosene (0.049%)	solid bait	house fly	4.0 oz. per 500 sq. ft.
	<b>QuikStrike® Fly Abatement Strip</b>	nithiazine (1.0%)	bait strip	house fly	See label for directions
	<b>QuikStrike® Fly Bait</b>	dinotefuran (0.50%) + (Z)-9-tricosene (0.04%)	solid bait	house fly	2.0 oz. per 250 sq. ft.
	<b>QuikStrike® Fly Bait Spray</b>	dinotefuran (0.50%) + (Z)-9-tricosene (0.04%)	sprayable bait	house fly	16 oz. per 1 gal. water
<b>SYNGENTA</b>	<b>Zyrox® Fly Granular Bait</b>	cyantraniliprole (0.5%)	solid bait	house fly	6.4 oz. per 1,000 sq. ft.

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. \*Not for stable flies \*\* Restricted use insecticide in Alaska, Indiana, Michigan and Vermont.

**Table 2.**

<b>WATER-BASED ON-ANIMAL SPRAYS</b>				
<b>TARGET FLY SPECIES: house fly, stable fly (see label for others)</b>				
<b>MFR.</b>	<b>BRAND NAME</b>	<b>ACTIVE INGREDIENT</b>	<b>RATE</b>	<b>MEAT/MILK W/D</b>
<b>BASF</b>	<b>ULD® HydroPy-300</b>	natural pyrethrins (3.0%) + PBO (15.0%)	10.7 to 42.7 fl. oz. per 1 gal. water (2 fl. oz. mixture per adult animal, sufficient to wet the hair but not soak hide)	
	<b>Microcare® 3% CS</b>	natural pyrethrins (3.0%; microencapsulated)	4.0 fl. oz. per 1 gal. water. Lightly mist animals thoroughly, but do not treat to runoff.	
<b>BAYER</b>	<b>DeltAGard® Insecticide</b>	deltamethrin (2.0%)	Can be applied as a non-thermal ULV (ultra low volume) space spray with the animals present. See label for rates and restrictions.	
	<b>Permethrin™ II</b>	permethrin (10.0%)	2.5 fl. oz. per 1 gal. water (up to 8 fl. oz. mixture per animal)	
	<b>Vapona® Concentrate Insecticide *</b>	dichlorvos (40.2%)	<i>Do not apply to animals less than 6 months old.</i> See label for rates and restrictions.	1 day-meat
<b>CONTROL SOLUTIONS</b>	<b>Martin's® Permethrin SFR</b>	permethrin (36.8%)	0.2 fl. oz. per 1 gal. water (2 qts. mixture per animal)	
	<b>Stryker™ Insecticide Concentrate</b>	natural pyrethrins (6.0%) + PBO (60.0%)	2.0 fl. oz. per 1 gal. water (wet hair thoroughly)	
	<b>Vector-Ban™ Plus</b>	permethrin (10.0%) + PBO (10.0%)	1.3 fl. oz. per 1 gal. water (wet hair thoroughly)	
<b>MERCK</b>	<b>Atroban® 11% EC</b>	permethrin (11%)	0.6 fl. oz. per 1 gal. water (1-2 qts. mixture per animal)	

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**Table 2. (Continued)**

WATER-BASED ON-ANIMAL SPRAYS				
TARGET FLY SPECIES: house fly, stable fly (see label for others)				
MFR.	BRAND NAME	ACTIVE INGREDIENT	RATE	MEAT/MILK W/D
<b>MGK</b>	<b>EverGreen® Pro 60-6</b>	natural pyrethrins (6.0%) + PBO (60.0%)	2.0 fl. oz. per 1 gal. water (wet hair thoroughly)	
	<b>EverGreen® Pyrethrum Concentrate</b>	natural pyrethrins (5.0%; organic)	3.0 fl. oz. per 1 gal. water (wet hair thoroughly)	
	<b>Riptide® Waterbased Pyrethrin ULV</b>	natural pyrethrins (5.0%) + PBO (25%)	Dilute 1 part concentrate with 49 parts water. Apply 2 fl. oz. of diluted product per adult animal in an amount sufficient to wet the hair but not to soak the hide.	
<b>NEOGEN</b>	<b>Prozap® Insectrin X Concentrate</b>	permethrin (10.0%)	1.3 fl. oz. per 1 gal. water (spray thoroughly to cover the entire animal)	
	<b>Prozap® Pyrethrin Aqueous Fly Spray RTU on Horses &amp; Cattle</b>	natural pyrethrins (0.1%) + PBO (1.0%)	Use undiluted. Apply mist sufficient to wet the hair.	
	<b>Prozap® Vapona 400E *</b>	dichlorvos (40.2%)	<i>Do not apply to animals less than 6 months old. See label for rates and restrictions.</i>	1 day-meat
<b>PYRANHA</b>	<b>Pyranha® 1-10 PX Concentrate</b>	permethrin (10.0%) + PBO (10.0%)	1.3 fl. oz. per 1 gal. water (wet hair thoroughly)	
<b>STARBAR</b>	<b>Attack-All® Livestock &amp; Premise Fly Spray</b>	natural pyrethrins (0.05%) + permethrin (0.10%) + PBO (0.50%)	See label for rates and restrictions	See label (meat & milk)
	<b>E-Pro Adulticide Spray</b>	permethrin (36.8%)	0.2 fl. oz. per 1 gal. water (2 qts. mixture per animal)	
	<b>Pyronyl™ 303 EC</b>	natural pyrethrins (3.0%) + PBO (30.0%)	Dilute 1 part to 29 parts water. Apply as a fog or mist at 2 fl. oz. mixture per 1,000 cubic feet of space using a hand-held mechanical fogger.	
	<b>Pyronyl™ Crop Spray</b>	natural pyrethrins (6.0%) + PBO (60.0%)	2.0 fl. oz. per 1 gal. water (wet hair thoroughly)	
	<b>UL-100 EC Insecticidal Spray</b>	natural pyrethrins (0.96%) + PBO (9.60%)	Dilute 1 part concentrate and 9 parts water and apply one qt. per adult animal to wet hair thoroughly with particular attention to the legs, flanks, barrel, topline and other body areas commonly attacked by flies.	
<b>Y-TEX</b>	<b>Gardstar® 40% EC</b>	permethrin (40%)	0.2 fl. oz. per 1 gal. water (1-2 qts. mixture per animal)	

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. \*Restricted use insecticide.

**Table 3.**

OIL-BASED ON-ANIMAL SPRAYS				
MFR.	BRAND NAME	ACTIVE INGREDIENT	TARGET FLY SPECIES	RATE
<b>BASF</b>	<b>ULD® BP-100</b>	natural pyrethrins (1%) + PBO (5%)	house fly, stable fly (see label for others)	Use undiluted. Apply a light mist sufficient to wet the tips of the hair.
<b>BAYER</b>	<b>Permethrin® CDS Pour-On</b>	permethrin (7.4%) + PBO (7.4%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 2 ml per 100 lbs. body weight up to a maximum of 20 ml for any one animal.
	<b>Permethrin® Pour-On</b>	permethrin (1.0%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 0.5 fl. oz. per 100 lbs. body weight up to a maximum of 5.0 fl. oz. for any one animal.
	<b>Permethrin™ S Synergized Formula</b>	permethrin (1.0%) + PBO (1.0%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 0.5 fl. oz. per 100 lbs. body weight up to a maximum of 5.0 fl. oz. for any one animal.

DAIRY CALF HUTCHES, DAIRY BARNs, DRYLOTS AND FEEDLOTS

Integrated Pest Management

Table 3. (Continued)

OIL-BASED ON-ANIMAL SPRAYS				
MFR.	BRAND NAME	ACTIVE INGREDIENT	TARGET FLY SPECIES	RATE
CONTROL SOLUTIONS	Martin's® Fly-Ban Synergized Pour-On	permethrin (7.4%) + PBO (7.4%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 2 ml per 100 lbs. body weight up to a maximum of 20 ml for any one animal.
	Martin's® Permethrin 1.0% Synergized Pour-On	permethrin (1.0%) + PBO (1.0%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 0.5 fl. oz. per 100 lbs. body weight up to a maximum of 5.0 fl. oz. for any one animal.
	Stryker® 100	natural pyrethrins (1.0%) + PBO (5.0%)	horn fly, face fly, stable fly (see label for others)	Use undiluted. Apply a light mist sufficient to wet the tips of the hair.
MERCK	Synergized DeLice® Pour-On	permethrin (1.0%) + PBO (1.0%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 0.5 fl. oz. per 100 lbs. body weight up to a maximum of 5.0 fl. oz. for any one animal.
MGK	EverGreen® 100 Synergized ULV Concentrate	natural pyrethrins (1.0%) + PBO (5.0%)	house fly (see label for others)	Apply undiluted at the rate of 1.25 fl. oz. per 1,000 ft <sup>3</sup> of space. Direct spray toward the upper portions of the enclosure above the animals, filling the room with mist or fog.
NEOGEN	Prozap® Beef & Dairy RTU*	dichlorvos (1.0%)	house fly, stable fly (see label for others)	Verify restriction status in your state before using. <i>Do not apply to calves less than 6 months in age.</i> Use undiluted; apply 1-2 oz. per animal. Do not use in excess of 2 oz. per adult animal. Do not soak the skin or wet the hide.
	Prozap® Dairy & Ranch Insect Spray	natural pyrethrins (0.1%) + PBO (1.0%)	house fly, stable fly (see label for others)	See label for application rates and directions.
	Prozap® Dairy Cattle Spray	dichlorvos (0.50%) + natural pyrethrins (0.05%) + PBO (0.10%)	house fly, stable fly (see label for others)	See label for application rates and directions.
	Prozap® Insectrin 1% Pour-on Xtra	permethrin (1.0%) + PBO (1.0%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 0.5 fl. oz. per 100 lbs. body weight up to a maximum of 5.0 fl. oz. for any one animal.
	Prozap® Insectrin CS	permethrin (7.4%) + PBO (7.4%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 2 ml per 100 lbs. body weight up to a maximum of 20 ml for any one animal.
	Prozap® VIP Insect Spray	dichlorvos (0.500%) + natural pyrethrins (0.025%) + PBO (0.250%)	house fly, stable fly (see label for others)	<i>Do not apply to calves less than 6 months in age.</i> Use undiluted; apply 1-2 oz. per animal. Do not use in excess of 2 oz. per adult animal. Do not soak the skin or wet the hide.
STARBAR	UL-100 EC Insecticidal Spray	natural pyrethrins (0.96%) + PBO (9.60%)	house fly, stable fly (see label for others)	Dilute 1 part Pyronyl UL-100 with 9 parts of oil and apply as a fog or fine mist directing spray toward the ceiling and upper corners until the area is filled with mist using about 2 fl. oz. of mixture per 1,000 cubic feet of space.
	Cattle Armor™ 1% Permethrin Synergized Pour-On	permethrin (1.0%) + PBO (1.0%)	house fly, stable fly (see label for others)	Use undiluted using a mist sprayer to apply 0.5 fl. oz. per 100 lbs. body weight up to a maximum of 5.0 fl. oz. for any one animal.
	Pyronyl™ Oil Concentrate #525	natural pyrethrins (5.0%) + PBO (25.0%)	house fly, stable fly (see label for others)	Dilute 1 part concentrate with 49 parts oil (refined kerosene). Apply 2 fl. oz. of diluted product per adult animal, sufficient to wet the hair but not to soak the hide.

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. No meat or milk withdrawals indicated. \*Restricted use insecticide in New Jersey.

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Table 4.

ON-ANIMAL SPRAY INSECTICIDES FOR USE IN CATTLE PREMISE AUTOMATIC MISTING SYSTEMS*		
TARGET FLY SPECIES: house fly, stable fly (see label for others)		
RATE: See label for dilution rates. Spray must be directed to the legs of cattle to control stable flies.		
MFR.	BRAND NAME	ACTIVE INGREDIENT
BASF	ULD® HydroPy-300	natural pyrethrins (3%) + PBO (15%)
CONTROL SOLUTIONS	Vector-Ban™ Plus	permethrin (10%) + PBO (10%)
	Stryker® 5-25	natural pyrethrins (5%) + PBO (25%)
MGK	Riptide® Waterbased Pyrethrin ULV	natural pyrethrins (5%) + PBO (25%)
PYRANHA	Pyranha® 1-10 PX Concentrate	permethrin (10%) + PBO (10%)
STARBAR	Pyronyl™ 303 EC	natural pyrethrins (3.0%) + PBO (30.0%)

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. No meat or milk withdrawals indicated. \*Check with your local state regulatory office for misting system and insecticide regulations and restrictions.

Table 5.

AEROSOL ON-ANIMAL SPRAYS		
TARGET FLY SPECIES: house fly, stable fly (see label for others)		
RATE: See label for detailed directions.		
MFR.	BRAND NAME	ACTIVE INGREDIENT
BASF	Clear Zone® Double Impact Farm Fly Spray	natural pyrethrins (0.25%) + permethrin (0.25%) + piperonyl butoxide (2.00%)
BAYER	Catron® IV	permethrin (0.50%)
CONTROL SOLUTIONS	Martin's Pystol® Farm & Dairy Aerosol	natural pyrethrins (0.25%) + permethrin (0.25%) + piperonyl butoxide (2.00%)
	Martin's Stryker® Farm & Dairy Aerosol Insect Spray	natural pyrethrins (0.5%) + piperonyl butoxide (4.0%)
DURVET	Dairy Bomb 55	natural pyrethrins (0.5%) + piperonyl butoxide (5.0%)
	Dairy Bomb 55Z	natural pyrethrins (0.5%) + piperonyl butoxide (5.0%)
COUNTRY VET	Dairy Aerosol CV-ECO Flying Insect Killer	natural pyrethrins (0.5%) + piperonyl butoxide (5.0%)
	Farm & Dairy CV-80D for Insect Control	natural pyrethrins (0.5%) + piperonyl butoxide (4.0%)
	Mosquito & Fly Spray	natural pyrethrins (1.76%) + piperonyl butoxide (5.00%)

**DAIRY CALF HUTCHES, DAIRY BARNs, DRYLOTS AND FEEDLOTS**

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**Table 5. (Continued)**

<b>AEROSOL ON-ANIMAL SPRAYS</b>		
<b>TARGET FLY SPECIES:</b> house fly, stable fly (see label for others)		
<b>RATE:</b> See label for detailed directions.		
<b>MFR.</b>	<b>BRAND NAME</b>	<b>ACTIVE INGREDIENT</b>
<b>PROZAP</b>	<b>CT-75 Dairy Aerosol</b>	natural pyrethrins (0.7%) + piperonyl butoxide (5.0%)
	<b>DyFly Aerosol Insecticide</b>	natural pyrethrins (0.5%) + piperonyl butoxide (5.0%)
	<b>LD-44T®</b>	natural pyrethrins (1.0%) + piperonyl butoxide (2.0%) + synergist 264 (3.0%)
	<b>LD-44Z® Insect Fogger</b>	natural pyrethrins (0.5%) + piperonyl butoxide (4.0%)

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. No meat or milk withdrawals indicated.

**Table 6.**

<b>FLY LARVICIDES</b>					
<b>MFR.</b>	<b>BRAND NAME</b>	<b>ACTIVE INGREDIENT</b>	<b>FORMULATION</b>	<b>TARGET FLY SPECIES</b>	<b>RATE</b>
<b>BAYER</b>	<b>Rabon™ 7.76 Oral Larvicide Pre-Mix</b>	tetrachlorvinphos (7.76%)	Feedthrough	maggots of flies	See label for inclusion rate.
<b>CHAMPION ANIMAL HEALTH</b>	<b>JustiFLY® 3% 360gram addpack</b>	diflubenzuron (3.0%)	Feedthrough	maggots of flies	See label for inclusion rate.
	<b>JustiFLY® Feedthrough</b>	diflubenzuron (3.0%)	Feedthrough	maggots of flies	See label for inclusion rate.
<b>CONTROL SOLUTIONS</b>	<b>Tekko™ 10</b>	novaluron (9.3%)	Spray	maggots of dump fly and soldier fly	1.5-3.0 fl. oz. per 1,000 ft <sup>2</sup> area. Apply directly to fly breeding sites around hay bales, dairy barns, cattle feedlots, and all other premise areas where flies breed. Apply in sufficient volume of water (up to 20 gals. per 1,000 sq.ft.) to uniformly and thoroughly wet target areas.
<b>ELANCO</b>	<b>Elector® PSP</b>	spinosad (44.2%)	Spray	maggots of flies	0.20 fl. oz. per 1 gal. water
	<b>Neporex® 2 SG</b>	cyromazine (2.0%)	Granules or Spray	maggots of flies	1.0 lb. dry granules per 200 sq. ft. or 1.0 lb. per 1 gal. water to treat 200 sq. ft.
<b>MGK</b>	<b>NyGuard® IGR Concentrate</b>	pyriproxyfen (10.0%)	Spray	maggots of flies	0.4 fl. oz. per 1 gal. water to treat 1,500 sq. ft. of area
<b>MILK PRODUCTS</b>	<b>Sav-A-Caf Elim-A-Fly™ Add-Pack with ClariFly® Larvicide</b>	diflubenzuron (0.16%)	Feedthrough	maggots of house fly and stable fly	See label for inclusion rate.
<b>STARBAR</b>	<b>ClariFly® Add-Pack Fly Control for Calves</b>	diflubenzuron (0.16%)	Feedthrough	maggots of house fly and stable fly	See label for inclusion rate.
	<b>ClariFly® Larvicide 0.67% Premix</b>	diflubenzuron (0.67%)	Feedthrough	maggots of house fly and stable fly	See label for inclusion rate.

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer. No meat or milk withdrawals indicated.

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Table 7.

LIVE PARASITIC WASPS					
MFR.	BRAND NAME	WASP SPECIES	FORMULATION	TARGET PEST	RATE
BENEFICIAL INSECTARY	Beneficial Insectary	<i>Spalangia cameroni</i> , <i>Muscidifurax zaraptor</i> and <i>Muscidifurax raptorellus</i>	Live parasitic wasps	pupae of stable fly and house fly	Consult with manufacturer for details. Call 1-800-477-3715

Prior to using any product mentioned in this article, carefully read and follow all available instructions, warnings and safety information made available by the product's manufacturer.

Table 8.

EMPTY-BARN RESIDUAL SPRAYS					
MFR.	BRAND NAME	ACTIVE INGREDIENT	FORMULATION	TARGET FLY SPECIES	RATE
BASF	Alpine® WSG Water Souble Granule Insecticide	dinotefuran (40.0%)	Spray (water soluble granules)	flies (see label for others)	10 to 20 grams per 1 gal. water to treat 1,000 sq. ft.
	Durashield® CS*	chlorpyrifos (20.0%)	Spray (water-based; micro-encapsulated)	flies (see label for others)	5.00 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Optashield® CS	cyfluthrin (6.0%)	Spray (water-based; micro-encapsulated)	flies (see label for others)	2.00 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	PermaCap CS®	permethrin (23.0%)	Spray (water-based; micro-encapsulated)	stable fly, house fly (see label for others)	5.30 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
BAYER	Annihilator™ PolyZone®	deltamethrin (4.75%)	Spray (water-based; PolyZone technology)	flies (see label for others)	1.50 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Tempo® 20 WP	cyfluthrin (20.0%)	Wettable powder	flies (see label for others)	0.70 oz. per 1 gal. water to treat 1,000 sq. ft.
	Tempo® SC Ultra Premise Spray	beta-cyfluthrin (11.8%)	Spray (water-based)	flies (see label for others)	0.54 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
CONTROL SOLUTIONS	Cyzmic® CS	lambda-cyhalothrin (9.7%)	Spray (water-based; micro-encapsulated)	flies (see label for others)	0.80 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Optimate® CS	gamma-cyhalothrin (5.9%)	Spray (water-based; micro-encapsulated)	stable fly, house fly (see label for others)	0.65 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Permethrin CS	permethrin (23.6%)	Spray (water-based; micro-encapsulated)	stable fly, house fly (see label for others)	5.30 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Pyrofos™ CS*	chlorpyrifos (20.0%)	Spray (water-based; micro-encapsulated)	flies (see label for others)	5.00 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Pyrofos™ 42 CS*	chlorpyrifos (41.85%)	Spray (water-based; micro-encapsulated)	flies (see label for others)	0.2 to 0.8 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
ELANCO	Elector® PSP	spinosad (44.2%)	Spray (water-based)	stable fly, house fly (see label for others)	0.20 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	StandGuard™ Premise Insecticide	gamma-cyhalothrin (5.9%)	Spray (water-based; controlled-release)	flies (see label for others)	0.33 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
MERCK	Grenade® ER Insecticide	lambda-cyhalothrin (9.7%)	Spray (water-based; micro-encapsulated)	flies (see label for others)	0.80 fl. oz. per 1 gal. water to treat 1,000 sq. ft.

DAIRY CALF HUTCHES, DAIRY BARNs, DRYLOTS AND FEEDLOTS

Integrated Pest Management

Table 8. (Continued)

EMPTY-BARN RESIDUAL SPRAYS					
MFR.	BRAND NAME	ACTIVE INGREDIENT	FORMULATION	TARGET FLY SPECIES	RATE
MGK	Onslaught <sup>®</sup> FastCap Spider and Scorpion Insecticide	esfenvalerate (6.4 %) + prallethrin (1.6%) + PBO (8.0%)	Spray (water-based)	house flies (see label for others)	1.00 fl. oz. to 2.00 fl. oz. per 1 gal. water (or sufficient water to treat 1,000 sq. ft.)
	Onslaught <sup>®</sup> Microencapsulated Insecticide	esfenvalerate (6.4 %)	Spray (water-based; micro-encapsulated)	house flies (see label for others)	1.00 fl. oz. per 1 gal. water to treat 1,000 sq. ft.
	Tobex <sup>™</sup> Multi MoA Concentrate	lambda-cyhalothrin (4.00%) + prallethrin (0.40%) + pyriproxyfen (1.30%) + piperonyl butoxide (6.00%)	Spray (water-based; micro-encapsulated)	house flies (see label for others)	1.00 fl. oz. to 2.00 fl. oz. per 1 gal. water (or sufficient water to treat 1,000 sq. ft.)

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Table 9.

FLY TRAPS	
TARGET PEST: house fly*	
MFR.	BRAND NAME
CATCHMASTER	Pro Series Bulk Scented Bug & Fly Ribbon
	Pro Series Giant Fly Trap
	GLOstik <sup>™</sup> Flying Insect Trap
STARBAR	*Bite Free <sup>™</sup> Stable Fly Trap (for stable flies)
	Captivator <sup>®</sup> Fly Trap
	EZ Trap <sup>®</sup> Fly Trap
	Fly Stik <sup>™</sup>
	Fly Stik <sup>™</sup> Jr.
	Fly Terminator <sup>®</sup> Pro
	FlyRelief <sup>™</sup> Disposable Fly Trap
	Giant FlyRelief <sup>™</sup> Disposable Fly Trap
	Trap 'N Toss <sup>™</sup> Disposable Fly Trap
STERLING INTERNATIONAL	Rescue <sup>®</sup> Big Bag Disposable Fly Trap
	Rescue <sup>®</sup> Disposable Fly Trap
	Rescue <sup>®</sup> Fly Tape
	Rescue <sup>®</sup> TrapStik <sup>®</sup> Fly Trap
VICTOR	Fly Catcher 4-Pack
	Fly Magnet <sup>®</sup> Trap
	Poison Free <sup>®</sup> Super Fly Roll
	Poison-Free <sup>®</sup> Fly Magnet Disposable Fly Trap with Bait

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Table 10.

**EQUIPMENT FOR APPLYING INSECTICIDES IN AND AROUND DAIRY CALF HUTCHES, DAIRY BARNs, DRYLOTS AND BEEF CATTLE FEEDLOTS**

MFR.		MODEL	WEBSITE ADDRESS
A1 MIST SPRAYER SYSTEMS		Terminator Heavy Duty 3-Point Mist Sprayer	<a href="http://mistsprayers.com">http://mistsprayers.com</a>
CURTIS DYNA-FOG		Hurricane Fogger	<a href="http://www.dynafog.com/products/sanitation-and-greenhouse/hurricane-2/">www.dynafog.com/products/sanitation-and-greenhouse/hurricane-2/</a>
STIHL		SR 450 Backpack Sprayer/Duster w/ ULV Kit	<a href="http://www.stihlusa.com/products/sprayers/backpack-blower-and-sprayer/sr450/">www.stihlusa.com/products/sprayers/backpack-blower-and-sprayer/sr450/</a>
		SR 200 Backpack Sprayer w/ ULV Kit	<a href="http://www.stihlusa.com/products/sprayers/backpack-sprayer/sr200/">www.stihlusa.com/products/sprayers/backpack-sprayer/sr200/</a>
THERMO FOGGER		Model 2107 Pest Control Fogger	<a href="http://thermo-fogger.com">http://thermo-fogger.com</a>

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