

Livestock

Beef Cattle Pests

Sergio Arispe

Latest revision—March 2018

In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Notes:

1. Materials suggested for use on dairy animals may also be used on beef animals.
2. Some of the products suggested for insect control are registered as drugs, not insecticides, and are regulated by the FDA.
3. For an overview of methods used to control flies and parasites in beef cattle, see <http://ipm.wsu.edu/livestock/CattleSurveyEB.pdf>

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Beef cattle—Cattle grub

Common cattle grub (heel fly) (*Hypoderma lineatum*)

Northern cattle grub (*Hypoderma bovis*)

Biology Typically, the life cycle of a cattle grub spans about a year, with most of that time spent as a larva migrating inside the animal's body. To avoid adverse host-parasite reactions, cattle should be treated either before or after grubs migrate through the body. The best time to treat is as soon as the heel fly (adult stage) season is over. In practical terms, treatment for grubs may be accomplished at the same time as fall treatment for internal parasites but no later than November 30 to prevent a toxic reaction from dead/dying grubs that have migrated to vital regions such as the esophagus or spinal canal.

Management—chemical control (all drugs)

- ◆ doramectin pour-on (Dectomax) at 1 ml/10 kg (22 lb) body weight. Apply along the midline of the back in a narrow strip between the shoulders and tailhead. Do not slaughter within 45 days of treatment.
- ◆ doramectin subcutaneous injection (Dectomax) at 1 ml/50 kg (110 lb) body weight. Inject under loose skin in front of or behind shoulder. Do not slaughter within 35 days of treatment.
- ◆ eprinomectin pour-on (Eprinex) at 1 ml/10 kg (22 lb) body weight. Apply along midline of back. No slaughter interval, no required milk discard time.
- ◆ eprinomectin subcutaneous injection (LongRange) at 1 ml/50 kg (110 lb) body weight. Inject under the loose skin in front of the shoulder. Do not slaughter within 48 days of the last treatment.
- ◆ ivermectin pour-on (Ivomec, Phoenectin, Noromectin) at 1 ml/10 kg (22 lb) of body weight. Apply along the midline of the back in a narrow strip between the shoulders and tailhead. Do not slaughter within 48 days of treatment.

- ◆ ivermectin subcutaneous injection (Ivomec) at 1 ml/50 kg (110 lb) of body weight. Inject under loose skin in front of or behind shoulder. Do not slaughter within 35 days of treatment.
- ◆ moxidectin pour-on (Cydectin) at 1 ml/10 kg (22 lb) body weight. Apply along the midline of the back in a narrow strip between the shoulders and tailhead. No slaughter interval, no required milk discard time.
- ◆ moxidectin subcutaneous injection (Cydectin) at 1 ml/50 kg (110 lb) body weight. Do not overdose. Inject under loose skin in front of or behind shoulder. Do not slaughter within 21 days of treatment.
- ◆ tetrachlorvinphos (Rabon RTU 3%)—After grubs have encysted apply 3 to 4 oz down the backline and rub in thoroughly taking care to get the dust into the warble.

Beef cattle—Face fly

Musca autumnalis

Biology Face flies feed on the secretions of the eyes and nose for short periods of time; only a small percentage of the local face fly population may be found on animals at any one time. These aspects of its life history make management of face fly a very difficult task. Hence, many of the products labeled for efficacious horn fly control indicate that they merely aid in face fly control.

Management—chemical control

Ear tags

- ◆ beta-cyfluthrin + piperonyl butoxide ear tag (Cylence Ultra)—One tag to each ear of all animals older than 3 months when flies appear. Remove tags at end of fly season or before slaughter.
- ◆ diazinon + coumaphos ear tag (Corathon)—One tag to each ear on all mature animals when flies appear. One ear tag per calf. Remove tags at end of fly season or before slaughter.
- ◆ lambda-cyhalothrin + piperonyl butoxide ear tag (Saber Extra)—One tag to each ear on all animals when flies appear in spring. Remove tags in fall or before slaughter.
- ◆ lambda-cyhalothrin + pirimiphos-methyl ear tag (Double Barrel VP)—One tag to each ear on all animals in herd when flies appear in spring. Remove tag in fall.
- ◆ permethrin ear tag (GardStar Plus)—One tag per ear on all animals when flies first appear in spring. Remove before slaughter.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon MagnuM)—One tag per head of all mature and weaned animals when flies appear in spring. Remove tag at the end of fly season or before slaughter.

Pour-ons, sprays

- ◆ cyfluthrin pour-on (CyLence)—See label for dosing instructions. Pour along the top of the back and top of the head. Repeat as needed but no more than once every 3 weeks.
- ◆ ddvp concentrated spray (Vapona)—Dilute 1 gal in 50 gal water (1% solution) and apply up to 2 fl oz of solution per animal as a fine mist spray. Do not wet hide. Do not treat Brahman animals or calves under 6 months of age. One day withdrawal. Restricted Use Pesticide.
- ◆ permethrin ready-to-use pour on (1%; Atroban) at 0.5 fl oz (0.005 fl oz or 0.15 ml ai) per 100 lb of body weight to a maximum of 5 fl oz (0.05 fl oz or 1.5 ml ai) per animal. Pour along backline and down face. Treat once every 2 weeks as needed.
- ◆ permethrin + piperonyl butoxide pour on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat once every 2 weeks as needed.
- ◆ permethrin spray (Gardstar 40% EC) at 30 to 118 ml (1 to 4 fl oz) per 25 gal water (0.013 to 0.05% ai). 1 to 2 quart high pressure spray over body of animal. For low-pressure spray, apply at 118 ml (4 fl oz) to 2.5 gal water, spray till wet but not to runoff.

- ◆ tetrachlorvinphos + ddvp (Ravap)—Mix 1 gal in 75 gal water. Apply as coarse spray, 0.5 to 1 gal spray per animal. Do not treat Brahman cattle or calves under 6 months of age. Do not treat more often than once every 10 days.

Dusts, backrubbers

- ◆ coumaphos EC (Co-Ral Emulsifiable) at 9.75 fl oz per gal of No. 2 diesel or fuel oil. Place backrubber where animals congregate.
- ◆ permethrin backrubber or self-oiler (Gardstar 40% EC) at 118 ml (4 fl oz) to 10 gal diesel or mineral oil. Keep rubbing device charged. Results improve with forced daily use.
- ◆ permethrin dust (several brands, 0.25%)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animal's backline. Direct applications of 2 oz per animal may be repeated as needed.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon)—Apply in dust bag, shaker, dusting glove, or mechanical duster. Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animal's backline. Direct applications of 2 oz per animal may be repeated as needed but not more often than once every 3 days.

Feed supplements

- ◆ diflubenzuron feed supplement (Clarify 8%)—Prevents development of immature forms in manure of treated animals. Mix into grain according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight/day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ diflubenzuron add-pack for milk (Clarify Add-Pack)—Prevents development of immature forms in manure of treated calves. Mix daily into milk/milk replacer according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight/day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ tetrachlorvinphos mineral block (Sweetlix Rabon)—For control of fecal flies in manure of treated animals. Feed free choice, 1 block for 5 head of cattle. Consult veterinarian before using this product with pregnant or lactating animals. See label for details.

Beef cattle—Horn fly

Haematobia irritans

Biology The horn fly was introduced into the United States during the 1800s and it spread rapidly across North America. Females lay eggs in fresh cattle manure, which is where immature forms complete development. During warm weather the life cycle of a horn fly is 10–20 days; there are many generations of flies each year. The first flies appear in June or earlier; flies disappear with hard frosts in fall. Both sexes suck blood from cattle and other animals. If enough flies are present, this can lead to reduced weight gains or milk production of cattle. However, cattle can tolerate a low density of horn flies without measurable losses. The generally agreed upon economic threshold is 200 horn flies per animal.

Management—chemical control

Ear tags

- ◆ abamectin ear tag (XP 820)—Apply to all animals in herd when flies become a problem in spring. One or two tags/animal. Remove tags at end of fly season or before slaughter.
- ◆ beta-cyfluthrin + piperonyl butoxide ear tag (Cylence Ultra)—One tag to each ear of all animals older than 3 months when flies appear. Remove tags at end of fly season or before slaughter.
- ◆ diazinon ear tag (Patriot, OPTimizer)—One tag to each ear of all animals older than 3 months. Remove before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when flies appear. Remove before slaughter.

- ◆ diazinon + coumaphos ear tag (Corathon)—One tag to each ear on all mature animals when flies appear. One ear tag per calf. Remove tags at end of fly season or before slaughter.
- ◆ lambda-cyhalothrin ear tag (Saber Extra)—One tag to each ear on all animals when flies appear in spring. Remove tags in fall or before slaughter.
- ◆ lambda-cyhalothrin (6.8%) + pirimiphos-methyl (14%) ear tag (Double Barrel VP)—One tag to each ear on all animals in herd when flies appear in spring. Remove tag in fall.
- ◆ permethrin ear tag (GardStar plus)—One tag per ear on all animals when flies first appear in spring. Remove before slaughter.
- ◆ pirimiphos-methyl ear tag (Dominador)—One tag per ear on all animals when flies first appear in spring. Remove tags in fall.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon MagnuM)—One tag per head of all mature and weaned animals when flies appear in spring. Remove tag at the end of fly season or before slaughter.

Pour-ons, sprays

- ◆ coumaphos spray (Co-Ral Emulsifiable) at 2.5 fl oz per 4 gal water. Apply to run-off. Check label for application restrictions.
- ◆ cyfluthrin pour-on (CyLence)—See label for dosing instructions. Pour along top of back and head of the animal. Repeat as needed but no more than once every 3 weeks.
- ◆ ddvp concentrated spray (Vapona)—Dilute 1 gal in 50 gal water (1% solution) and apply up to 2 fl oz of solution per animal as a fine mist spray. Do not wet hide. Do not treat Brahman animals or calves under 6 months of age. One day withdrawal.
- ◆ eprinomectin pour-on (Eprinex, drug) at 1 ml/10 kg (22 lb) body weight. Apply along midline of back in a narrow strip extending from the withers to the tailhead. No slaughter interval, no required milk discard time.
- ◆ gamma-cyhalothrin pour-on (Standguard) at 10 ml (0.3 fl oz) if < 600 lb or 15 ml (0.5 fl oz) if > 600 lb to backline. Do not apply to face. Repeat as needed but no more than once every 2 weeks and no more than 4 times in a 6 month period.
- ◆ ivermectin pour-on (Ivomec, drug) at 1 ml/10 kg (22 lb) body weight. Do not slaughter within 48 days of treatment.
- ◆ lambda-cyhalothrin + piperonyl butoxide pour-on (Exile Ultra) at 10 ml (0.3 fl oz) if < 600 lb or 15 ml (0.5 fl oz) if > 600 lb to backline. Do not apply to face. Repeat as needed but no more than once every 2 weeks and no more than 4 times in a 6 month period.
- ◆ permethrin ready-to-use pour on (1%; Atroban) at 0.5 fl oz (0.005 fl oz or 0.15 ml ai) per 100 lb of body weight to a maximum of 5 fl oz (0.05 fl oz or 1.5 ml ai) per animal. Pour along backline and down face. Treat once every 2 weeks as needed.
- ◆ permethrin + piperonyl butoxide pour on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat once every 2 weeks as needed.
- ◆ permethrin spray (Gardstar 40% EC) at 30 to 118 ml (1 to 4 fl oz) per 25 gal water (0.013-0.05% ai). 1 to 2 quarts high pressure spray over body of animal. For low-pressure spray, apply at 118 ml (4 fl oz) to 2.5 gal water, spray till wet but not to runoff.
- ◆ phosmet spray (Prolate/Lintox-HD) at 1 gal per 200 gal water. Apply as high pressure spray wetting skin and hair but not to point of runoff. Do not slaughter within 3 days after treatment. Repeat as needed every 7 to 10 days. See label for other restrictions.
- ◆ pyrethrins (EverGreen EC 60-6) at 1 to 2 fl oz/gallon of water. Wet hair thoroughly. Repeat as needed. Also available as aerosol.
- ◆ tetrachlorvinphos + ddvp spray (Ravap)—Mix 1 gal in 75 gal water. Apply as coarse spray, 0.5 to 1 gal spray per animal. Do not treat Brahman cattle or calves under 6 months of age. Do not treat more often than once every 10 days.

Dusts, backrubbers

- ◆ coumaphos dust (Co-Ral)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animal's backline. Direct applications of 2 oz per animal may be repeated no more frequent than 10 days apart and no more than 12 applications in 12 months.
- ◆ coumaphos (Co-Ral Fly & Tick Spray) at 9.75 fl oz per gal of No. 2 diesel or fuel oil. Place backrubber where animals congregate.
- ◆ permethrin backrubber or self-oiler (Gardstar 40% EC) at 118 ml/10 gal mineral oil or diesel oil. Keep rubbing device charged. Results improve with forced daily use.
- ◆ permethrin dust (several brands, 0.25%)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animal's backline. Direct applications of 2 oz per animal may be repeated as needed.
- ◆ phosmet backrubber (Prolate/Lintox HD)—Dilute 1 gal into 50 gal fuel oil or other suitable carrier. Charge backrubber device as needed. Do not slaughter within 3 days of treatment. See label for restrictions.
- ◆ tetrachlorvinphos + ddvp backrubber (Ravap)—Mix 1 gal in 25 gal water. Mix with approved oil and use in mechanical rubbing device or burlap or rope backrubbers. Charge as needed.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon)—Apply in dust bag, shaker, dusting glove, or mechanical duster. Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animal's backline. Direct applications of 2 oz per animal may be repeated as needed but not more often than once every 3 days.

Feed supplements

- ◆ diflubenzuron feed supplement (Clarify 8%)—Prevents development of immature forms in manure of treated animals. Mix into grain according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight/day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ diflubenzuron add-pack for milk (elim-A-fly Add-Pack with Clarify)—Prevents development of immature forms in manure of treated calves. Mix daily into milk/milk replacer according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight/day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ (S)-methoprene premix (Altosid IGR Custom 2%)—Use formulas on label to determine proper amounts to mix with feed or minerals. Begin use 30 days prior to fly season; continue feeding until cold weather restricts horn fly activity.
- ◆ (S)-methoprene mineral tub (Mineralix fly tub with IGR)—Feed free choice. Place tubs out before flies appear and continue use until cold weather marks end of fly season.
- ◆ tetrachlorvinphos mineral block (Sweetlix Rabon)—Feed free choice. 1 block for 5 head of cattle. See label for details.

Beef cattle—Lice

Includes

Cattle chewing louse (*Bovicola bovis*)—biting
Little blue louse (*Solenopotes capillatus*)—sucking
Long-nose louse (*Linognathus vituli*)—sucking
Short-nose louse (*Haematopinus eurysternus*)—sucking

Management—chemical control

A single treatment may not give complete seasonal control because none of the listed products are effective against eggs. A second treatment no later than 14 days after the first treatment is usually recommended.

Ear tags

- ◆ diazinon ear tag (Patriot)—One tag to each ear of all animals older than 3 months. Remove before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—Apply one tag per animal in late fall or early winter.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon MagnuM)—Apply one tag per head in late fall or early winter.

Injections, pour-ons, sprays

- ◆ amitraz spray or dip (Taktic)—Mix one can (760 ml) in 100 gal water. Use up to 2 gal spray or dip solution for each mature animal; wet thoroughly to point of run-off. Retreat 10 to 14 days later. No slaughter interval, no milk withholding period.
- ◆ cyfluthrin pour-on (CyLence)—See label for dosing instructions. Pour along top of back and head. Repeat treatment 3 weeks later.
- ◆ diflubenzuron pour-on (Clean-Up) at 3 ml per 100 lb of body weight up to 30 ml per animal. Apply down face and along back. Retreat as needed, but no more than once every 2 weeks.
- ◆ essential plant oils (Essentria IC3) at 30 to 90 ml (1 to 3 oz) per gal mineral oil. Spray directly on animal in amounts to sufficiently cover.
- ◆ ivermectin subcutaneous injection (Ivomec, drug) at 1 ml/50 kg (110 lb) of body weight. Inject under loose skin in front of or behind shoulder. Do not slaughter within 35 days of treatment. For control of sucking lice only.
- ◆ ivermectin pour-on (Ivomec, drug) at 1 ml/10 kg (22 lb) body weight. Apply along topline of animal. Do not slaughter within 48 days of treatment.
- ◆ lambda-cyhalothrin pour-on (Saber 1%) at 10 ml (0.3 fl oz) if < 600 lb or 15 ml (0.5 fl oz) if > 600 lb down backline of animal. Do not apply to face. Repeat as needed but no more than once every 2 weeks and no more than 4 times in 6 months.
- ◆ moxidectin pour-on (Cydectin, drug) at 1 ml/10 kg (22 lb) body weight. No pre-slaughter interval, no milk discard.
- ◆ permethrin ready-to-use pour on (1%; Atroban Delice) at 0.5 fl oz (0.005 fl oz or 0.15 ml ai) per 100 lb of body weight to a maximum of 5 fl oz (0.05 fl oz or 1.5 ml ai) per animal. Pour along backline and down face. Treat again in 14 days.
- ◆ permethrin + piperonyl butoxide pour-on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat again in 14 days.
- ◆ permethrin spray (GardStar 40% EC) at 30 to 118 ml (1 to 4 fl oz) per 25 gal water (0.013-0.05% ai). 1 to 2 quarts high pressure spray over body of animal. For low-pressure spray, apply at 118 ml (4 fl oz) to 2.5 gal water, spray till wet but not to runoff. Repeat treatment 10 to 14 days later.
- ◆ phosmet spray (Prolate/Lintox-HD) at 1 gal per 150 gal water. Apply mixture as a coarse spray wetting skin but not to point of runoff. Repeat as needed in 7 to 10 days. Do not apply within 3 days of slaughter.
- ◆ tetrachlorvinphos + ddvp (Ravap)—Mix 1 gal in 75 gal water. Apply as coarse spray, 0.5 to 1 gal spray per animal. Do not treat

Brahman cattle or calves under 6 months of age. Do not treat more often than once every 10 days.

Dusts, backrubbers

- ◆ cyfluthrin dust (CyLence)—Suspend bag where cattle congregate but not over feed, water, mineral troughs; hang bag 4 to 6 inches below backline of cattle. See label for direct application guidelines; apply as needed but no more than once every 21 days.
- ◆ permethrin backrubber or self-oiler (Gardstar 40% EC) at 118 ml/10 gal mineral oil or diesel oil. Keep rubbing device charged. Results improve with forced daily use.
- ◆ permethrin dust (several brands, 0.25%)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animal's backline. Direct applications of 2 oz per animal may be repeated as needed.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon) at 2 oz per animal. Apply in dust bag, shaker, dusting glove, or mechanical duster. Repeat as needed but not more often than once every 3 days.

Beef cattle—Scabies mite

Sarcoptes scabiei

Management—chemical control

- ◆ amitraz dip (Taktic)—One can (760 ml) mixed with 50 gal water. Thoroughly wet animals to the point of runoff. Apply as instructed by USDA-APHIS bulletins. Two treatments 7 to 10 days apart are required for control.
- ◆ eprinomectin pour-on (Eprinex, drug) at 1 ml/10 kg (22 lb) body weight. No slaughter interval, no milk withholding period.
- ◆ ivermectin pour-on (Ivomec, drug) at 1 ml/10 kg (22 lb) body weight. Apply along topline of animal. Do not slaughter within 48 days of treatment.
- ◆ ivermectin subcutaneous injection (Ivomec, drug) at 1 ml/50 kg (110 lb) of body weight. Inject under loose skin in front of or behind shoulder. Do not slaughter within 35 days of treatment.
- ◆ lime sulfur dip or spray (BSP Lime-Sulfur Solution) at 1 gal in 15 gal warm water. Dipping vats must be maintained at 95 to 105°F. Use mixture only once; retreat animals as needed every 12 days. Lime sulfur corrodes application equipment.
- ◆ permethrin spray (Atroban 11% EC) at 1 pint in 25 gal water. 1 to 2 quarts coarse spray per animal; thoroughly wet animal. Repeat application in 10 to 14 days.
- ◆ phosmet spray (Prolate/Lintox-HD) at 1 gal per 100 gal water. Apply mixture as a coarse spray wetting skin but not to point of runoff. Repeat as needed in 7 to 10 days. Do not apply within 3 days of slaughter.

Beef cattle—Spinose ear tick

Otobius megnini

Management—chemical control

- ◆ amitraz spray (Taktic)—One can (760 ml) with 100 gal water. Direct low-pressure spray toward the head, ears, shoulders, and neck.
- ◆ beta-cyfluthrin ear tag (CyLence Ultra)—One tag to each ear of all mature animals when ticks are present. Remove tags at end of fly season or before slaughter.
- ◆ diazinon ear tag (Corathon, Patriot, Optimizer)—One tag to each ear of all animals older than 3 months when ticks are present. Remove tags at end of fly season or before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when pests appear. Remove tags at end of fly season or before slaughter.
- ◆ permethrin spray (Atroban 11% EC) at 1 pt to 2.5 gal water. 1 to 2 oz spray per animal, spot treatment.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon) at 1/3 oz (1 T) directly to inside of each ear. Repeat as needed but not more often than once every 3 days.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon)—One tag to each ear of all animals when ticks appear. Remove tags at end of fly season or before slaughter.

Beef cattle—Tick

Includes *Ixodes* spp. and *Dermacentor* spp.

Management—chemical control

- ◆ abamectin ear tag (XP820)—One tag to each ear of all animals when ticks appear. Remove tags at end of season or before slaughter.
- ◆ amitraz spray or dip (Taktic)—One can (760 ml) with 100 gal water. Use up to 2 gal spray or dip solution for each mature animal; wet thoroughly to point of run-off.
- ◆ beta-cyfluthrin ear tag (CyLence Ultra)—One tag to each ear of all mature animals when ticks appear. Remove tags at end of fly season or before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when pests appear. Remove tags at end of fly season or before slaughter.
- ◆ essential plant oils (Essentria IC3) at 30 to 90 ml (1 to 3 oz) per gal mineral oil. Spray directly on animal in amounts to sufficiently cover.
- ◆ permethrin + piperonyl butoxide pour-on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat once every 2 weeks as needed.
- ◆ permethrin spray (GardStar 40% EC) at 30 to 118 ml (1 to 4 fl oz) per 25 gal water (0.013 to 0.05% ai). 1-2 quarts coarse spray over body of animal, thoroughly wet.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon) at 2 oz per animal. Apply in dust bag, shaker, dusting glove, or mechanical duster. Repeat as needed but not more often than once every 3 days.

Management of Resistance to Pyrethroid Insecticides

Horn fly resistance to pyrethroid insecticides is in all cattle-raising areas of the United States. Strategies for combating the flies, while minimizing further buildup of resistance, need to be addressed. If you treat the herd with the proper dosage of a pyrethroid, but within days of using it see many more flies than before the treatment, then resistance is likely. This resistance may be to a spray, dust, or ear tag treatment. Remember that the following guidelines pertain to horn flies only. If resistance is suspected, do not use pyrethroids.

The following control strategies are recommended (may be used singly or in combination):

- ◆ Do not treat for horn flies. Cattle can tolerate moderate levels of horn flies (up to 200 per head), so no treatment at all is an option. This has the greatest effect on reducing or slowing insecticide resistance.
- ◆ Separate mature animals from calves. There is no evidence that horn flies affect mature cattle, other than reducing milk production in lactating cows. Calves should be treated to optimize weight gain. However, cows without calves and replacement heifers (animals for which efficient weight gain is not imperative) probably should not be treated. With cow-calf pairs, it is more effective to tag cows than calves. Calf weaning weights have been shown to be greater when cows are tagged because of higher milk production. Generally, horn flies aren't a problem on calves until the end of the season.
- ◆ Use a four-year rotation strategy to prolong the effectiveness of insecticide-impregnated ear tags. An example of a rotation follows: for the first year, use tags impregnated with abamectin; the second year, use endosulfan tags; the third year, use an organophosphate ear tag; and the fourth year, use a pyrethroid tag. With this plan, a different class of insecticide with a different mode of action is used each year.
- ◆ Delay control until flies exceed the treatment threshold. To avoid wasting insecticide and getting poor results, do not apply until horn flies build up in the spring or summer. However, show cattle or other special animals may require intensive treatment.
- ◆ Treat periodically with organophosphate sprays, dips, backrubbers, ear tags, oilers, or dusts to reduce early buildup of fly populations. Insecticide resistance can be delayed or reduced by periodic treatments that give high levels of immediate control, followed by a period of no control during which time the pest population again builds up. One to two treatments in early summer may delay the need for more sustained controls.
- ◆ Use feed-through fly control products that contain insect growth regulators instead of pyrethroid products. These products are fed to cattle during the months when flies are present. The risk of insecticide resistance development is very low for insect growth regulators such as s-methoprene and diflubenzuron.
- ◆ Treat late in the season. This should begin before the horn fly enters its overwintering phase. Any effort to reduce the number of flies that overwinter may hold down the initial density of flies the following spring. For late-season control, use an insecticide with a different mode of action than the one used during peak periods. If flies are not a problem late in the season, skip the late-season control.
- ◆ Remove ear tags in the fall; this eliminates the low insecticide pressure during the winter that could foster the development of resistance.

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2. Materials listed below are approved for use in all dairy cattle, including lactating animals, unless otherwise noted.
3. Some of the products suggested for insect control are registered as drugs, not insecticides, and are regulated by the FDA.

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Dairy cattle—Cattle grub

Common cattle grub (heel fly) (*Hypoderma lineatum*)
Northern cattle grub (*Hypoderma bovis*)

Biology Typically, the life cycle of a cattle grub spans about a year, with most of that time spent as a larva migrating inside the animal's body. To avoid adverse host-parasite reactions, cattle should be treated either before or after grubs migrate through the body. The best time to treat would be as soon as the heel fly (adult stage) season is over. In practical terms, treatment for grubs may be accomplished at the same time as fall treatment for internal parasites but no later than November 30 to prevent a toxic reaction from dead/dying grubs that have migrated to vital regions such as the esophagus or spinal canal.

Management—chemical control (all drugs)

- ◆ tetrachlorvinphos (Rabon RTU 3%)—After grubs have encysted apply 3 to 4 oz down the backline and rub in thoroughly taking care to get the dust into the warble.

Dairy cattle—Face fly

Musca autumnalis

Biology Face flies feed on the secretions of the eyes and nose for short periods of time; only a small percentage of the local face fly population may be found on animals at any one time. These aspects of its life history make management of face fly a very difficult task. Hence, many of the products labeled for efficacious horn fly control indicate that they merely aid in face fly control.

Management—chemical control

Ear tags

- ◆ beta-cyfluthrin + piperonyl butoxide ear tag (Cylence Ultra)—One tag to each ear of all animals older than 3 months when flies appear. Remove tags at end of fly season or before slaughter.
- ◆ diazinon + coumaphos ear tag (Corathon)—One tag to each ear on all mature animals when flies appear. One ear tag per calf. Remove tags at end of fly season or before slaughter. Do not use on lactating dairy cattle.

- ◆ lambda-cyhalothrin + piperonyl butoxide ear tag (Saber Extra)—One tag to each ear on all animals when flies appear in spring. Remove tags in fall or before slaughter. Do not use on lactating dairy cattle.
- ◆ lambda-cyhalothrin + pirimiphos-methyl ear tag (Double Barrel VP)—One tag to each ear on all animals in herd when flies appear in spring. Do not use on lactating dairy cattle. Remove tag in fall.
- ◆ permethrin ear tag (GardStar Plus)—One tag per ear on all animals when flies first appear in spring. Remove before slaughter.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon MagnuM)—One tag per head of all mature and weaned animals when flies appear in spring. Remove tag at the end of fly season or before slaughter.

Pour-ons, sprays

- ◆ cyfluthrin pour-on (CyLence)—See label for dosing instructions. Pour along top of back and head. Repeat as needed but no more than once every 3 weeks.
- ◆ ddvp concentrated spray (Vapona)—Dilute 1 gal in 50 gal water (1% solution) and apply up to 2 fl oz of solution per animal as a fine mist spray. Do not wet hide. Do not treat calves under 6 months of age. One day withdrawal.
- ◆ permethrin ready-to-use pour on (1%; Atroban) at 0.5 fl oz (0.005 fl oz or 0.15 ml ai) per 100 lb of body weight to a maximum of 5 fl oz (0.05 fl oz or 1.5 ml ai) per animal. Pour along backline and down face. Treat once every 2 weeks as needed.
- ◆ permethrin + piperonyl butoxide pour on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat once every 2 weeks as needed.
- ◆ permethrin spray (Gardstar 40% EC) at 118 ml (4 fl oz) per 50 gal water (0.05% ai). 1 to 2 quarts high pressure spray over body of animal. For low-pressure spray, apply at 118 ml (4 fl oz) to 2.5 gal water, spray till wet but not to runoff.
- ◆ tetrachlorvinphos + ddvp (Ravap)—Mix 1 gal in 200 gal water. Apply as coarse spray. Avoid contacting teats with spray unless teats are washed and dried before milking. Do not treat calves under 6 months of age. Do not treat more often than once every 10 days.

Dusts, backrubbers

- ◆ coumaphos (Co-Ral Fly & Tick Spray)—Mix 4 quarts in 13 gal of no. 2 diesel or fuel oil. Place backrubber where animals congregate.
- ◆ permethrin dust (several brands, 0.25%)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animals' backline. Direct applications of 2 oz per animal may be repeated as needed.
- ◆ tetrachlorvinphos (Rabon 3%)—Direct applications of 2 oz per animal by shaker can, rotary duster or by spoon to the upper portions of the back, neck and poll and to the face as an aid in the control of face flies. Rub in lightly to carry the dust beneath the hair. May be repeated as needed but not more often than once every 7 days.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon)—Apply in dust bag, shaker, dusting glove, or mechanical duster. Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animals' backline. Direct applications of 2 oz per animal may be repeated as needed but not more often than once every 3 days.

Feed supplements

- ◆ diflubenzuron feed supplement (Clarify 8%)—Prevents development of immature forms in manure of treated animals. Mix into grain according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ diflubenzuron add-pack for milk (Clarify Add-Pack)—Prevents development of immature forms in manure of treated calves. Mix

daily into milk/milk replacer according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.

- ◆ tetrachlorvinphos mineral block (Sweetlix Rabon)—For control of fecal flies in manure of treated animals. Feed free choice, 1 block for 5 head of cattle. Consult veterinarian before using this product with pregnant or lactating animals.

Dairy cattle—Horn fly

Haematobia irritans

Biology The horn fly was introduced into the United States during the 1800s and it spread rapidly across North America. Females lay eggs in fresh cattle manure, which is where immature forms complete development. During warm weather the life cycle of a horn fly is 10–20 days; there are many generations of flies each year. The first flies appear in June or earlier; flies disappear with hard frosts in fall. Both sexes suck blood from cattle and other animals. If enough flies are present, this can lead to reduced weight gains or milk production of cattle. However, cattle can tolerate a low density of horn flies without measurable losses. The generally agreed upon economic threshold is 200 horn flies per animal.

Management—chemical control

Ear tags

- ◆ abamectin ear tag (XP 820)—Apply to all animals in herd when flies become a problem in spring. One or two tags/animal. Do not tag lactating dairy cows. Remove tags at end of fly season or before slaughter.
- ◆ beta-cyfluthrin + piperonyl butoxide ear tag (Cylence Ultra)—One tag to each ear of all animals older than 3 months when flies appear. Remove tags at end of fly season or before slaughter.
- ◆ diazinon ear tag (Patriot, Optimizer)—One tag to each ear of all animals older than 3 months. Do not use on lactating dairy cattle. Remove before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when flies appear. Do not use on lactating dairy cattle. Remove before slaughter.
- ◆ diazinon + coumaphos ear tag (Corathon)—One tag to each ear on all mature animals when flies appear. One ear tag per calf. Do not use on lactating dairy cattle. Remove tags at end of fly season or before slaughter.
- ◆ lambda-cyhalothrin ear tag (Saber Extra)—One tag to each ear on all animals when flies appear in spring. Do not use on lactating dairy cattle. Remove tags in fall or before slaughter.
- ◆ lambda-cyhalothrin (6.8%) + pirimiphos-methyl (14%) ear tag (Double Barrel VP)—One tag to each ear on all animals in herd when flies appear in spring. Do not use on lactating dairy cattle. Remove tag in fall.
- ◆ permethrin ear tag (GardStar Plus)—One tag per ear on all animals when flies first appear in spring. Remove before slaughter.
- ◆ pirimiphos-methyl ear tag (Dominador)—One tag per ear on all animals when flies first appear in spring. Do not use on lactating dairy cattle. Remove tags in fall.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon MagnuM)—One tag per head of all mature and weaned animals when flies appear in spring. Remove tag at the end of fly season or before slaughter.

Pour-ons, sprays

- ◆ cyfluthrin pour-on (CyLence)—See label for dosing instructions. Pour along top of back and head. Repeat as needed but no more than once every 3 weeks.
- ◆ ddpv concentrated spray (Vapona)—Dilute 1 gal in 50 gal water (1% solution) and apply up to 2 fl oz of solution per animal as a fine mist spray. Do not wet hide. Do not treat calves under 6 months of age. One day withdrawal.
- ◆ permethrin ready-to-use pour on (1%; Atroban) at 0.5 fl oz (0.005 fl oz or 0.15 ml ai) per 100 lb of body weight to a maximum of 5 fl oz (0.05 fl oz or 1.5 ml ai) per animal. Pour along backline and down face. Treat once every 2 weeks as needed.
- ◆ permethrin + piperonyl butoxide pour on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat once every 2 weeks as needed.
- ◆ permethrin spray (Gardstar 40% EC) at 118 ml (4 fl oz) per 50 gal water (0.05% ai). 1 to 2 quarts high pressure spray over body of animal. For low-pressure spray, apply at 118 ml (4 fl oz) to 2.5 gal water, spray till wet but not to runoff.
- ◆ pyrethrins (EverGreen EC 60-6) at 1 to 2 fl oz/gal of water. Wet hair thoroughly. Repeat as needed. Also available as aerosol.
- ◆ tetrachlorvinphos + ddpv spray (Ravap)—Mix 1 gal in 75 gal water. Apply as coarse spray, 0.5 to 1 gal spray per animal. Avoid contacting teats with spray unless teats are washed and dried before milking. Do not treat Brahman cattle or calves under 6 months of age. Do not treat more often than once every 10 days.

Dusts, backrubbers

- ◆ coumaphos dust (Co-Ral)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animals' backline. For lactating dairy cows, bags may be suspended in exit of milking barn. Direct applications of 2 oz per animal may be repeated no more frequently than 10 days apart and no more than 12 applications in 12 months.
- ◆ coumaphos (Co-Ral Fly & Tick Spray)—Mix 4 quarts in 13 gal of no. 2 diesel or fuel oil. Place backrubber where animals congregate.
- ◆ permethrin dust (several brands, 0.25%)—Suspend bags where cattle congregate. Place bags so they hang 4 to 6 inches below animals' backline. Direct applications of 2 oz per animal may be repeated as needed.
- ◆ tetrachlorvinphos + ddpv backrubber (Ravap)—Mix 1 gal in 25 gal water. Mix with approved oil and use in mechanical rubbing device or burlap or rope backrubbers. Charge as needed. Avoid contacting teats with spray unless teats are washed and dried before milking. Do not treat calves under 6 months of age.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon)—Apply in dust bag, shaker, dusting glove, or mechanical duster. Suspend bags where cattle congregate. For lactating dairy cows, bags may be suspended in exit of milking barn. Place bags so they hang 4 to 6 inches below animals' backline. Direct applications of 2 oz per animal may be repeated as needed but not more often than once every 3 days.

Feed supplements

- ◆ diflubenzuron feed supplement (Clarify 8%)—Prevents development of immature forms in manure of treated animals. Mix into grain according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ diflubenzuron add-pack for milk (elim-A-fly Add-Pack with Clarify)—Prevents development of immature forms in manure of treated calves. Mix daily into milk/milk replacer according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ (S)-methoprene premix (Altosid IGR Custom 2%)—Use formulas

on label to determine proper amounts to mix with feed or minerals. Begin use 30 days prior to fly season; continue feeding until cold weather restricts horn fly activity.

- ◆ (S)-methoprene mineral tub (Mineralix fly tub with IGR)—Feed free choice. Place tubs out before flies appear and continue use until cold weather marks end of fly season.
- ◆ tetrachlorvinphos mineral block (Sweetlix Rabon)—Feed free choice, 1 block for 5 head of cattle. Consult veterinarian before using this product with pregnant or lactating animals.

Dairy cattle—Lice

Includes

Cattle chewing louse (*Bovicola bovis*)—biting
Little blue louse (*Solenopotes capillatus*)—sucking
Long-nose louse (*Linognathus vituli*)—sucking
Short-nose louse (*Haematopinus eurysternus*)—sucking

Management—chemical control

A single treatment may not give complete seasonal control because none of the listed products are effective against eggs. A second treatment no later than 14 days after the first treatment is usually recommended.

Ear tags

- ◆ diazinon ear tag (Patriot)—One tag to each ear of all animals older than 3 months. Do not use on lactating dairy cattle.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—Apply one tag per animal in late fall or early winter. Do not use on lactating dairy cattle.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (Python MagnuM)—Apply one tag per head in late fall or early winter.

Injections, pour-ons, sprays

- ◆ amitraz spray or dip (Tactic)—Mix one can (760 ml) in 100 gal water. Use up to 2 gal spray or dip solution for each mature animal; wet thoroughly to point of run-off. Retreat 10 to 14 days later. No slaughter interval, no milk withholding period.
- ◆ cyfluthrin pour-on (CyLence)—See label for dosing instructions. Pour along top of back and head. Repeat treatment 3 weeks later.
- ◆ diflubenzuron pour-on (Clean-Up) at 3 ml per 100 lb of body weight up to 30 ml per animal. Apply down face and along back. Retreat as needed, but no more than once every 2 weeks.
- ◆ essential plant oils (Essentria IC3) at 30 to 90 ml (1 to 3 oz) per gal mineral oil. Spray directly on animal in amounts to sufficiently cover. Avoid contacting teats with spray unless teats are washed and dried before milking.
- ◆ permethrin ready-to-use pour on (Atroban Delice) at 0.5 fl oz (0.005 fl oz or 0.15 ml ai) per 100 lb of body weight to a maximum of 5 fl oz (0.05 fl oz or 1.5 ml ai) per animal. Pour along backline and down face. Treat again in 14 days.
- ◆ permethrin + piperonyl butoxide pour-on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat again in 14 days.
- ◆ permethrin spray (Gardstar 40% EC) at 118 ml (4 fl oz) per 50 gal water (0.05% ai). 1 to 2 quarts high pressure spray over body of animal. For low-pressure spray, apply at 118 ml (4 fl oz) to 2.5 gal water, spray till wet but not to runoff.
- ◆ tetrachlorvinphos + ddpv (Ravap)—Mix 1 gal in 75 gal water. Apply as coarse spray, 0.5 to 1 gal spray per animal. Avoid contacting teats with spray unless teats are washed and dried before milking. Do not treat Brahman cattle or calves under 6 months of age. Do not treat more often than once every 10 days.

Dusts, backrubbers

- ◆ permethrin backrubber or self-oiler (Gardstar 40% EC) at 118 ml/10 gal mineral oil or diesel oil. Keep rubbing device charged. Results improve with forced daily use.

- ◆ permethrin dust (several brands, 0.25%)—Suspend bags where cattle congregate. For lactating dairy cows, bags may be suspended in exit of milking barn. Place bags so they hang 4 to 6 inches below animals' backline. Direct applications of 2 oz per animal may be repeated as needed.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon) at 2 oz per animal. Apply in dust bag, shaker, dusting glove, or mechanical duster. For lactating dairy cows, bags may be suspended in exit of milking barn. Repeat as needed but not more often than once every 3 days.

Dairy cattle—Scabies mite

Sarcoptes scabiei

Management—chemical control

- ◆ amitraz dip (Taktic)—One can (760 ml) mixed with 50 gal water. Thoroughly wet animals to the point of runoff. Apply as instructed by USDA-APHIS bulletins. Two treatments 7 to 10 days apart are required for control. No slaughter interval, no milk withholding period.
- ◆ lime sulfur dip or spray (BSP Lime-Sulfur Solution) at 1 gal in 15 gal warm water. Dipping vats must be maintained at 95° to 105°F. Use mixture only once; retreat animals as needed every 12 days. Lime sulfur corrodes application equipment.
- ◆ permethrin spray (Atroban 11% EC) at 1 quart in 50 gal water. 1 to 2 quarts coarse spray per animal; thoroughly wet animal. Repeat application in 10 to 14 days.

Dairy cattle—Spinose ear tick

Otobius megnini

Management—chemical control

- ◆ amitraz spray (Taktic)—One can (760 ml) with 100 gal water. Direct low-pressure spray toward the head, ears, shoulders, and neck.
- ◆ beta-cyfluthrin ear tag (CyLence Ultra)—One tag to each ear of all mature animals when ticks are present. Remove tags at end of fly season or before slaughter.
- ◆ diazinon ear tag (Patriot)—One tag to each ear of all animals older than 3 months when ticks are present. Do not use on lactating dairy cattle. Remove tags at end of fly season or before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when pests appear. Do not use on lactating dairy cattle. Remove tags at end of fly season or before slaughter.
- ◆ permethrin spray (Atroban 11% EC) at 1 quart to 5 gal water. 1 to 2 oz spray per animal.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon)—Apply 1/3 oz (1 T.) directly to inside of each ear. Repeat as needed but not more often than once every 3 days.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon)—One tag to each ear of all animals when ticks appear. Remove tags at end of fly season or before slaughter.

Dairy cattle—Stable fly

Stomoxys calcitrans

Biology The stable fly is a very serious economic biting fly pest for confined cattle throughout the US and is becoming a serious pest for pastured cattle as well. Both sexes suck blood and prefer to feed on the lower body and legs of cattle. If enough flies are present, this may lead to reduced weight gains or milk production in dairy cows. Annual economic loss in North America due to stable flies is estimated at nearly \$1 billion. Stable flies breed in many wet places, including old manure, decaying feed, calf bedding, compost, silage, etc. Stable flies will also disperse long distances from where they were bred and become significant pests of humans. The generally agreed upon economic threshold for cattle is 5 flies per leg, at which point beef cattle show reduced weight gains. Similar effects likely occur in milking cows. Management of stable flies is principally through improved sanitation and manure management. When sanitation measures are not enough to control adult populations, application of insecticides to premises or animal quarters may be necessary (see “Fly Control” section). There are a few on-animal chemical control options, listed below.

Management—chemical control

Ear tags

- ◆ diazinon ear tag (Patriot)—One tag to each ear of all animals older than 3 months. Do not use on lactating dairy cattle. Remove before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when flies appear. Do not use on lactating dairy cattle. Remove before slaughter.
- ◆ permethrin ear tag (GardStar Plus)—One tag per ear on all animals when flies first appear in spring. Remove before slaughter.
- ◆ zeta-cypermethrin + piperonyl butoxide ear tag (PYthon MagnuM)—One tag per head of all mature and weaned animals when flies appear in spring. Remove tag at the end of fly season or before slaughter.

Sprays, pour-ons

- ◆ ddvp (Vapona 1% RTU) at 1 to 2 fl oz per animal as mist. Spray daily with hand or walk-through mist sprayer. Do not wet animals' skin. Do not treat animals less than 6 months old. Wash teats and udder with warm water prior to milking.
- ◆ essential plant oils (Essentria IC3) at 30 to 90 ml (1 to 3 oz) per gal mineral oil. Spray directly on animal in amounts to sufficiently cover. Avoid contacting teats with spray unless teats are washed and dried before milking.
- ◆ permethrin spray (Atroban 11% EC) at 1 quart/50 gal of water. Thoroughly wet animals, including ears.
- ◆ permethrin RTU (Permethrin S)—Use undiluted in a mist sprayer. Apply to neck, face, back, legs, and ears.
- ◆ pyrethrins (EverGreen EC 60-6) at 2 to 3 fl oz/gallon of water. Wet hair thoroughly. Repeat as needed.

Dusts, backrubbers

- ◆ permethrin backrubber or self-oiler (Gardstar 40% EC) at 118 ml/10 gal mineral oil or diesel oil. Keep rubbing device charged. Results improve with forced daily use.
- ◆ pyrethrins dust (EverGreen EC 60-6) at 2 oz per animal. Apply in dust bag, shaker, dusting glove, or mechanical duster. Make sure to apply dust to legs.

- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon) at 2 oz per animal. Apply in dust bag, shaker, dusting glove, or mechanical duster. Make sure to apply dust to legs. Repeat as needed but not more often than once every 3 days.

Feed supplements

- ◆ diflubenzuron feed supplement (Clarify 8%)—Prevents development of immature forms in manure of treated animals. Mix into grain according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ diflubenzuron add-pack for milk (elim-A-fly Add-Pack with Clarify)—Prevents development of immature forms in manure of treated calves. Mix daily into milk/milk replacer according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ tetrachlorvinphos mineral block (Sweetlix Rabon)—Feed free choice, 1 block for 5 head of cattle. Consult veterinarian before using this product with pregnant or lactating animals.

Dairy cattle—Tick

Includes *Ixodes* spp. and *Dermacentor* spp.

Management—chemical control

- ◆ abamectin ear tag (XP820)—Two tag to each ear of all animals when ticks appear. Do not tag lactating dairy cows. Remove tags at end of season or before slaughter.
- ◆ amitraz spray or dip (Tactic)—One can (760 ml) with 100 gal water. Use up to 2 gal spray or dip solution for each mature animal; wet thoroughly to point of run-off.
- ◆ beta-cyfluthrin ear tag (CyLence Ultra)—One tag to each ear of all mature animals when ticks appear. Remove tags at end of fly season or before slaughter.
- ◆ diazinon + chlorpyrifos ear tag (Warrior)—One tag to each ear of all animals older than 3 months when pests appear. Do not use on lactating dairy cattle. Remove tags at end of fly season or before slaughter.
- ◆ essential plant oils (Essentria IC3) at 30 to 90 ml (1 to 3 oz) per gal mineral oil. Spray directly on animal in amounts to sufficiently cover. Avoid contacting teats with spray unless teats are washed and dried before milking.
- ◆ permethrin + piperonyl butoxide pour-on (Ultra Boss) at 3 ml per 100 lb body weight. Maximum of 30 ml (1 fl oz) per animal. Treat once every 2 weeks as needed.
- ◆ permethrin ear tag (GardStar 40% EC)—Two tags to each ear of animals when pests appear. Remove tags at end of fly season or before slaughter.
- ◆ zeta-cypermethrin + piperonyl butoxide dust (PYthon) at 2 oz per animal. Apply in dust bag, shaker, dusting glove, or mechanical duster. For lactating dairy cows, bags may be suspended in exit of milking barn. Repeat as needed but not more often than once every 3 days.

Fly Control

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In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Fly control—Dairy barns

Management—cultural control

Under ordinary conditions, using insecticides in the milk room is unnecessary if flies are controlled effectively in other areas of the dairy. Also, use of sanitation and manure management programs will reduce the need for insecticide applications. Reduce fly breeding sites by cleaning up feed spills, removing manure and used bedding regularly, reducing moisture in manure storage and repairing water leaks.

Management—chemical control

Note: Most of the products listed here cannot be used in areas where food animals are present. Check label for restrictions.

- ◆ azadirachtin (Ecozin Plus 1.2%) at 1.25 oz per 1,000 sq ft diluted in 20 to 40 gal water. Direct a coarse spray on fly and beetle breeding sites. Apply weekly during fly breeding season. Add a spray oil or surfactant to enhance penetration into manure and refuse piles.
- ◆ beta cyfluthrin (Tempo Ultra) at 8 mL/gal of water (0.025% solution). Use as general surface, spot, mist or crack and crevice treatment.
- ◆ bifenthrin (Talstar)—Use as a surface spray at 0.33 to 1 fl oz/1,000 sq ft for unoccupied areas. Treatment may be made to cracks and crevices where animals are present, see label for restrictions.
- ◆ cyfluthrin (Cy-Kick) at 1 fl oz/gal water (0.05% solution). Apply as a general surface treatment where flies collect or rest. Do not apply while animals are present.
- ◆ ddvp (Vapona 40.2%) spray at 1 gal/100 gal water. Apply as a mist spray or as a coarse, wet spray. Do not contaminate water, feed, milk or milking utensils.
- ◆ ddvp (Nuvan Prostrips, Prostrips+)—Hang strips out of reach of animals. See label for usage restrictions. One strip treats 100-200 cu ft. Replace every 4 months or as needed.
- ◆ deltamethrin (D-Fense SC) at 0.75 to 1.5 fl oz/gal of water. Use as general surface, spot, mist or crack and crevice treatment. Do not spray where or when animals are present.
- ◆ dinotefuran bait (QuikStrike)—Apply as scatter bait or in bait stations. Scatter bait not for use in areas where animals are present. Place bait stations out of reach of animals. See label for restrictions.
- ◆ essential plant oils (Essentria IC3) at 1 to 3 fl oz per gal mineral oil. Apply 1 gal diluted spray per 500-1,000 sq ft where pests rest or congregate.

- ◆ esfenvalerate (FenvaStar EcoCap) at 1 fl oz/gallon to treat 1,000 sq ft. Apply as a surface spray, crack and crevice treatment, spot treatment. Remove animals before spraying and do not allow them back in treated area until spray has dried.
- ◆ fenvalerate (Onslaught) at 0.5 to 1 fl oz/gallon to treat 1,000 sq ft. Apply as a surface spray, crack and crevice treatment, spot treatment. Remove animals before spraying and do not allow them back in treated area until spray has dried.
- ◆ imidacloprid + Z-9-tricosene (QuickBayT) pelleted bait—Use in bait stations or as a paint-on application. Reapply every 7 days as needed. Do not place in areas accessible to animals.
- ◆ imidacloprid + Z-9-tricosene (MaxForce) fly spot bait—Use at 5.7 to 6.3 oz per 1,000 sq ft in bait stations. Reapply every 7 days as needed. Do not place in areas accessible to animals.
- ◆ lambda-cyhalothrin (Grenade ER) at 0.015 to 0.036% ai (0.2 to 0.8 fl oz/gal). For unoccupied areas of livestock barns. Do not apply to milk rooms or feed rooms. Allow surfaces to dry before introducing livestock.
- ◆ nithiazine (QuikStrike) fly abatement strip—Attach to flat surface out of reach of animals.
- ◆ permethrin + piperonyl butoxide (1% ready to use)—Apply directly to surfaces where flies crawl or rest. Re-treat as needed but not more than once every 2 weeks.
- ◆ permethrin spray at 0.1 lb ai/12.5 gal water. Apply as surface treatment to walls and ceilings, 1 gal dilute spray per 750 sq ft. Remove animals and avoid contamination of feed and water during treatment. Do not treat manure.
- ◆ pyrethrins + piperonyl butoxide (EverGreen EC 60-6)—Allowable use as a fine mist space spray (2 fl oz/gal) in poultry houses but birds should be removed first. Use as a surface spray (1 part product to 59 parts water) in houses not occupied by poultry. Follow manufacturer's directions.
- ◆ pyriproxyfen (NyGuard)—As a surface spray, apply at 1 fl oz diluted in water to cover 1,500 sq ft. As a fogger, 1.5 fl oz diluted in carrier to treat 12,000 cu ft. Not for use in areas where animals are present. Do not contaminate food or water.
- ◆ spinosad spray (Extinosad) at 2 oz/10 gal (0.08%) and apply 1 gal/500 to 1,000 sq ft. Do not use in milking rooms. Do not apply where animals are present. Cover food, feed, and water before treatment. Re-apply every 7 to 10 days as needed.
- ◆ spinosad bait (Elector)—Use as a scatter bait, in bait stations, or as a paint-on or spray-on. Not for use in milk rooms. Only for areas inaccessible to animals.
- ◆ tetrachlorvinphos+ ddvp (Ravap 23% EC)—Apply as a spray to surfaces at a rate of 5 oz/gallon, 1 gallon spray for 500 to 1,000 sq ft.
- ◆ gamma-cyhalothrin (Standguard) at 0.16 to 0.33 fl oz/gallon of water. 1 gallon of dilution to treat 500 to 1,000 sq ft. Apply as a general surface and/or crack and crevice spray. Do not apply in areas where animals are present. See label for restrictions.
- ◆ imidacloprid + Z-9-tricosene (MaxForce) fly spot bait—Use at 5.7 to 6.3 oz per 1,000 sq ft in bait stations. Reapply every 7 days as needed. Do not place in areas accessible to animals.
- ◆ imidacloprid (0.5%) + tricosene (Maxforce Granular Fly Bait)—For use only outside in areas such as feedlots, broiler houses, livestock housing structures, and horse stables.
- ◆ methomyl bait (Deosect II)—Scatter bait at a rate of 0.25 lb/500 sq ft. Apply around the outside of feed lots, poultry houses, and livestock barns. Do treat areas where animals can feed on bait.
- ◆ permethrin spray (Atroban 11% EC) at 1 quart/20 gal water, or 25% 6 tbs/2 gal water. Apply 1 gal per 750 sq ft of surface. Do not apply these diluted solutions to animals. Do not treat manure or litter. Re-treat as needed but not more than once every 2 weeks.
- ◆ permethrin space spray (Atroban 11% EC) at 1 qt/20 gal diesel or mineral oil. Use 4 oz per 1,000 sq ft of air space.
- ◆ tetrachlorvinphos (Rabon) spray—50% WP at 4 lb/25 gal water, 1 gal solution on 500 sq ft. Do not apply these dilutions to animals.

Fly control—Poultry building

Management—cultural control

Use of sanitary and manure management programs will reduce the need for insecticide applications. Reduce fly breeding sites by cleaning up feed spills, removing manure and used litter regularly, reducing moisture in manure storage and repairing water leaks.

Management—chemical control

Note: Most of the products listed here cannot be used in areas where food animals are present. Check label for restrictions.

- ◆ azadirachtin (Ecozin Plus 1.2%) at 1.25 oz per 1,000 sq ft diluted in 20 to 40 gal water. Direct a coarse spray on fly and beetle breeding sites. Apply weekly during fly-breeding season. Add a spray oil or surfactant to enhance penetration into manure and refuse piles.
- ◆ beta cyfluthrin (Tempo Ultra) at 8 ml/gal of water (0.025% solution). See label for mixing instructions. Do not apply where animals are present.
- ◆ bifenthrin (Talstar)—Use as a surface spray at 0.33 to 1 fl oz/1,000 sq ft for unoccupied areas. Treatment may be made to cracks and crevices where birds are present, see label for restrictions.
- ◆ cyfluthrin (Cy-Kick) at 1 fl oz/gal water (0.05% solution). Apply as a general surface treatment where flies collect or rest. Do not apply while animals are present.
- ◆ ddvp (Vapona 40.2%) spray at 1 gal/100 gal water. Apply as a mist spray or as a coarse, wet spray. Do not contaminate water, feed, or foodstuffs.
- ◆ ddvp treated plastic strips (Nuvan Prostrips, Prostrips+)—Hang strips out of reach of animals. See label for usage restrictions. One strip treats 900-1200 cu ft. Replace every 4 months or as needed.
- ◆ deltamethrin (D-Force)—Ready to use as a crack and crevice treatment indoor federally inspected poultry plants. Use outside buildings as a general surface spray. Do not spray where or when animals are present.
- ◆ dinotefuran bait (QuikStrike)—Apply as scatter bait or in bait stations. Scatter bait not for use in areas where animals are present. Place bait stations out of reach of animals. See label for restrictions.
- ◆ essential plant oils (Essentria IC3) at 1 to 3 fl oz per gal mineral oil. Apply 1 gal diluted spray per 500 to 1,000 sq ft. where pests rest or congregate.

Fly control—General, on agricultural premises (other than in dairy barn, milk room, and poultry house)

Management—chemical control

Note: The term ultra low volume (ULV) applies when total spray volume to be applied is 0.5 gal/acre or less and material is applied undiluted. The terms low-volume or concentrate spray apply when total spray volume to be applied will cover the area uniformly but not to the point of runoff. Apply sprays to the point of runoff, usually at a rate of about 0.5 to 1 gal per 1,000 sq ft. The amount of spray needed varies with the surfaces. Any of the materials recommended for use in and about dairy barns may be used. In addition, any of the materials listed below may be used outside barns other than dairy. To eliminate possible trace pesticide residues, avoid using these materials anywhere on dairy premises.

- ◆ chlorpyrifos (Pyrofos CS) at 0.9 to 2.3 fl oz/0.5 gal per 1,000 sq ft using backpack sprayer. Remove animals before spraying. Do not allow animals into treated areas until surfaces are dry.

- ◆ esfenvalerate (FenvaStar EcoCap)—1 fl oz/gallon to treat 1,000 sq ft. Apply as a surface spray, crack and crevice treatment, spot treatment. Remove animals before spraying and do not allow them back in treated area until spray has dried.
- ◆ fenvalerate (Onslaught)—0.5 to 1 fl oz/gallon to treat 1,000 sq ft. Apply as a surface spray, crack and crevice treatment, spot treatment. Remove animals before spraying and do not allow them back in treated area until spray has dried.
- ◆ gamma-cyhalothrin (Standguard)—0.16 to 0.33 fl oz/gallon of water. 1 gallon of dilution to treat 500 to 1,000 sq ft. Apply as a general surface and/or crack and crevice spray. Do not apply in areas where birds are present. See label for restrictions.
- ◆ imidacloprid + Z-9-tricosene (MaxForce) fly spot bait—Use at 5.7 to 6.3 oz per 1,000 sq ft in bait stations. Reapply every 7 days as needed. Do not place in areas accessible to animals.
- ◆ imidacloprid + Z-9-tricosene (MaxForce) fly spot bait—Apply at 16 oz/gallon to surfaces where flies aggregate. Re-apply as needed, but not before 7 days. Spray places that are out of reach of animals.
- ◆ lambda-cyhalothrin (Grenade ER) at 0.015 to 0.03% ai/gal (0.2 to 0.4 fl oz/gal). For unoccupied areas of poultry houses. Allow surfaces to dry before introducing animals. Follow manufacturer's directions.
- ◆ methomyl bait (Stimukil Fly Bait)—Scatter bait at a rate of 0.25 lb/500 sq ft. When fly populations are high the bait should be replenished every 3-5 days or when the bait is no longer visible in the treated area. Apply around the outside of poultry houses only. Do treat areas where animals can feed on bait.
- ◆ nithiazine (QuikStrike) fly abatement strip—Attach to flat surface out of reach of animals.
- ◆ permethrin + piperonyl butoxide (1% ready to use)—Apply directly to surfaces where flies crawl or rest.
- ◆ permethrin spray at 0.1 lb ai/12.5 gal water. Apply as surface treatment to walls and ceilings, 1 gal dilute spray per 750 sq ft. Do not apply this dilution to animals. Avoid contamination of feed and water during treatment. Do not treat litter.
- ◆ pyrethrins + piperonyl butoxide (Evergreen 60-6)—Allowable use as a space spray in houses where birds are not present. Follow manufacturer's directions.
- ◆ pyriproxyfen (NyGuard, Surge)—As a surface spray, apply at 1 fl oz diluted in water to cover 1,500 sq ft. As a fogger, 1.5 fl oz diluted in carrier to treat 12,000 cu ft. Not for use in areas where animals are present. Do not contaminate food or water.
- ◆ spinosad bait (Elector)—Use as a scatter bait, in bait stations, or as a paint-on or spray-on. Only for areas inaccessible to birds.
- ◆ tetrachlorvinphos+ ddivp (Ravap 23% EC)—Apply as a spray to surfaces at a rate of 5 oz/gallon, 1 gallon of spray for 500 to 1,000 sq ft.

Fly control—Fly larvae

Management—biological control

Wasp parasites (Spalding, Kunafin), when properly applied, can greatly reduce fly populations on dairies, in feedlots and at other confined livestock operations, equine facilities, and poultry farms. The tiny adult female wasp inserts an egg into a fly pupa, killing the fly. The egg hatches into a larva that feeds inside the pupal case and develops into an adult that emerges from the case to seek other hosts to parasitize. Application instructions vary with type of operation and number of animals. For optimum effectiveness, multiple releases are required throughout the fly season. Parasite releases are generally not compatible with insecticide use.

Management—chemical control

- ◆ azadirachtin (Ecozin Plus 1.2%) at 1.25 oz per 1,000 sq ft diluted in 20 to 40 gal water. Direct a coarse spray on fly and beetle breeding sites. Apply weekly during fly-breeding season. Add a spray oil or surfactant to enhance penetration into manure and refuse piles.
- ◆ cyromazine (Larvadex)—Poultry only. See label for rates and restrictions. Feed for 4 to 6 weeks and then monitor manure for fly activity. Continue treatment if larvae appear. Sanitation and adult fly control are essential for satisfactory results.
- ◆ cyromazine (Neporex 2SG)—Scatter 1 lb/200 sq ft or spray 1 lb/gal per 200 sq ft. Spray floor of calf hutches 3 days after manure removal, repeat treatment after each manure removal or when fly larvae are found. In poultry houses, spray entire manure area 1 week after manure removal, repeat treatment after each manure removal or when fly larvae are found.
- ◆ ddivp (Vapona 40.2%)—Apply 0.5% solution as a mist or a coarse wet spray at 1 to 2 qt/100 sq ft of manure once a week. See label for restrictions.
- ◆ diflubenzuron feed supplement (Clarify 8%)—For use in cattle feeds only. Mix into grain according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding in the spring before flies appear and discontinue when cold weather restricts fly activity.
- ◆ diflubenzuron add-pack for milk (elim-A-fly Add-Pack with Clarify)—Prevents development of immature forms in manure of treated calves. Mix daily into milk/milk replacer according to label to provide 0.1 mg ai/kg (4.55 mg/100 lb) body weight per day. Start feeding early in spring before flies appear and discontinue when cold weather limits fly activity.
- ◆ diflubenzuron (Dimilin 2L)—Broadcast spray or spot treatment to litter, waste feed, waste hay, manure, or bedding material. Repeat as needed, typically at 2 to 3 week intervals. Do not apply directly to animals. Do not contaminate feed or water. See label for details.
- ◆ malathion spray (Prentox)—For use around livestock/poultry buildings only. Apply as a sugar/molasses bait spray over surface of manure or poultry droppings. See label for mixing instructions.
- ◆ (S)-methoprene premix (Altosid IGR Custom 2%)—For use in cattle only. Use formulas on label to determine proper amounts to mix with feed or minerals. Begin use 30 days prior to fly season; continue feeding until cold weather restricts horn fly activity.
- ◆ tetrachlorvinphos mineral block (Sweetlix Rabon)—Feed free choice, 1 block for 5 head of cattle. See label for details.
- ◆ tetrachlorvinphos + ddivp (Ravap)—1 gal/25 gal water, apply dilution at 1 gal/100 sq ft of droppings/manure. Repeat at 7- to 10-day intervals. Do not spray animals directly with concentrate.

Horse Pests

Dawn M. Sherwood

Latest revision—March 2018

In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Horse—Bot

Includes

Common bot (*Gasterophilus intestinalis*)

Nose bot (*Gasterophilus haemorrhoidalis*)

Throat bot (*Gasterophilus nasalis*)

Pest description and damage Bot flies have four life stages: a free living non-biting fly, eggs attached to hairs on the animal, larvae migrating through tissues of the mouth, and the internal stage as larvae on mucosa of stomach lining and intestines. The main problem of the free living stage (bot fly) is the annoyance factor. On warm sunny days when bot flies are active, horses will fight the flies from morning until late afternoon. When the bot flies are present, horses will walk, run, bob their heads, and seek shelter in shaded areas. The larvae stages of the bot can do extensive damage to the horse's system.

- ◆ ivermectin oral liquid (Eqvalan) at 200 mcg/kg of body weight or 91 mcg/lb of body weight. Liquid delivered via nasogastric intubation or oral drench. Effective on a wide range of internal parasites. Not for use in horses intended for human consumption. Dispensed by veterinary prescription only.
- ◆ ivermectin paste (1.87%) at 91 mcg/lb (200 mcg/kg) of body weight. For oral use in horses only. May be used in horses of all ages, including mares at any stage of pregnancy. Stallions may be treated without adversely affecting fertility. Do not use in horses intended for human consumption. This product should not be used in other animal species as severe adverse reactions, including fatalities in dogs, may result.
- ◆ ivermectin at 1 ml per 110 lb of body weight. Not for use in horses intended for food purposes.
- ◆ methoprene (0.27%) + pyrethrins (0.2%) + PBO (0.37%) + attractant (Ovitrol Plus II)—Kills adults and eggs. Apply spray directly to horse's coat, giving particular attention to legs, shoulders, flanks, neck and topline. To treat face, dampen a cloth with spray and rub on face and head, being careful to avoid eyes. Repeat every 2 months if necessary. Consult a veterinarian before using on debilitated, aged, pregnant, nursing or horses on medication. For preventing hatch of horse botfly eggs: Spray any infested areas directly at the first sign of visible eggs, paying particular attention to legs, shoulders, flanks, neck and topline. Spray to the point of dampness but not to the point of run-off of the spray. For a high degree of botfly egg control, spray animals every 3-5 days during the botfly season. Do not treat horses destined for food.
- ◆ moxidectin (2%) at 0.4 mg per kg body weight. For oral use in horses and ponies 6 months of age and older. Extreme caution

should be used when administering the product to foals, young and miniature horses, as overdosage may result in serious adverse reactions. Do not use in sick, debilitated, or underweight animals. This product should not be used in other animal species as severe adverse reactions, including fatalities in dogs, may result. Not for use in horses intended for food.

Horse—Biting fly

Including

Black fly (Simuliidae)

Deer fly (*Chrysops* spp.)

Horn fly (*Haematobia irritans*)

Horse fly (*Tabanus* spp.)

Stable fly (*Stomoxys calcitrans*)

Pest description and damage There are several kinds of flies that suck blood from horses. These include: horn flies, horse flies, deer flies, stable flies, and in some cases, black flies. The primary concern regarding these flies is annoyance to the horse.

Note: Dusts may be the preferred treatment. Horses often react violently to higher spray pressures. It may be safer to apply dilute sprays with a sponge.

- ◆ coumaphos (emulsified) spray at 2.5 oz/4 gal. Apply to runoff. Repeat as necessary. Treat thoroughly all wounds and injuries. Do not apply to sick, convalescent, or stressed horses or to colts less than 3 months old. Do not apply with other medications or treatments or in stress situations. Do not allow contact with treated animals until their coats are dry. **(RESTRICTED USE PESTICIDE: Acute Oral Hazard. For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certification).**
- ◆ coumaphos (flowable insecticide) spray at 1 qt/200 gal of water and mix thoroughly. Apply for complete wetting to run-off. Do not spray more than six times per year. Do not make applications less than 10 days apart. **(RESTRICTED USE PESTICIDE: Acute Oral Hazard. For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certification).**
- ◆ coumaphos (Co-ral Fly and Tick Spray) on-animal spray at 2 quarts/50 gal water or 5 oz/4 gal water. Treat all wounds thoroughly. Do not exceed six treatments per year. Allow at least 10 days between treatments. Not for use in horses intended for human consumption.
- ◆ cyromazine (Solitude IGR Feed-Through Fly Control 2.12%)—Apply 0.5 oz to daily ration regardless of horse breed or size. The 0.5 oz serving provides 300 mg cyromazine/horse per day. Begin feeding before flies begin to appear and feed into the fall until cold weather inhibits fly development. Not for use in horses intended for food purposes.
- ◆ cypermethrin 0.15% + pyrethrins 0.20%—Spray or wipe entire body. Use on clean dry horses. Reapply every 5-7 days, as protection builds; reapply every 10-14 days. Not for use in horses intended for human consumption.
- ◆ diflubenzuron (Simplify with LarvaStop Feed-Through Fly Control 0.24%)—Top dress grain daily to provide 6.8 mg of diflubenzuron/100 lb of body weight. Daily dosage table provided on label. Not for use in horses intended for food purposes.
- ◆ methoprene (0.27%) + pyrethrins (0.2%) + PBO (0.37%) + attractant (Ovitrol Plus II)—Spray directly to horse's coat until moist but before runoff, being careful to avoid the eyes. Spray every 2 months to aid in fly control. Do not treat horses intended for food purposes. Consult a veterinarian before using on debilitated, aged, pregnant, nursing or horses on medication.
- ◆ permethrin 10% at 1.28 oz/1 gal water for severe infestations. Spray to thoroughly cover the entire animal.

- ◆ permethrin 10% at 0.64 oz/1 gal water for normal infestations. Spray to thoroughly cover the entire animal.
- ◆ permethrin (7.4%) + piperonyl butoxide (7.4%)—Pour-on 8 to 16 ml to back and face being cautious of eyes. Pour-on to MATURE horses only. Wipe-on 8 to 16 ml using a dampened applicators mitt or towel. Wipe-on can be applied to mature horses and foals. Repeat as needed, but not more than once every two weeks.
- ◆ pyrethrins + piperonyl butoxide synergist—Spray or wipe entire body. Follow manufacturer's directions. No limit. Repeat as needed.

Horse—Lice

Including

Horse biting louse (*Damalinia equi*)

Horse sucking louse (*Haematopinus asini*)

Pest description and damage There are two types of lice in the Pacific Northwest important to the horse; the biting louse and the blood sucking louse. The blood sucking lice are more injurious because heavy infections mean a large loss of blood that may seriously weaken the animal. Lice occur in largest numbers in the winter months when hair is long. Infections spread from animal to animal in adjacent stalls and around mangers. Sucking lice are usually found on the head, neck, back and inner surface of the thighs. Biting lice may be found anywhere on the body, although they seem to occur in greatest numbers around the withers and the base of the tail. The biting lice feed on the hair and scales from the skin.

- ◆ coumaphos (emulsified) spray at 2.5 oz/4 gal. Apply to runoff. Repeat as necessary. Treat thoroughly all wounds and injuries. Do not apply to sick, convalescent, or stressed horses or to colts less than 3 months old. Do not apply with other medications or treatments or in stress situations. Do not allow contact with treated animals until their coats are dry. **(RESTRICTED USE PESTICIDE: Acute Oral Hazard.** For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certification).
- ◆ coumaphos (flowable insecticide) spray at 1 quart/200 gal of water and mix thoroughly. Apply for complete wetting to run-off. Do not spray more than six times per year. Do not make applications less than 10 days apart. **(RESTRICTED USE PESTICIDE: Acute Oral Hazard.** For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certification).
- ◆ coumaphos (Co-Ral Fly and Tick Spray) at 2 quarts/50 gal water or 5 oz/4 gal water. Apply to runoff. Treat thoroughly all wounds and injuries. Do not exceed six treatments per year. Allow at least 10 days between treatments.
- ◆ permethrin 10% at 0.64 oz/1 gal water for normal infestations. Spray to thoroughly cover the entire animal.
- ◆ permethrin 10% at 1.28 oz/1 gal water for severe infestations. Spray to thoroughly cover the entire animal. A second treatment 14 to 21 days later is recommended.
- ◆ permethrin (7.4%) + piperonyl butoxide (7.4%)—Pour-on 8 to 16 ml to back and face being cautious of eyes. Pour-on to MATURE horses only. Wipe-on 8 to 16 ml using a dampened applicators mitt or towel. Wipe-on can be applied to mature horses and foals. Repeat as needed, but not more than once every two weeks.
- ◆ pyrethrins + piperonyl butoxide synergist—Spray or wipe entire body. Follow manufacturer's directions. No limit. Repeat when necessary.
- ◆ zeta-cypermethrin 0.075% dust—Apply up to 2 oz per animal evenly in the hair over the head, ears, neck, shoulders, back and tailhead. Do not apply more often than every 3 days. Never use on dogs or cats.

Horse—Tick

Including

American dog tick (*Dermacentor variabilis*)

Pacific coast tick (*Dermacentor occidentalis*)

Western black legged tick (*Ixodes pacificus*)

Winter tick (*Dermacentor albipictus*)

Pest description and damage In some areas ticks are also a problem. Ticks feed on horses by sucking blood and animals can develop severe anemia. Ticks are usually found on the neck, between front and hind legs, under the jaw, and along ventral abdomen.

- ◆ coumaphos (emulsified) spray at 5 oz/4 gal. Apply to runoff. Repeat as necessary. Treat thoroughly all wounds and injuries. Do not apply to sick, convalescent, or stressed horses or to colts less than 3 months old. Do not apply with other medications or treatments or in stress situations. Do not allow contact with treated animals until their coats are dry. **(RESTRICTED USE PESTICIDE: Acute Oral Hazard.** For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certification).
- ◆ coumaphos (flowable insecticide) spray at 0.5 to 1 gal/200 gal of water and mix thoroughly. Apply for complete wetting to run-off. Do not spray more than six times per year. Do not make applications less than 10 days apart. **(RESTRICTED USE PESTICIDE: Acute Oral Hazard.** For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certification).
- ◆ coumaphos (Co-Ral Fly and Tick Spray) at 4 quarts/50 gal water or 10 oz/4 gal water. Apply to runoff. Treat thoroughly all wounds and injuries. Do not exceed six treatments per year. Allow at least 10 days between treatments.
- ◆ permethrin 10% at 0.64 oz/1 gal water for normal infestations. Spray to thoroughly cover the entire animal.
- ◆ permethrin 10% at 1.28 oz/1 gal water for severe infestations. Spray to thoroughly cover the entire animal.
- ◆ permethrin spray at 0.75 oz ai/50 gal water. Spray to runoff or use 0.5 to 1 gal of spray mix per animal. For spot spray, increase rate to 0.75 oz ai/3 gal water and spray each animal with up to 0.5 pint of spray solution. Not for use in horses intended for human consumption.
- ◆ permethrin (7.4%) + piperonyl butoxide (7.4%) - Pour-on 8 to 16 ml to back and face being cautious of eyes. Pour-on to MATURE horses only. Wipe-on 8 to 16 ml using a dampened applicators mitt or towel. Wipe-on can be applied to mature horses and foals. Repeat as needed, but not more than once every two weeks.
- ◆ zeta-cypermethrin 0.075% dust—Apply up to 2 oz per animal evenly in the hair over the head, ears, neck, shoulders, back and tailhead. Do not apply more often than every 3 days. Never use on dogs or cats.

Poultry Pests

Craig Hollingsworth

Latest revision—March 2018

In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Note: Products are listed in alphabetical order and *not* in order of preference or superiority of pest control.

Poultry—Lice and mite

Includes

- Chicken body louse (*Menacanthus stramineus*)
- Shaft louse (*Menapon gallinae*)
- Chicken mite (*Dermanyssus gallinae*)
- Northern fowl mite (*Ornithonyssus sylviaum*)
- Scaly leg mite (*Menapon gallinae*)

Management—chemical control

For direct application to chicken, duck, goose, and turkey

- ◆ permethrin 0.25% dust at 1 lb per 100 birds. Thoroughly treat vent area.
- ◆ permethrin spray at 3 oz ai/50 gal water. Spray birds, cages, or nests. Spray 0.5 oz dilute spray per bird or 1 gal dilute, coarse spray per 100 birds. Thoroughly treat vent area.
- ◆ tetrachlorvinphos + ddpv (Ravap)—28% EC at 1 gal/50 gal water. Apply 1 gal dilution per 100 birds using high pressure to vent areas. Use 1 oz spray per bird. Use 1 to 2 gal/1,000 sq ft of litter. Treat walls, roosts, cracks, and crevices. Repeat as necessary but not more than every 14 days.
- ◆ tetrachlorvinphos (Rabon 50WP) at 0.5% solution. Apply directly to birds using 1 gal spray mixture per 100 birds. Do not repeat more often than 14 days.
- ◆ tetrachlorvinphos 3% dust—For caged birds, apply 0.48 oz ai per 300 birds. Treat dust box at 0.96 oz ai per 100 birds.

For application to litter and housing

- ◆ cyromazine (Larvadex 2SL) at 0.1% finished spray. Apply finished spray at 1 gal/100 sq ft of area over surface of manure, and other sides. Do not exceed one treatment in 21 days.
- ◆ permethrin spray at 4 oz ai/36 gal water. Spray to runoff. Cover feed and water before spraying. Apply 3 oz ai/50 gal when spraying cages.
- ◆ tetrachlorvinphos + ddpv (Ravap) roost paint—28% EC at 1 gal/25 gal water; use 1 gal spray per 100 sq ft of roost area. Apply as brush-on or spray. Use 1 to 2 gal/1,000 sq ft of litter. Treat walls, roosts, cracks, and crevices. Repeat as necessary but not more than every 14 days.
- ◆ tetrachlorvinphos (Rabon 50W) spray—50% WP at 4 lb/25 gal water. Paint brush or hand spray 1 pint/100 ft of roost. Stir occasionally and apply thoroughly. May also be dusted; refer to label.
- ◆ tetrachlorvinphos 3% dust—Apply to litter at 0.48 oz ai/100 sq ft. For roost paint, make a thick slurry by mixing 1 pint water with 0.48 oz ai dust per 100 linear ft.

For more information

Common Lice and Mites of Poultry: Identification and Treatment (<http://anrcatalog.ucanr.edu/pdf/8162.pdf>)

Control of Poultry Pests (<http://extension.entm.purdue.edu/publications/E-3.pdf>)

Sheep and Goat Pests

Gene Pirelli

Latest revision—March 2018

In all cases, follow the instructions on the pesticide label. The *PNW Insect Management Handbook* has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications.

Notes:

1. Products labeled for use on dairy goats may not be legal to use on meat goats. Read the label carefully or contact the manufacturer of the product if there are questions. In the event there is conflicting information between this document and the label, the product label is the legal definition for the use of the product.
2. Veterinarians can prescribe insecticides that are not specifically labeled for pests on sheep and goats provided a valid veterinary-client relationship exists.
3. If you have questions, consult your veterinarian or Extension professional before applying any pesticide to livestock.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control.

Sheep and goat—Lice

Includes

- Angora goat biting louse (*Bovicola crassipes*)
- Goat biting louse (*Bovicola caprae*)
- Goat sucking louse (*Linognathus stenopsis*)
- Sheep biting louse (*Bovicola ovis*)
- Sheep foot louse (*Linognathus pedalis*)

Management—chemical control

- ◆ permethrin (spray)—Follow label for dosage depending on severity of infestation and spray location. Spray affected areas or entire body or bedding. Re-treat after 4 to 6 weeks if needed. Remove feed and water while spraying. Do not treat more than once every 14 days.
- ◆ permethrin pour-on—Pour along backline and down face. Use 0.005 oz ai per 100 lb of body weight to a maximum of 0.03 oz ai/animal. Repeat as needed. Use no more than once every 2 weeks. For spot treatment, mix 0.75 oz ai/3 gal and spray each animal with 0.5 pint spray mixture per head. See label for other details. Sheep only.
- ◆ permethrin + piperonyl butoxide—Usage instructions depends upon concentration. Follow label for dosage and precautions. Sheep only.
- ◆ pyrethrin + piperonyl butoxide—Usage instructions depends upon concentration. Follow label for dosage and precautions.

- ◆ rosemary and peppermint oils—Follow label for dosage and precautions.
- ◆ zeta-cypermethrin with piperonyl butoxide dust—Use at 2 oz per animal. Apply directly to animal. Repeat as necessary, but not more often than once every 3 days.
- ◆ zeta-cypermethrin dust at 2 oz per animal. Apply directly to animal.

Sheep and goat—Sheep ked

Melophagus ovinus

Management—chemical control

- ◆ permethrin at 8 oz/25 gal water. Do not treat more often than once every 2 weeks. Thoroughly wet all portions of the body by dipping or spraying with sufficient pressure and with a nozzle adjustment to penetrate the wool. Sheep only.
- ◆ permethrin 1% pour-on—Pour along backline and down face. Use 0.5 fl oz per 100 lb of body weight to a maximum of 3 fl oz per animal. Repeat as needed. Use no more than once every 2 weeks. Sheep only.
- ◆ permethrin + piperonyl butoxide—Usage instructions depends upon concentration. Follow label for dosage and precautions. Sheep only.
- ◆ pyrethrin + piperonyl butoxide—Usage instructions depends upon concentration. Follow label for dosage and precautions.
- ◆ zeta-cypermethrin dust at 2 oz per animal. Apply directly to animal.
- ◆ zeta cypermethrin with piperonyl butoxide dust at 2 oz per animal. Apply directly to animal. Repeat as necessary, but not more often than once every 3 days.

Sheep and goat—Tick

Pacific Coast tick (*Dermacentor occidentalis*)

Rocky Mountain wood tick (*Dermacentor andersoni*)

Western blacklegged tick (*Ixodes pacificus*)

Management—chemical control

- ◆ permethrin spray, paint, or dip—11% EC at 1 pint/25 gal water. Some products are not labeled for goats. Use 1 to 2 quarts spray per animal. Read label for instructions and dosage for goats. Do not use within 14 days of slaughter.
- ◆ permethrin + piperonyl butoxide—Usage instructions depends upon concentration. Follow label for dosage and precautions.
- ◆ pyrethrin + piperonyl butoxide—Usage instructions depends upon concentration. Follow label for dosage and precautions.
- ◆ rosemary and peppermint oils—Follow label for dosage and precautions.
- ◆ zeta-cypermethrin with piperonyl butoxide dust at 2 oz per animal. Apply directly to animal. Repeat as necessary, but not more often than once in 3 days.
- ◆ zeta-cypermethrin dust at 2 oz per animal. Apply directly to animal.

Sheep and goat—Wool maggot

Includes black blowfly (*Phormia regina*)

Management—chemical control

- ◆ permethrin spray at 1 pint per 25 gal water. Spray affected areas or entire body or bedding. Re-treat after 4 to 6 weeks if needed but not more than every 14 days. Remove feed and water while spraying.
- ◆ permethrin spray, paint, or dip—Do not use within 14 days of slaughter. Sheep only.
- ◆ rosemary and peppermint oils—Follow label for dosage and precautions.

Swine Pests

Gene Pirelli

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In all cases, follow the instructions on the pesticide label. The PNW Insect Management Handbook has no legal status, whereas the pesticide label is a legal document. Read the product label before making any pesticide applications. Contact your veterinarian for information on the proper use of these products for market and breeding animals. Follow all label withdrawal time instructions.

Note: Products are listed in alphabetical order and not in order of preference or superiority of pest control.

Swine—Lice

Hog louse (*Haematopinus suis*)

Note: Do not use rotenone on swine because it may cause a serious reaction.

Management—chemical control

- ◆ ivermectin injection at 1 ml per 75 lb body weight. Treat sows 14 days before breeding. Do not treat 8 days before slaughter.
- ◆ permethrin 0.25% dust at up to 1 oz dust per animal. Ear treatment is important. Re-treat in 10 days.
- ◆ permethrin spray at 1 quart/100 gal water. Spray affected areas or entire body or bedding. Re-treat no more than every 14 days. Remove feed and water.
- ◆ tetrachlorvinphos (Rabon 50 WP Insecticide) at 0.5% solution. Apply 1 to 2 quarts per head as a coarse spray. Repeat in 2 weeks if necessary. No withholding period.

Swine—Hog mange

Follicle mite (*Demodex* spp.)

Hog mange mite (*Sarcoptic scabiei suis*)

Management—chemical control

- ◆ permethrin spray at 1 quart/100 gal water. Spray until entire animal is covered thoroughly, paying particular attention to ears and hard-to-reach areas. Also spray walls and floor and replace the bedding to kill free living mites. For particularly severe or persistent hog mange, use 1 quart/50 gal water, applied as directed.