

Fly Control in and around Animal Facilities: Current Challenges and Solutions to an Age Old Problem:

Understanding Organics and Grazing:
Livestock Management and Health
October 28-30, 2008 - Auburn NY

J. Keith Waldron
Livestock & Field Crop IPM
New York State IPM Program
Cornell University
NYSAES, Geneva, NY

Dr. Don Rutz
Professor of Veterinary Entomology
Director of the NYS IPM Program
Cornell University



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Flies on the Farm....

- ❖ **Animal Health**
 - Transmission of Disease causing Agents
 - Decrease Milk Production, Weight Gain
- ❖ **Annoy / Irritate Animals & Farm Workers**
- ❖ **Off-Site Movement**
 - Neighborhood Conflicts, Public Health
- ❖ **Control Challenges**
 - Pesticide Resistance and the FQPA



Animal Stress => Impacts

- ❖ **Impacts from flies + mange + lice
+ other stresses....**
- ❖ **Stresses - annually and over lifetime**
- ❖ **Younger animals more at risk - may affect
productivity over their lifetime**

Economics

For a 100 cow herd....

USDA DATA (All Pests, Potential Annual Impacts)

% Loss	\$ Loss/Cow	Annual \$ Loss
5%	\$153	\$15,300
10%	\$306	\$30,600
20%	\$612	\$61,200

Assumes: 17K lbs milk / animal / yr, \$18 cwt

Changing Face of Rural America



Off Farm Impacts

- ❖ **Publicity**
- ❖ **Public Health**
- ❖ **Neighborhood Relations**
- ❖ **Litigation?**



June 25, 2008

Town Watches the Skies After an Invasion of Flies

By THE NEW YORK TIMES

NAPLES, N.Y., June 23 — Will they return, or is the worst over? Will the buzzing black masses swarm around homes, settling on screens and siding? Will they once again slip through the cracks around windows or fly in doors, landing on food and brushing across the faces of the sleeping? Will more barbecues be canceled, more garden parties postponed?

If only the people of Naples knew. Last week, millions of flies hatched and descended on about half a dozen houses in town, three weeks after a local farmer spread 200 tons of chicken manure on a 20-acre field nearby. Some residents scattered to the homes of friends and relatives. The town's health officer, noting that dead flies were several inches deep around the houses, declared a public health risk. Neighbors banded together to pester county and state health and environmental officials for help. Town leaders fielded inquiries from news media as far away as Japan.



The Insectal From Naples, N.Y. June 23, 2008. Dennis Whisman scooped up dead flies from her porch last week after a black swarm descended on about half a dozen homes in Naples, N.Y.

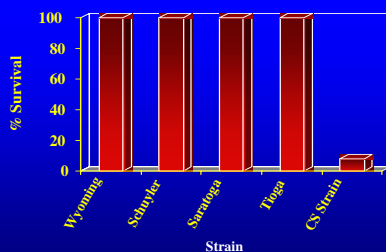
Insecticide Resistance

- ❖ **House and Stable flies resistant to many insecticides**
- Kaufman, P. E. and D. A. Rutz. 2002. Susceptibility of house flies (Diptera: Muscidae) exposed to five commercial insecticides on painted plywood. *Pest Manag. Sci.* 58: 174-178
- Kaufman, P.E., J.G. Scott and D.A. Rutz. 2001. Monitoring Insecticide Resistance in House Flies from New York Dairies. *Pest Manag. Sci.* 57: 514-521
- ❖ Fewer insecticides being registered for livestock use
- ❖ Very few new chemistries on the horizon
- ❖ Food Quality Protection Act

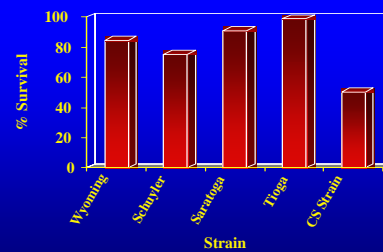
Monitoring Insecticide Resistance in House Flies from New York Dairies

D. A. Rutz, P. E. Kaufman, J. G. Scott
Department of Entomology
Cornell University

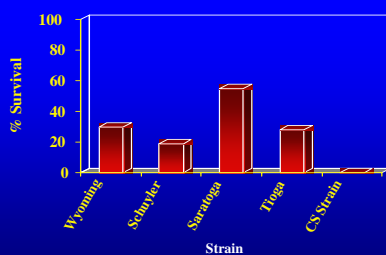
Permethrin



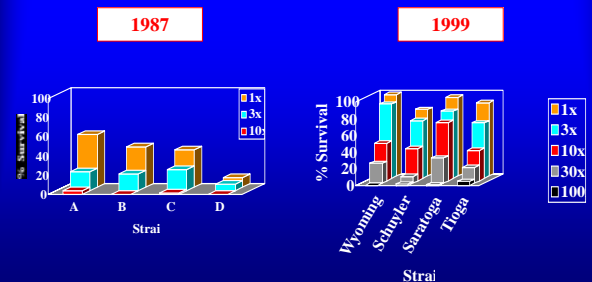
Dimethoate



Cyfluthrin



Change In Permethrin Resistance



Integrated Pest/Fly Management



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Insect / Arthropod Pests of Livestock

- ❖ Pest Species
- ❖ Biology
- ❖ Environment / Habitat
- ❖ Monitoring / Threshold
- ❖ Management



Insect / Arthropod Pests of Livestock

- ❖ House Flies
- ❖ Stable Flies
- ❖ Face Flies
- ❖ Horn Flies
- ❖ Deer Flies
- ❖ Horse Flies
- ❖ Cattle Grubs
- ❖ Cattle Lice
- ❖ Mange Mites



Insect / Arthropod Pests of Livestock

- ❖ House Flies
- ❖ Stable Flies
- ❖ Horn Flies
- ❖ Cattle Lice
- ❖ Mange Mites



Identification and Biology

House flies, *Musca domestica*



- ❖ Non-biting
- ❖ Habitat:
 - ↓ undisturbed *moist* organic matter (soiled bedding, manure, spilled feed & silage, etc.)

Identification and Biology

House fly, *Musca domestica*



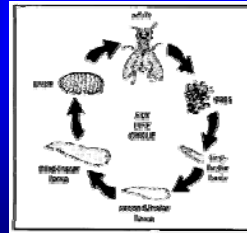
Identification and Biology

Stable fly, *Stomoxys calcitrans*



- ❖ **Biting Flies**
- ❖ **Habitat:**
 - ↳ undisturbed *moist* organic matter - straw and manure, spilled feed & silage, round bales, grass clippings, pond/lake weeds on shorelines, etc.

Identification and Biology



House fly - *Musca domestica*

- Life Cycle: 10 Days
- Live: 10- 21 Days
- Eggs: Up to 600

Stable fly - *Stomoxys calcitrans*

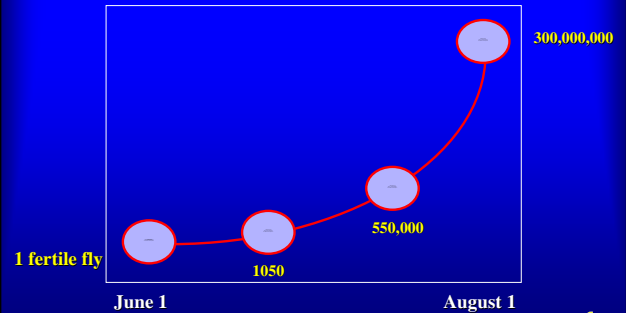
- Life Cycle: 21 Days
- Live: 20- 30 Days
- Eggs: Up to 400

House Fly Development

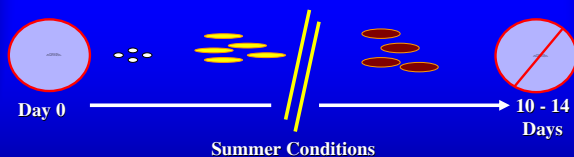
Constant Temp.	Hours to Hatch	Days to Pupation	Days to adult	Total Days
68	23	8 - 10	10 - 11	18 - 21
77	14	7 - 8	7 - 9	14 - 17
86	10	5 - 6	4 - 5	9 - 11
95	8	3 - 4	3 - 4	6 - 8

NOTE: Actual fly development varies with normal daily temperature fluctuations. House fly females can lay 4-6 batches of 100-150 eggs over their lifetime.

Potential Population Growth - 60 days



Sanitation: Break the life cycle



Clean fly breeding areas every 7 days
more frequently if you can...

Hang Outs & Hide Outs

Common fly breeding sites



- (1) calf hutches
- (2) silo leak and spill areas
- (3) animal stalls / pens, feed storage / prep areas, feed bunks, etc., near water sources
- (4) calf, hospital, maternity areas
- (5) water tanks
- (6) feed troughs
- (7) manure handling areas

Prime fly breeding sites



Clean: curbs, corners, crevices, cracks, and other places...

Monitoring

Spot Cards

- ❖ Count or estimate the # of spots
- ❖ Min. 5 cards, fly resting areas, distribute throughout barn
- ❖ 7 days/sample
- ❖ Action Guideline: 100 spots/card/week



Sticky Tapes / Ribbons

- ❖ Min. 5 sticky tapes / ribbons, distributed throughout barn
- ❖ 7 days/sample
- ❖ Action Guideline: ~ 250 flies/ tape /week

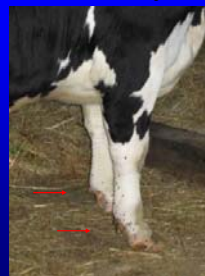


Monitoring - 3X5 Index "Spot" Card



Monitoring

Stable fly, *Stomoxys calcitrans*



- ❖ Count flies on all four legs
- Count standing animals
- Min. of 15 animals
- ❖ Sample every week
- ❖ Action Guideline
Avg. 10 flies per animal



Management Alternatives Cultural & Mechanical Control

Disrupt Fly Life Cycle:

- ❖ **Sanitation**
 - ↓ Moist organic matter is... *Paradise to a Fly!*
 - ↓ Clean manure, "soiled" bedding, moist hay / grain, spilled feed frequently at least weekly
 - ↓ Dry is good!
- ❖ **Spread manure thinly**
 - ↓ Disk in where possible



Management Alternatives Cultural Control

- ❖ **Control moisture**
 - Check for leaks in water system
 - Adequate ventilation
 - Proper grading and drainage
 - Add rain gutters to buildings



Management Alternatives Cultural Control

Bedding?

- Keep it dry
- Change often enough to break up fly development cycles



Management Alternatives Cultural Control

Can Choice of Animal Bedding Material Have an Impact on Fly Production?

- What's available?
- What's economical / practical?



Can Choice of Animal Bedding Material Have an Impact on Fly Production?

Bedding	Avg. # Maggots		% Reduction	
	H.Fly	S.Fly	H.Fly	S.Fly
1988				
Straw	6.6	64.6
Straw + filter	6.0	66.7	9	...
Sand	1.6*	0*	76	100
Sand + filter	0.3*	<0.1*	95	>99
Gravel	0.3*	0.1*	95	>99
Gravel + filter	0.1*	<0.1*	>98	>99

*Mean differs from that in straw bedding (P=0.05), 6 week trials

Source: Suppressing Immature House and Stable Flies in Outdoor Calf Hutches with Sand, Gravel and Sawdust Bedding. Schmidtman J. Dairy Sci. 74:3956-3960.

Can Choice of Animal Bedding Material Have an Impact on Fly Production?

Bedding	Avg. # Maggots		% Reduction	
	H.Fly	S.Fly	H.Fly	S.Fly
1989 Straw	15.0	52.4
Straw + filter	3.0	54.9	80	none
Pine Shavings	6.4	59.8	57	none
P. Shavings + filter	15.4	34.1	none	35
Sawdust	1.4	9.8*	91	81
Sawdust + filter	8.3	11.8*	45	77

*Mean differs from that in straw bedding (P=0.05)

Source: Suppressing Immature House and Stable Flies in Outdoor Calf Hutches with Sand, Gravel and Sawdust Bedding, Schmidtman J. Dairy Sci. 74:3956-3960.

Can Choice of Animal Bedding Material Have an Impact on Fly Production?

Considerations:

- Calf vs Cow Bedding Areas
- Available Sources?
- Economics?
- Other Management Issues?

Management Alternatives Cultural & Mechanical Control

- Sticky tapes, paper, ribbons
- Fly-free zone in milk room
 - Screen doors & windows
 - Traps
 - Limited insecticides
- Control moisture
 - Check for leaks in water system
 - Adequate ventilation and fans
 - Proper grading and drainage
 - Add rain gutters to buildings
 - Dump old water away from bedding



Sticky Ribbons & Tapes



Giant Sticky Trap
"Spider web"

Biological Control of House/Stable Flies



Predaceous Mites
Macrocheles muscadomestica



Predaceous Beetles
Carcinops spp



Diseases
Beauveria bassiana



Parasitoids
Muscidifurax raptor
M. raptorellus

Releasing Natural Enemies

- ❖ Sanitation is the *Foundation*
- ❖ Fly traps / Bait stations
- ❖ Parasitoids
 - ↓ Start middle to late May
 - ↓ Weekly releases
 - ↓ Sold as parasitized House fly pupae
 - Scatter pupae near breeding sites
 - ↓ Cost ~ \$14 / 10,000 / week
 - (50 cows or 10 calves)



Muscidifurax raptor

M. raptorellus

Releasing Natural Enemies



Muscidifurax raptor

M. raptorellus

- Climatically adapted species?
- Disease free?

Evaluation of Two Parasitoids in Dairy Calf Greenhouses



Parasitoid Sampling

- Sentinel pupae - Cornell house fly colony
- 10 sets of live house fly pupae (30/bag) placed weekly
- Sentinel's returned to laboratory and held for fly/parasitoid emergence

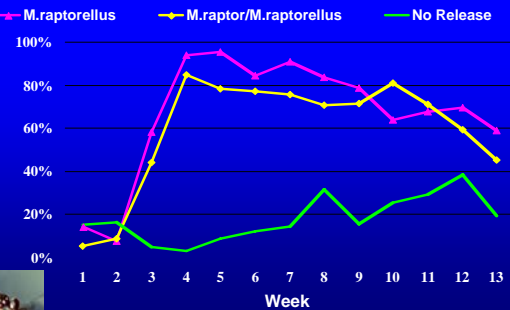


Parasitoid Evaluation

- Successful Parasitism (SP) - Pupae that produced adult parasitoids = *Recycling*
- Parasitoid-Induced Mortality (PIM) - Pupae that produced neither a fly nor a parasitoid
- Total Parasitism = SP + PIM = *Dead flies*

Fly Management in Calf Coveralls

2006-07 Total Parasitism



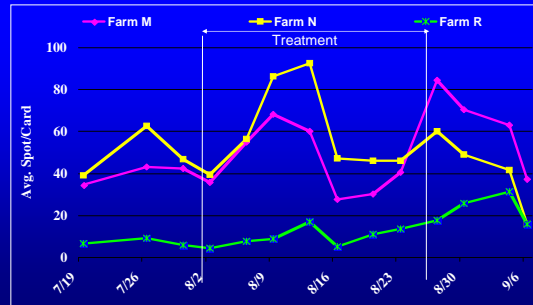
Fly Management In Stanchion Barns

Beauveria bassiana Bait Study



Fly Management In Stanchion Barns

2007 *B. bassiana* Bait Study

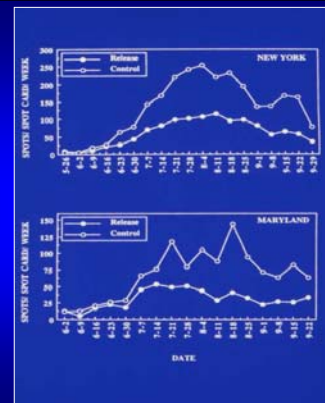


IPM for Managing Flies in Animal Confinement Areas

- ❖ Sanitation & Cultural Practices - the first line of defense
- ❖ Sticky tapes, paper, ribbons
- ❖ Bait traps
- ❖ Natural enemies
- ❖ Space sprays for early season control



Effect of using complete IPM approach on barn fly populations - sanitation, release of *Muscidifurax raptor*, judicious insecticide use and other IPM practices



Management Alternatives

Chemical Control

In accordance with Nat'l Organic Program?
Listed by Organic Materials Review Institute (OMRI)?
Registered for use in NYS by NYSDEC?
Or your home state equivalent?

Approved by your organic certifying agency?

Follow the label:

Organic Dairy Animals?
Lactating / non-lactating animals?
Any restrictions such as age, days to slaughter, etc.?
Confinement Areas / Facilities?

Resistance Management Plan?



Fly Control: Summary

- ❖ Economic losses due to flies and other arthropod pests
- ❖ Insecticide resistance, FQPA, off farm movement
- ❖ Fly Biology
- ❖ Monitor - weekly
- ❖ Management Options



Fly Control: Summary

Management Options:

- ❖ Sanitation
- ❖ Spread manure/organic matter
- ❖ Control moisture
- ❖ Screen doors & windows
- ❖ Sticky tapes, paper, ribbons
- ❖ Biological control - naturally-occurring and releases
 - bait traps
- ❖ Chemical Control
 - judicious use



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IPM for Fly Pests of Animals on Pasture



Insect and Mite Pests of Livestock

- ❖ Stable Flies
- ❖ Face Flies
- ❖ Horn Flies
- ❖ Deer Flies
- ❖ Horse Flies
- ❖ Cattle Grubs



Pasture Fly Biology - Habitat



- ❖ Stable Flies
- ❖ Face Flies
- ❖ Horn Flies
- ❖ Deer Flies
- ❖ Horse Flies
- ❖ Cattle Grubs

Identification and Biology

Face Flies, *Musca autumnalis*



- ❖ Non-biting insects
- ❖ Life Cycle: 14-21 Days
 - ↓ Live: 28 Days
 - ↓ Eggs: Up to 600
 - ↓ Overwinter as adult fly
- ❖ Habitat:
 - ↓ fresh undisturbed manure

Face Flies

Musca autumnalis



Face Fly Hibernaculum (overwintering site)



Identification and Biology

Horn fly, *Haematobia irritans*



- ❖ Biting Flies
- ❖ Life Cycle: 15 Days
 - ↓ Live: 35 Days
 - ↓ Eggs: 200 to 400
 - ↓ Overwinter as a pupa
- ❖ Habitat:
 - ↓ fresh undisturbed manure

Identification and Biology



Horn fly
Haematobia irritans

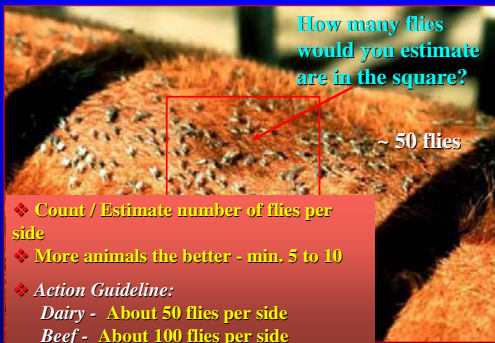
Monitoring Face Flies

- ❖ Count / Estimate number of flies per face
- ❖ More animals the better - min. 5 to 10
- ❖ Action Guideline: 10 flies per face



How many flies would you estimate?
~ 50 flies

Monitoring Horn Flies



- ❖ Count / Estimate number of flies per side
- ❖ More animals the better - min. 5 to 10
- ❖ Action Guideline:
 - Dairy - About 50 flies per side
 - Beef - About 100 flies per side

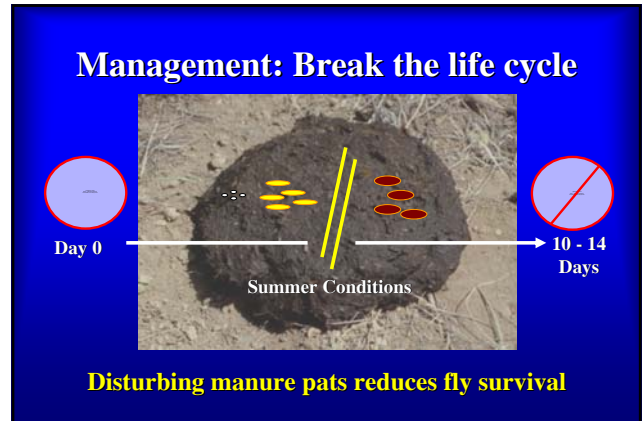
Monitoring

Stable fly, *Stomoxys calcitrans*



- ❖ Count flies on all four legs
- ❖ Count standing animals
- ❖ Min. of 10 - 15 animals
- ❖ Sample every week
- ❖ Action Guideline
 - Avg. 10 flies per animal





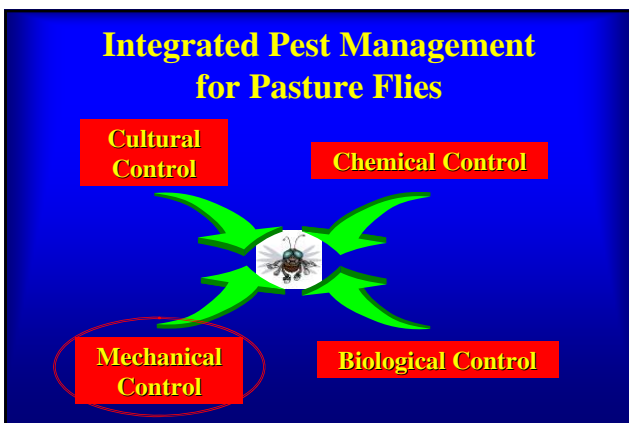
Management Alternatives Cultural & Mechanical Control

Disrupt Fly Life Cycle:

- ❖ **Chain / Drag Harrow**
 - ↓ harrow consisting of spikes attached to a network of flexible chain links, used for plowing on uneven ground, and pasture fly management
- ↓ Challenges w/pasture utilization?
- ↓ Pasture fouling?
- ↓ Impacts on natural enemies?

Management Alternatives - Biological Control

- ❖ **Natural enemies**
 - ↓ Predaceous Beetles
 - ↓ Predaceous Mites
 - ↓ Parasitoids
 - ↓ Diseases
 - ↓ Spiders
 - ↓ Birds
 - ↓ other Vertebrates
- ❖ **Habitat modifiers**
 - ↓ Dung Beetles



Traps for Pastured Dairy Fly Pests

- Part of the overall IPM strategy
- Attract (mimic host, movement, color)
- Effectiveness
 - varies with fly species
 - reduce population *not* eliminate
- Deployment - *Location, location, location*
- Animal Curiosity = Protect Trap
- Cost \$\$
- On-Going Research

<http://www.entomology.cornell.edu/Extension/Vet/>

Epps Trap



- Flies attracted to large things that stand out from surroundings. Tend to circle host before landing
- Fly into the clear plastic and bounce off into a tray full of liquid, where they drown

• **Horse, Deer, and Stable flies**

Epps Trap



Horse Pal Trap



- Specifically designed to attract and trap flies by resembling the underside of livestock
- Black ball moves, attracts
- Flies land on and above ball, move towards light in screened area, are ultimately trapped in jar

• **Horse, Deer, and Stable flies**

Horse Pal Trap



Alsynite Trap



- A fiberglass (alsynite) sheet that reflects light in wavelength that attracts flies
- Sheet of transparent fly paper wrapped around fiberglass. Insects stick....
- Sticky fly paper sheet is removed and replaced when full of flies

Stable flies

Alsynite Trap



Alsynite Trap



Pasture Fly Traps

Trap	Target Pest	Comments
"Avoidance"	Horn Fly, Face Fly, other flies	Provide animals with access to shelter
Epps Trap	Horse Fly, Deer Fly, Stable Fly	~\$360 (2006), Near water, fill trap reservoir, replace plastic, protect from animals
Horse Pal	Horse Fly, Deer Fly, Stable Fly	~\$225 (2006), protect from animals
Alsynite Trap (Olson or Broce)	Stable Fly	<\$50, Near water, fill trap reservoir, replace plastic, protect from animals
No-Zap / Stable Fly traps	Stable Fly	<\$10, Commercially available, protect from animals

<http://www.entomology.cornell.edu/Extension/Vet/>

Pasture Fly Management: Summary

- ❖ Economic losses due to flies and other arthropod pests
- ❖ Fly Biology
- ❖ Monitor - weekly
- ❖ Management Options



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Pasture Fly Management: Summary

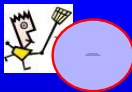
❖ Management Options:

- ❖ Cultural / Mechanical control
- ❖ Fly traps
- ❖ Biological control
- ❖ Chemical Control
 - Judicious use of insecticides
 - Note restrictions on lactating vs non-lactating animals
 - Read and follow the label
 - Use ear tags insecticides for mid- and late-season control
 - Alternate classes of insecticides



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Questions??



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Resources Available

- Pest Management Recommendations for Dairy Cattle, Horses, Sheep, Goats, Swine, and Poultry (Cornell / Penn State Publications)
- Video:
 - Integrated Fly Management Around Confined Livestock
 - Winter Active External Parasites of Dairy Cattle
- Factsheets:
 - Integrated Management of Flies In / Around Dairy / Livestock Barns
 - Pest Flies of Pastured Cattle & Horses
 - Common Pest Flies Found in Urban/Rural Environment & Their Biological Control Agents
 - Cattle Lice
- Other:
 - IPM for Flies in New York Dairy Barns: A How to Brochure
 - Integrated Pest Management for Confined Dairy Animal Fly Pests IPM Teleconference - (archive on-line)

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On-Line Resources

New York State IPM Program - Livestock IPM

❖ <http://www.nysipm.cornell.edu/lfc/>

Cornell Veterinary Entomology Program

❖ <http://www.entomology.cornell.edu/Extension/Vet/index.html>



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