

# Crop Profile for Dairy Cattle in Virginia

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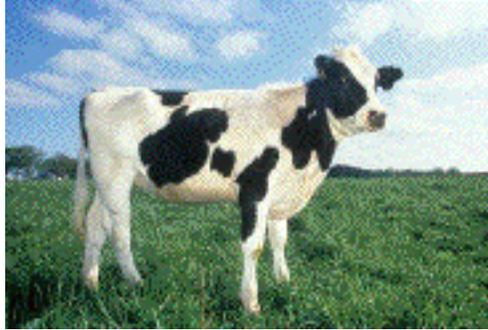


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## General Production Information<sup>1, 2, 3, 4</sup>

- Virginia ranks 22nd in milk production in the nation.
- There were 105,000 milk cows on approximately 838 farms in 2005.
- The average monthly cost of running a Virginia dairy farm in 2003 was approximately \$31,000.
- The top five counties in number of dairy cattle are Rockingham (26,000), Augusta (9,500), Franklin (8,600), Fauquier (5,100), and Wythe (4,200).
- 1.7 billion pounds of milk were produced in 2004.
- Each cow produced approximately 16,486 lbs. of milk in 2004.
- Cash receipts for milk in 2004 totaled \$308,147,000.

## Cultural Practices<sup>6, 7, 8, 19, 10, 11, 12</sup>

The dairy cattle breeds raised in Virginia include *Ayrshire*, *Brown Swiss*, *Guernsey*, *Holstein*, *Jersey*, *Milking Shorthorn*, and *Devon*. Dairy cows begin producing milk around age two when they have their first calf. Cows should calve every 12-14 months--optimally between 12.3 and 12.8 months. Milk production drops significantly after 13.6 months. Large-breed heifers should weigh at least 1,200 lbs. (800 lbs. for small-breed heifers) after they give birth in order to reach peak milk production rates of 70+

lbs. per day. Cows are milked two to three times daily, in the morning and the evening. It takes about four to six minutes for a cow to be milked, and 3-5 gallons are produced during each session. Optimally, cows are milked for 305 days following the birth of a calf. The cows then rest for about two months. A new lactation cycle begins when the next calf is born. Milk is stored at the farm in a bulk tank held at 36°F-40°F. Milk trucks pick up the milk and deliver it to a processing plant to be made into various dairy products.

Dairy cattle facilities should include free-stall barns or tie-stall barns, loose housing or bedded-pack barns, outside corrals, and pasture. Housing for calves should include a clean maternity area, a hutch, and a weaning pen or super hutch that holds three to five calves. Proper ventilation is key. The ideal site for a dairy farm must be of adequate size with access to water and electricity. Space should be reserved for a milking center, as well. Good drainage and adequate manure storage facilities are important. These facilities allow urine and feces to be stored until they can be used to fertilize crops. Storage facilities must be well built so that nitrogen does not leak into the environment and pose a health risk. Solid manure can be turned into the soil via tillage, while liquid manure can be either injected into the earth or sprayed on the soil using an irrigation system. The location of the dairy farm itself is critical. It must be set far enough away from its neighbors to avoid bothering them with smells and insect problems.

It is extremely important to make dairy cattle comfortable in order to improve their production. Stressful conditions can cause nutritional resources to be diverted to cope with the stressor rather than production. Some stressors that should be minimized include heat stress, overcrowding, poor ventilation, rough footing, uncomfortable stalls, and rough handling. Cows also appreciate privacy while giving birth; otherwise, they may become stressed. Heat stress late in pregnancy results in lower calf birth weights and reduced milk production. Providing shade for dry cows allows them to give birth to heavier calves and produce more milk. The optimal air temperature range for dairy cattle is 41°F -77°F. At higher temperatures, resources are reallocated to cooling. Heat stress can cause difficulty calving, heat exhaustion, reduced milk production, lameness, fatty livers, mastitis, vaccination side effects, abortions, and death. Heat-stressed animals eat less and prefer to eat at cooler times during the day. To reduce heat stress, cool the animals by spraying them with water or using fans, provide shade and ventilation, and do **NOT** overcrowd them. Put waterers in the shade, and make sure they are clean. Maintain the water temperature at 70°F -86°F. Also, provide plenty of water after milking because it takes at least 6 gallons of water to produce 1 gallon of milk. Adjust the summer rations to compensate for heat/humidity and include more minerals, which are lost through respiration. Provide extra feedings during cooler times of day, and make sure there is enough feed bunk space for all cows to eat together comfortably.

## **Worker Activities 13**

Spring and fall are the main times of year to treat livestock for parasites. Potential hazards include exposure to pesticides and injury resulting from animal handling. Livestock are large and unpredictable, and can cause injury if they are not handled properly while pesticides are applied. Risks of exposure to

pesticides are greatly reduced by following the recommendations on the product label and wearing personal protective equipment such as protective eyewear, face shields, boots, coveralls, gloves, masks, and hats. Workers are most likely to be exposed to pesticides while handling or mixing products before they are applied. Exposure via the skin, mouth, or nose is possible if pesticides are spilled, splashed, or become airborne during preparation. Dermal, oral, and inhalation exposure are also possible during the treatment itself. Workers may be exposed to pesticides when using high-pressure sprayers (75-100 psi) or power dusters to control pests. In addition to being sprayed, cattle may be dipped to treat for ectoparasites. Dipping increases the risk of exposure because splashing is very likely to occur as the cattle move through the vat. Pour-on treatments can end up on farm workers' skin or clothes if an animal moves unexpectedly during the application process. Injectable products also present a risk of injury, particularly if animals are not properly restrained. Non-permeable gloves should be worn when placing rodent-control products on the premises or when attaching ear tags. Additionally, pesticide-impregnated plastic strips hung in livestock houses pose a risk of dermal or oral exposure to those who hang them.

## Special Use Labels

Section 18 Emergency Use Exemption and Special Local Need 24 (c) labels are used to supplement the chemical tools available to producers for pest control. Once the problem or gap in pest control has been identified, specialists submit the proper documentation for the Emergency Use/Special Local Need label. Thus far, Extension specialists have been successful in obtaining these labels. Special Local Need (SLN) labels in Virginia are granted by the Virginia Department of Agriculture and Consumer Services (VDACS) and are usually only valid for limited time intervals. However, a fee must be paid annually by the registrant to keep the product registered for use in Virginia. Section 18 Emergency Use labels are evaluated and granted by the Environmental Protection Agency (EPA) and can be renewed annually.

## Insect Pests

### **ARTHROPOD PESTS 13, 14, 15, 16, 17, 18, 19, 20**

The United States Department of Agriculture (USDA) estimate of production losses due to livestock pests in 2004 is greater than \$2 billion. Nationally, internal worms (\$991 million), horn flies (\$730 million), lice (\$126 million), stable flies (\$90 million), and face flies (\$53 million) cause the greatest damage to livestock. In general, internal and external parasites cause a reduction in weight gain and milk production. Parasites also lead to mastitis, higher somatic cell counts (SCC), greater disease susceptibility, and an increased spread of disease.

Adult flies, cattle grubs, lice, and mange mites are the principal external pests of cattle in Virginia. The key to effective fly control is to prevent them from becoming a problem in the first place. Good sanitation is crucial—livestock pens should be cleaned once or twice each week to interrupt the life cycles of flies that breed in manure and other decaying organic matter. Once manure is gathered, it can be spread thinly to dry or else stacked and covered COMPLETELY with black plastic. Both of these methods kill fly larvae (maggots). Wet feed, straw, and hay should also be gathered to remove potential fly-breeding areas. Proper drainage is important—use gravel to fill in low-lying pits that can become muddy and attractive to flies. Also, udder hair should be clipped or singed to keep manure from accumulating. These general cultural control methods should be implemented together with baits, residual sprays, space sprays, larvicides, and biological control methods, if possible. Avoid using broad-spectrum pesticides that could kill natural enemies of the pest insects.

### **Face Fly, *Musca autumnalis***

Face flies resemble large house flies. They are distributed throughout the United States but are more common in the northern states. Face flies do not bite but annoy animals by feeding on their secretions (tears, saliva, mucous, blood, and excrement). They are vectors of pinkeye (*Moraxella bovis*) and eye worms (*Thelazia lacrymalis*) in cattle. Face flies overwinter in buildings and become active in early spring. In the summer, females avoid shade and do not enter shelters. Face flies breed in fresh manure piles, and a new generation occurs approximately every two to three weeks until September. Populations tend to increase greatly during warm, wet weather. Face flies are strong fliers and can travel several miles.

**Monitoring:** Check cows for flies around the head. Cows may graze less, lose weight, and can sometimes be found hiding in shady refuges to avoid the flies. A population of more than ten to 20 flies per cow is considered moderate to heavy and should be treated. If pinkeye appears in the herd, begin treatment immediately.

**Chemical Control:** Face flies tend to spend less time on cows than do horn flies, which makes them slightly more difficult to control. Reliable methods include using dust bags or backrubbers placed near mineral feeders or gateways in such a way that cows must lift the bags up with their heads in order to gain access. See the *Chemical Arthropod Control* section for more information.

**Biological Control:** Natural control agents include parasitic nematodes and wasps, predaceous mites and yellow dung flies, pathogenic fungi, and dung beetles.

**Cultural/Mechanical Control:** Nonchemical walk-through traps designed to capture horn flies may catch some face flies as well, but this method is unreliable.

### **Grubs**

**Common Cattle Grub, *Hypoderma lineatum***

**Northern Cattle Grub, *H. bovis***

The common cattle grub and northern cattle grub are larval offspring of the heel fly and bomb fly, respectively. The adult flies resemble small bumble bees, are only active during the day, and do not enter buildings. Females lay their eggs on hairs located on the legs of cattle from May to August. The eggs hatch, and larvae then burrow into the animal's skin and through its connective tissues. The common cattle grub moves to the tissue near the esophagus, while the northern grub moves to the spinal column. The grubs relocate to the back of the cow between November and February and form a "warble," from which they will emerge two months later. The grubs pupate in the soil for a few weeks and re-emerge as adult flies. The hide and loin areas are the major sites damaged by late-stage grubs. This damage reduces the market value of the afflicted cattle.

**Monitoring:** Cattle panic and run with their tails in the air to escape fly attack. Cattle may exhibit reduced grazing and reduced weight gain along with the warbles. Grubs may delay the first lactation and reduce the amount of milk produced.

**Chemical Control:** Begin chemical treatments after fly activity is over but before the grubs reach the esophagus or spinal cord, and at least six weeks before the warbles appear on the cow's back. Proper timing of the treatment is **CRITICAL**. See the *Chemical Arthropod Control* section for more information.

**Biological Control:** No commercially effective controls are available.

**Cultural/Mechanical Control:** Cattle kept indoors are not attacked. Provide cattle with shady areas to retreat from fly attack. Organize or join a community-wide effort to treat all non-lactating cattle with systemic insecticides to reduce the following year's fly population.

### **Horn Fly, *Haematobia irritans***

Horn flies are half the size of stable flies and are brownish gray to black. They are distributed throughout the United States. The blood-feeding adult flies bother cattle with their painful bites—each fly feeds between 20 and 40 times each day. As a group, 500 flies can remove up to ½ lb. of blood each day. However, Virginia populations are not usually that high. Horn flies prefer warm, moist weather and emerge in the spring. Female flies leave the host only to lay their eggs in freshly excreted manure. Larvae feed on and develop in the droppings, producing a new generation every one to two weeks until autumn. Larvae or pupae overwinter in or under manure.

**Monitoring:** Look for flies from June to September gathered at the base of horns, neck, throat, belly, back, and thighs. Blood feeding causes reduced weight gain, reduced milk production, lethargy, and anemia. Begin treatment when there are more than 50-100 flies per cow.

**Chemical Control:** Adults remain on the animal at all times, so they are easy to treat with ear tags, dust bags, backrubbers, or walk-through traps. Overuse of ear tags has caused resistance in fly populations.

See the *Chemical Arthropod Control* section for more information.

**Biological Control:** Adult horn flies are attacked by yellow dung flies. Dung beetles collect and bury manure before maggots can complete development. Parasitic wasps (*Spalangia* spp.), ants, mites, beetles, birds, and mice are natural control agents of the larvae; however, they are ineffective.

**Cultural/Mechanical Control:** Clean up manure-pile breeding grounds or use a pasture harrow. Nonchemical walk-through traps can be used to capture horn flies.

### House Fly, *Musca domestica*

House flies are nonbiting pests, but they annoy livestock and people. They can also carry diseases and are a threat to public health. House flies are very common in milk rooms and can increase bacterial counts in milk. Eggs are laid in straw, spoiled grain, or other rotting organic matter. Several overlapping generations are produced each year, taking as little as one week to develop. Flies are active from May to October but are most prevalent in August and September. Some flies overwinter in buildings as larvae or pupae.

**Monitoring:** House flies gather inside and on buildings and leave vomit and fecal spots on walls. They can be monitored by using baited traps, sticky tape, or spot cards. If more than 100 "fly specks"/card/week are found, then begin low-residual pyrethrin control.

**Chemical Control:** Residual wall sprays should be used sparingly because flies are becoming resistant. Alternate insecticides to limit resistance. Short-term control can be used to treat the legs and underside of animals. Space sprays (*pyrethrins*), mist foggers, and baits (*methomyl*) work well with biological control methods. See the *Chemical Arthropod Control* section for more information.

**Biological Control:** Beneficial wasps (e.g., *Muscidafurax raptor*) that attack pupae are available for purchase and release. Other natural enemies, such as beetles and mites, are present in barns and should be protected. Residual space sprays (e.g., *permethrin*, *rabon*) are very toxic to natural enemies. Use these only as a last resort.

**Cultural/Mechanical Control:** Remove breeding sites twice each week (feed bunk areas, spilled/wet feed in troughs, and manure-covered bedding, especially in damp, low-lying areas). Plug gaps under feed bunks. Thoroughly clean stalls and stanchion barn gutters. Either spread manure thinly to dry and disk it under, or add it to a liquid manure pit. Use flypaper (change every one to two weeks), electrocuting traps, bait traps, and automatic misters. You can make traps using white freezer paper covered with sticky adhesive and baited with a mixture of molasses, water, grain, and milk. Place bait traps every 20-30 ft. around the fly-breeding area perimeter. Keep flies out of milk rooms using tightly closed screen windows and doors. Reduce the traffic in and out, and control any remaining flies with sticky tapes and traps.

### Semi-Aquatic Biting Flies

Mosquitoes, *Aedes*, *Culex*, *Ochlerotatus* spp.

Deer and Horse Flies, *Chrysops* and *Tabanus* spp.

Biting Midges (Gnats), *Culicoides* spp.

Mosquitoes are small flies that breed in stagnant water. Female mosquitoes are blood feeders whereas the males feed on nectar. Mosquitoes are more active at dawn, dusk, and during the night. Mosquitoes, deer flies, and horse flies can spread anaplasmosis and other diseases. Deer and horse flies are medium to large blood-feeding flies that lay eggs on or near aquatic plants. The bite wounds continue to bleed after the flies have gone, which attracts face flies. Adult deer and horse flies are most active on warm, sunny days. The biting midge, *Culicoides sonorensis*, is a very small blood feeder that is active at dawn and dusk. Midges occur mostly in wet, marshy areas. Females lay their eggs in moist habitats. The biting midge can spread bluetongue virus in sheep and cattle.

**Monitoring:** Watch for insect activity around animals that causes annoyance and interrupts grazing, leading to reduced weight gain and lowered milk production. Animals will seek shelter from attack in dark, secluded locations.

**Chemical Control:** Repellent sprays may provide temporary relief from deer and horse flies. Insecticides can be used on livestock facility walls. See the *Chemical Arthropod Control* section for more information.

**Biological Control:** No commercially effective controls are available.

**Cultural/Mechanical Control:** Improve sanitation, provide darkened shelters or shady areas for escape from deer and horse flies, keep animals away from wooded or marshy areas, drain wet areas, and empty containers that collect water.

### Stable Fly, *Stomoxys calcitrans*

Stable flies are one of the most serious external pests in dairy stables. Stable flies resemble house flies, but both males and females take blood meals. They annoy animals with their painful bites and will pursue their hosts over long distances to feed on their legs and bellies. This leads to fatigue, reduced grazing and milk production, and weight loss. A new generation will arise about every three to four weeks between May and October from eggs laid in manure, rotting straw, grass clippings, or piles of harvest residue. Adult flies will enter buildings in bad weather, but they prefer to rest outside in sunlight. Immature flies will overwinter as larvae or pupae in breeding material. Stable flies can transmit anthrax, anaplasmosis, brucellosis, and other livestock diseases.

**Monitoring:** Stable flies are most prevalent and annoying in the spring and summer. Cattle exhibit leg stamping, tail switching, and bunching when under attack. If the number of flies exceeds an average of ten per animal, then begin treatment.

**Chemical Control:** See the *Chemical Arthropod Control* section for more information.

**Biological Control:** Beneficial wasps (e.g., *Muscidafurax raptor*) that attack pupae are available for purchase and release.

**Cultural/Mechanical Control:** Prevention is the best cure, so try to improve sanitation. Get rid of or spread manure, wet straw, and spoiled grain weekly to destroy breeding sites. Traps consisting of vertical white panels, which simulate animal legs, plus bait that releases carbon dioxide should be placed less than 30 inches above the ground. These traps will attract flies that can then be killed with flypaper or an electrocuting grid. Place one trap every 20-30 ft. around the perimeter of the fly-breeding area.

### Lice

Short-Nosed Cattle Louse, *Haematopinus eurysternus*

Long-Nosed Cattle Louse, *Linognathus vituli*

Little Blue Cattle Louse, *Solenopotes capillatus*

Cattle-Biting Louse, *Bovicola bovis*

Cattle Tail Louse, *Haematopinus quadripertusis*

Of the five species listed above, only the cattle-biting louse is a chewing louse. The other species are sucking lice. The short-nosed cattle louse is the most economically important sucking louse. Lice are spread through contact among infected cattle. Lice are annoying and cause hair loss, reduced weight gain, reduced milk production (up to 25%), anemia, and unthriftiness. Self-induced injuries may occur while animals try to relieve the itching. Lice are more prevalent in winter because summer temperatures are lethal. Lice will survive in hot weather by living on the ear tips of infested animals. Fall or early spring calves, yearlings, and older, unhealthy cattle are the most vulnerable to infestations. Lice are most common on mature cattle between December and March. Calves housed in barns remain infested all year, but infestations peak in June. This is because the calves are not exposed to sunlight and high temperatures that would curtail the lice infestation.

**Monitoring:** Cattle will exhibit a shaggy, rough appearance; excessive rubbing and licking; and bald areas on the face, neck, back, shoulders, and the base of the tail. Inspect cattle every two weeks in fall, winter, and spring. Select about 15 animals (cows, heifers, and calves). Using a flashlight, inspect several square inches of hide. Check several body regions (tailhead, hips, back, neck, and head). Choose animals that are healthy but look louse infested. Calculate the average number of lice /inch<sup>2</sup>. Fewer than three lice/inch<sup>2</sup> is a light infestation, three to ten lice/inch<sup>2</sup> is a moderate infestation, and more than ten lice/inch<sup>2</sup> is a heavy infestation. Monitor light and moderate infestations every two weeks. Heavy infestations should be treated.

**Chemical Control:** Treat animals for lice in early winter before infestations become too serious. For heavy infestations, administer two treatments 14 days apart. The second treatment is critical because it will kill lice that were in the nit stage during the first treatment. See the *Chemical Arthropod Control*

section for more information.

**Biological Control:** No commercially effective controls are available.

**Cultural/Mechanical Control:** Keep new animals quarantined from the herd. House calves in individual hutches to reduce the infestation by up to 90%. Healthy animals are less vulnerable to heavy infestations. Cattle in free-stall barns have fewer problems with lice than confined animals because they can groom themselves more easily.

## ARACHNIDS

### Mange Mites

**Psoroptic Mange**, *Psoroptes ovis*

**Chorioptic Mange (Barn Itch)**, *Chorioptes bovis*

**Sarcoptic Mange**, *Sarcoptes scabiei*

Mange mites infest the skin throughout the year. They are highly contagious, and heavy infestations can be fatal. Animals can die from secondary infections, dehydration, toxic reactions, or hypothermia due to excessive hair loss. Psoroptic mites are surface feeders; they pierce the skin and feed on the secretions. Chorioptic mites feed on skin cells and hair on the surface. They are most severe in fall and winter but are mild in the summer. Sarcoptic mites tunnel under the skin. Sarcoptic lesions form because of an allergic reaction to the mites.

**Monitoring:** Signs of mange mites include excessive scratching, rubbing, licking, hair loss, and rough, scabby skin. Other symptoms include nervousness, dehydration, weight loss, and reduced milk production. Psoroptic mange first appears on the withers, along the back, and at the base of the tail, then spreads over the entire body. Sarcoptic mange begins on areas where there is little hair, such as the scrotum, udder, inner thighs, and ears. Humans can contract sarcoptic mites and develop the condition known as scabies. Chorioptic mange is found on the scrotum, udder, thighs, under the flanks, and inside the hocks. Skin scrapings are necessary to positively identify the mites because they are not typically visible to the naked eye.

**Chemical Control:** See the *Chemical Arthropod Control* section for more information.

**Biological Control:** No commercially effective controls are available.

**Cultural/Mechanical Control:** Remove infested individuals from the flock. Keep new animals quarantined and under observation for several weeks.

### Ticks

Ticks are blood feeders that are more closely related to spiders and mites than to insects. There are two

types: soft (Argasidae) and hard (Ixodidae). Hard ticks are pests of livestock in Virginia. Ticks can serve as disease vectors in livestock and humans. Rarely, ticks can be lethal if they occur in high numbers. Ticks are most common in late spring and early summer. Females lay eggs on soil; after they hatch, nymphs climb blades of grass and attach themselves to hosts when they pass by. Ticks overwinter as adults and are found in wooded areas and neglected pastures.

**Monitoring:** Use a flannel drag to identify tick-infested areas. Signs of infestation in livestock include itching and swelling of the bite wounds, reduced weight gain and milk production, and anemia. Tick paralysis occurs in cattle only when tick populations are very high.

**Chemical Control:** See the *Chemical Arthropod Control* section for more information.

**Biological Control:** No commercially effective controls are available.

**Cultural/Mechanical Control:** To prevent ticks, cut or burn brush, keep grass short, cultivate tillable land, and isolate new animals. Use blunt forceps to remove ticks, and clean the bite area with antiseptic.

### **Chemical Arthropod Control**

*Control recommendations found below were modified from information in the 2005 Virginia Crop Pest Management Guide-Field Crops* <sup>21</sup>

### **General Precautions**

For *fly control in milk rooms*, use tight screens made of copper, aluminum, bronze, plastic, or other rust-resistant materials on windows and doors. Sticky flypaper, flypaper impregnated with sex pheromones, and sticky foil flypaper with flies printed on it are good for mechanically controlling fly populations. However, they should be changed frequently, or they become less effective. The presence of pesticide residue in milk is not tolerated. Use only pesticides specifically labeled for use in dairy operations. Use space sprays labeled for use in milk rooms only if sanitation procedures prove inadequate. Only synergized pyrethrins (read label carefully) and Vapona strips should be used in milk rooms. Rely on cultural control methods for milk rooms.

Implement general cultural and mechanical control methods together with baits, residual sprays, space sprays, larvicides, and biological control methods, if possible. Do **NOT** treat unless flies exceed acceptable thresholds. Apply insecticides with caution to sick cows or calves-use lighter applications of safer chemicals. Avoid direct treatment of bedding and manure because natural enemies will be killed; however, boluses and feed additives are fine. Flies have become highly resistant to pesticides such as permethrin, naled, and rabon because of frequent use. Use these chemicals sparingly as a last resort. To help reduce fly resistance, use organophosphates early in the fly season, apply ear tags later in the summer, and remove the ear tags in fall to reduce resistance. If ear tags and boluses are used too early, the pesticides will not be as effective later in the season when they are really necessary.

Do **NOT** use *pour-on* lice/grub control between November 1 and February 1 because of potentially harmful interactions. If grubs are killed while in the gullet or the spinal column, serious complications or death can result. Apply pour-on grub treatments between August 1 and November 1 or after February 1. **Timing of cattle grub treatment is very important.** If you are unsure about when to treat, consult an Extension agent or veterinarian. If the age of the grubs is unknown, feed cattle dry hay or low-energy feed a few days before and after treatment to minimize the risk of bloat.

Do **NOT** apply *dips* or *sprays* for cattle grubs to sick or young animals. Do **NOT** dip or spray within 10 days of shipping or weaning. Do **NOT** apply with oral drenches, internal medications like phenothiazine, natural/synthetic pyrethroids plus their synergists, or organophosphates. Do **NOT** apply in a confined, nonventilated area.

*Backrubbers* will suppress lice but do not usually control them completely. It is safer to treat lice after February 1. Otherwise, use products registered only for lice control during fall and winter to minimize cattle grub host-parasite interactions.

For *dust bag* control, use closed mesh bags to limit waste.

*Residual sprays* are applied to walls, ceilings, partitions, stanchions, posts, and other places flies rest or congregate. They are more effective in stanchions than in open barns. Smooth surfaces require less spray than rough surfaces. Use spray pressures of 80-100 psi.

*Bait treatments* should be applied after floor litter and manure have been removed. Use baits liberally for best results. More bait may be needed when fly breeding is heavy. Use baits with other control methods for best results. Do **NOT** use baits in areas where animals can slip on them and fall or where children could access them.

*Space treatments* use pesticides known for their rapid knockdown of adult flies. Air movement should be restricted as much as possible for this application method to be most effective.

For *larvicidal treatments* to work, all manure must be treated within a rather large area. Because they do not kill adult flies, use supplemental treatments.

The list below contains all of the products available to producers for arthropod pest control in beef cattle production along with the recommended application rates. REIs are not listed here because the Worker Protection Standard (WPS) only covers pesticides that are used in the production of agricultural *plants*, not animals.

**Abbreviations: PBO = Piperonyl Butoxide, IGR = Insect Growth Regulator.**

- **Amitraz** (*Taktic* 12.5EC) - Amidine

- For spray control of ticks and lice, mix 1 can (760 mL) of product in 100 gal. of water, applying no more than 2 gal. of spray per animal. For the control of mites, mix 1 can of product in 50 gal. of water, applying no more than 2 gal. per animal.
- **Calcium Polysulfide** (*Lime-Sulfur Solution 29SC*) - Inorganic
  - For the control of mites on cattle, use as directed.
- **Chlorpyrifos** (*Duratrol Darkling Beetle Spray 20M*) - Organophosphate
  - For control of ticks on agricultural premises, use as directed. **RESTRICTED USE PESTICIDE.**
- **Coumaphos** (*Co-Ral Emulsifiable Livestock Insecticide 11.6EC*) - Organophosphate
  - For *spray* control of horn flies, lice, and ticks on **non-lactating** dairy cattle, mix 2.5 to 5 oz. in 4 gal. water, and apply to the point of run-off. For *spray* control of lice on **lactating** dairy cattle, mix and apply no more than 1 ¼ oz. of product in 4 gal. water. For *backrubber* control of horn flies and face flies on lactating dairy cattle, mix 9 ¾ oz. in 1 gal. of diesel fuel and apply to rubber device.
- **Cyfluthrin** (*Cylence Pour-On Insecticide 1%*) - Pyrethroid
  - For *pour-on* control of horn flies, face flies, and ticks, use 4 oz. for animals up to 400 lbs., 8 oz. for animals between 400 and 800 lbs., and 12 oz. for animals over 800 lbs. For control of biting and sucking lice, use 8 oz. for animals up to 400 lbs., 16 oz. for animals between 400 and 800 lbs., and 24 oz. for animals over 800 lbs. This product does **NOT** control cattle grubs.
  - (*Cylence Ultra 8%*) - For *ear tag* control of face flies and horn flies, apply one tag per ear using the recommended applicator and follow label directions to avoid ear damage. Remove tags before slaughter.
  - (*Tempo 1D*) For the control of flies and ticks in cattle barns and corrals, remove animals and apply 0.5 to 1.0 lb. dust per 1000 sq. ft.
- **Cypermethrin (10%) + PBO (20%)** (*Python Magnum*) - Pyrethroid + Synergist
  - For *ear tag* control of face flies and horn flies, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.
- **Deltamethrin** (*Suspend 4.75SC*) - Pyrethroid
  - For the control of ticks and mosquitoes in cattle facilities, mix 0.75 to 1.5 oz. per gal. of water, and apply until surfaces are wet.
- **Diazinon** (*Optimizer 21.4%*) - Organophosphate
  - For *ear tag* control of face flies, horn flies, lice, and ticks on **non-lactating dairy cattle**, apply with recommended applicator and follow label directions to avoid ear damage. Remove tags before slaughter.
- **Dichlorvos** (*Gordon's Vapona Dairy Cattle Spray 1%*) - Organophosphate
  - For spray control of face flies, horn flies, house flies, stable flies, and mosquitoes on cattle and in barns, use as directed.
  - (*Spectracide Bug Stop Pest Strip 18.6%*) - For control of flies, gnats, and mosquitoes in livestock facilities with closed windows and doors. Replace the strips when they are no longer effective.
- **Diflubenzuron** (*Vigilante 9.7%*) - Benzoyl-Urea Compound
  - For *bolus* control of face flies, horn flies, house flies, and stable flies, administer half a

bolus to cattle between 300 and 550 lbs. or one bolus to cattle weighing over 550 lbs. Do NOT administer to cattle under 300 lbs. Do NOT administer more than one bolus to any animal.

- **Eprinomectin** (*Eprinex Pour-on for Beef and Dairy Cattle*) - Macrocyclic Lactone
  - For *pour-on* control of grubs, horn flies, lice, sarcoptic mange, and chorioptic mange on dairy cattle, use 1 mL of product for every 22 lbs. of body weight. Apply along the backline in a narrow strip from the withers to the tailhead. If used according to label directions, no pre-slaughter withdrawal period or milk discard time is necessary.
- **Ethion** (*Commando 36%*) - Organophosphate
  - For *ear tag* control of face flies and horn flies, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.
- **Fenvalerate** (*Ectrin*) - Pyrethroid
  - For *ear tag* control of face flies and horn flies, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.
- **Hydroprene** (*Prescription Treatment Brand ULD BP-100 + Hydroprene 0.706%*) - IGR
  - For control of lice, flies, and ticks on cattle, use as directed.
- **Ivermectin** (*IVOMEC 1%*) - Macrocyclic Lactone
  - For *injectable* control of sucking lice and grubs on **cattle not of breeding age**, inject 10 mL of ivermectin/110 lbs. body weight using a 16-gauge, ½ - ¾ inch needle into the loose skin around the shoulders. Divide doses larger than 10 mL between two injection sites to minimize discomfort. For maximum effectiveness, treat cattle grubs immediately after the end of the heel fly season. A second treatment can follow later in the winter to treat internal parasites, mange mites, or lice without danger of grub-related complications. Do **NOT** treat cattle within 35 days of slaughter. Do **NOT** use in dairy cattle of breeding age because a withdrawal time in milk has not been established. Do **NOT** administer intravenously or intramuscularly. Make sure animals are properly restrained to ensure treatment is given properly. Use sterile equipment, including clean needles, and sanitize the injection site. If the treatment site seems infected, consult a veterinarian and treat with antibiotics. Keep the product away from light. Do **NOT** smoke or eat while handling the product. Wash hands after use.
- **Lambda-Cyhalothrin (6.8%) + Pirimiphos-Methyl (14%)** (*Double Barrel VP*) - Organophosphate
  - For *ear tag* control of face flies and horn flies on dairy cattle, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.
- **Methomyl (1%) + (Z)-9-Tricosene (0.04%)** (*Deosect II*) - Carbamate
  - For bait control of flies in and around livestock facilities, apply 0.25 lb. per 500 sq. ft.
- **Methoprene** (*Altosid Cattle Custom Blending Premix 10.5G*) - IGR
  - For feeding additive control of horn fly maggots, use as directed.
- **Permethrin** (*Permethrin Dairy Cattle and Swine Dust 0.25D*) - Pyrethroid
  - For *hand dust* control of horn flies, face flies, and lice on cattle, apply 2 oz. (6 tbsp) of the product per animal using a shaker can. Repeat, if necessary. Do **NOT** contaminate water, food, or feed. Keep container sealed when not in use.
  - (*Atroban 11EC*) - For *backrubber* control of face flies, horn flies, and stable flies on

cattle, use 1 pt. of product per 10 gal. of #2 diesel oil or other approved backrubber base oils. Do **NOT** use motor oil or waste oil on backrubbers. Keep rubbing device charged. Results are improved with daily forced use.

For *wetting spray* control of face flies, horn flies, horse flies, house flies, stable flies, lice, mites, and ticks on cattle, mix 1 pt. of product in 25 gal. of water. Apply 1-2 qts. of coarse spray over the entire body surface of the animal. Do **NOT** use until after milking is completed. Do **NOT** contaminate feed or water.

- (*Permanone 10EC*) - For *spray* control of face flies, horn flies, deer flies, horse flies, stable flies, lice, and ticks, mix 1.3 oz. of product in 1 gal. of water, and apply 1 qt., wetting animal thoroughly. Do **NOT** contaminate feed or water.
- (*Hard Hitter 5.7EC*) - For *backrubber* control of face flies, horn flies, and stable flies on cattle, mix 1 qt. of product in 10 gal. of #2 diesel oil. For *wetting spray* control of face flies, horn flies, stable flies, and ticks on cattle, mix 1 qt. of product in 25 gal. of water. Apply 1-2 qts. of spray over the entire body surface. Do **NOT** contaminate feed or water. For *wetting spray* control of lice on cattle, mix 1 qt. of product in 100 gal. of water. Make a second application 2-3 weeks later.
- (*Brute 10%*) - For *pour-on* control of horn flies and lice on cattle, use 1/8 oz. /250 lbs. of body weight applied from the poll down the neck to the shoulders and along the midline of the back. Does **NOT** control cattle grubs. Repeat as necessary, but not more than once every 2 weeks.
- (*Gard Star Plus 10%*) - For *ear tag* control of face flies and horn flies, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.
- (*Boss Pour-on 5%*) - For *pour-on* control of face flies, horn flies, and lice on cattle, apply 0.10 oz./100 lbs. body weight, up to 1 oz./animal. Repeat application as necessary, but **NOT** more than once every two weeks. Does **NOT** control cattle grubs.
- **Permethrin + PBO** (*Livestock and Barn Fogging Spray 7.4%*) - Pyrethroid + Synergist
  - For *backrubber* control of face flies, horn flies, and lice on cattle, mix 2.1 oz. of product/1 gal. of mineral oil. Results improve with daily forced use. For *wetting spray* control of face flies, horn flies, and lice on cattle, follow label directions. Can be applied directly to lactating livestock and their premises.
  - (*Atroban Extra*) - For *ear tag* control of face flies and horn flies, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.
  - (*Atroban Delice Pour-On 1%*) - For *pour-on* control of face flies, horn flies, and lice on cattle, apply 0.5 oz./100 lbs. body weight, up to 5 oz./animal. Repeat if necessary, but **NOT** more than once every two weeks.
- **Phosmet** (*Lintox-HD 11.6EC*) - Organophosphate
  - For *backrubber* or *facerubber* control of face flies, horn flies, and lice on **non-lactating** dairy cattle, follow label directions. Use only #2 diesel oil or other approved backrubber oil. Do **NOT** use motor oil or waste oil on backrubbers.
- **Pirimiphos-Methyl** (*Dominator 20%*) - Organophosphate
  - For *ear tag* control of face flies and horn flies on **non-lactating** dairy cattle, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags

before slaughter.

- **Pyrethrins + Synergists** (*Purina Fly-A-Rest Insecticide Mist*) - Botanical
  - For *mist spray* control of horn flies and stable flies on cattle, apply 1-2 oz. of product directly to the animal once a day, preferably in the morning.
  - (*Multi-Purpose Pyrenone 0.1%*) - For *short-term residual spray* control of stable flies, house flies, and horn flies in barns, milk rooms, and dairies, follow label directions.
  - (*PY-80 0.5%*) - For *short-term residual spray* control of flies, mosquitoes, fleas, and wasps in livestock facilities, close windows and doors and apply at a rate of 2-3 seconds/1,000 cubic feet of area. Do **NOT** remain in treated area. Vent area after 15 minutes.
  - (*Purina Insecticide Mist 0.1%*) - For *space treatment* of flies, close doors and windows and apply as a fog or fine mist, directing spray to ceiling and upper corners of the room until the area is filled with mist. Wear a mask or respirator to avoid breathing fumes. Use about 0.5 oz. of solution per 1,000 cubic feet. Allow the mist to settle on the animals. Leave the room closed for 5 minutes after treatment, but ventilate area before re-entering. Repeat if necessary. Wash teats of dairy animals before milking. Does not affect natural enemies of flies.
- **Spinosad** (*Elector 2.46F*) - Spinosyn
  - For *wetting spray* control of horn flies and lice on cattle, follow label directions. Do **NOT** treat more than 5 times consecutively. Do **NOT** apply more than once every 7 days. Do **NOT** apply within 2 days of slaughter.
  - For *pour-on* control of horn flies and lice on cattle, apply on face and back. See label for directions. Repeat as necessary, but **NOT** more than once in a 2-week period. Do **NOT** treat more than 5 times consecutively. Do **NOT** apply within 2 days of slaughter.
  - For *space treatment* of stable and house flies on livestock premises, mix 20 oz. of product per 5 gal. of water, and apply at a rate of 1 gal. of solution per 500-1,000 sq. ft. Do **NOT** apply in milking parlor or milk room. Do **NOT** use in overhead sprinkler system. Safe for use with beneficial insects.
- **Tetrachlorvinphos** (*Rabon 3D*) - Organophosphate
  - For *dust bag* control of lice, horn flies, and face flies, install burlap bags so that they hang in doorways of milking and loafing barns. Keep the bags in place in winter to help control lice infestations. Do **NOT** contaminate feed or water with the dust.
  - For *hand dust* control of horn flies, face flies, and lice on cattle, wear rubber gloves and apply approximately 2 oz. of the product to the upper parts of the back, neck, poll, and face. Rub in the dust to distribute it beneath the hair. Do **NOT** contaminate feed or water.
  - (*Rabon 50WP*) - For *long-term residual spray* control of flies in animal buildings, follow label directions. Remove calves and lactating animals before spraying. Do **NOT** contaminate feed and drinking water.

For *larvicidal treatment* of fly maggots in manure in livestock facilities, apply 1 gal. of 1% solution per 100 sq. ft. of manure piles. Repeat every 7-10 days until control is achieved. Do **NOT** spray animals directly. Toxic to bees and fish. Do **NOT** mix with iodine or alkaline compounds.
  - (*Crystalyx Rolyx Max 0.68P*) - For *feeding additive* control of face flies, horn flies, house

flies, and stable flies, place one container per 20-30 head of cattle near loafing or watering areas, with at least two containers placed per facility. Begin treating animals in early spring before flies first appear and continue throughout the summer and fall until cold weather restricts fly activity.

- **Tetrachlorvinphos (23%) + Dichlorvos (5.3%) (Ravap)** - Organophosphates
  - For *backrubber* control of face flies, horn flies, and stable flies on cattle, dilute 5 oz. of product with 1 gal. of #2 diesel oil.
  - For *long-term residual spray* control of flies in animal buildings, mix 1 gal. of product in 25 gal. of water (or 1 gal. of product in 12.5 gal. of water for heavy infestations). Apply at a rate of 1 gal. of spray per 500-1,000 sq. ft. of walls, ceilings, or other areas flies congregate. Remove animals before spraying. Do **NOT** contaminate feed or drinking water. Can be used in dairy barns, poultry houses, swine buildings, livestock sheds, and other animal buildings.
  - For *larvicidal treatment* of fly maggots in manure in livestock facilities, apply mix described above at a rate of 1 gal. of spray per 100 sq. ft. of manure. Repeat at 7- to 10-day intervals until droppings cone up. Thereafter, treat only hot spots with many maggots. Do **NOT** spray animals directly.
- **Zeta-Cypermethrin + PBO (Python Dust 0.075D)** - Pyrethroid + Synergist
  - For *hand dust* control of horn flies and lice, check label directions.
  - (*Python 10%*) - For *ear tag* control of face flies, horn flies, lice, and ticks, apply with recommended applicator, and follow label directions to avoid ear damage. Remove tags before slaughter.

## Diseases

### BACTERIAL DISEASES

#### Anthrax, *Bacillus anthracis*<sup>22</sup>

Anthrax is a bacterial disease that occurs in livestock, but rarely in the United States. Anthrax was once a problem in the United States but is no longer widespread, due to better quarantine and hygiene efforts, antibiotics, and vaccinations. Anthrax was formerly known as "wool sorters' disease" because workers in woolen mills were frequently infected. Anthrax spores form after an animal dies and can persist in the environment for up to 37 years. These spores can be spread via flooding. The most common way livestock become infected is by eating contaminated feed. The other modes of infection are by inhalation or cuts in the skin. Once infected, animals can die within hours of developing symptoms.

**Monitoring:** If any animals die **SUDDENLY** (within hours of acting healthy), contact a veterinarian. Other symptoms include high fever and bloody discharge from body openings.

**Chemical Control:** No chemical control methods are available.

**Biological Control:** No biological control methods are available.

**Cultural Control:** Keep predators away from infected carcasses to limit the spread of spores in the environment.

### **Anaplasmosis, *Anaplasma marginale* 23, 24, 25**

Anaplasmosis is an infectious bacterium that destroys red blood cells. It is transmitted via biting insects (e.g., horse flies, stable flies, and mosquitoes), ticks, or dirty needles/surgical instruments. There are four stages of the disease: incubation stage (three to eight weeks), developmental stage (four to nine days), convalescent stage (two to three months), and carrier stage (until death). Animals either die or begin to recover one to four days after symptoms first appear.

**Monitoring:** Symptoms in the developmental stage include clinical anemia, fever, a rapid decrease in milk production, lethargy, refusal to eat or drink, pale or yellow skin, and weight loss. A blood test is necessary to identify the disease.

**Chemical Control:** Spray or dip animals periodically to control insects and ticks. Tetracycline antibiotics can be given to manage the infection. Vaccines are also available.

**Biological Control:** No biological control methods are available.

**Cultural Control:** Graze animals where fly populations are lower and cull carrier animals. Sterilize instruments before using them on other animals, and use clean needles to administer medications. Buy only bulls that test negative for the disease to avoid infecting other cattle.

### **Johne's Disease, *Mycobacterium paratuberculosis* 26, 27**

Johne's disease is a contagious, chronic, usually fatal bacterial infection of the small intestine in ruminants. Animals are most vulnerable in their first year of life. Livestock become infected by ingesting contaminated manure.

**Monitoring:** Symptoms include diarrhea, emaciation, bottlejaw (swelling), and a normal appetite.

**Chemical Control:** No chemical control methods are available.

**Biological Control:** No biological control methods are available.

**Cultural Control:** Keep infected animals out of the herd, ask for certification of negative status before

buying new animals, provide a clean birthing environment, and avoid manure contamination of equipment, feed bunks, and waterers. Use colostrum from healthy females, do not pool colostrums, and use artificial milk or pasteurized milk for newborns. Clean the udder and teats before allowing young to feed. It is very important to sign up with a veterinarian to become a certified negative herd producer.

### **Leptospirosis, *Leptospira* spp. <sup>28</sup>**

Leptospirosis is a bacterial infection vectored by rodents that causes abortions in cattle, bloody urine in calves, and mastitis in cows. A vaccine can prevent this disease. Leptospirosis can be spread to humans via urine-contaminated water. There is a new strain known as *Lepto hardjo-ovis* that causes infected animals to become lifetime carriers.

**Monitoring:** Have a veterinarian take blood and urine samples from at least 15 mature cattle.

**Chemical Control:** Administer the Spirovac vaccine and treat carrier animals with antibiotics (tetracycline and ceftiofur).

**Biological Control:** There are no biological control agents available.

**Cultural Control:** Prevent contamination of water with urine. Control rodent populations in livestock facilities.

### **Salmonella, *Salmonella* spp. <sup>29</sup>**

Salmonella is a bacterial infection that can cause disease and death in cattle and is an important food-borne illness of humans. It is common in the cattle digestive system and is more prevalent in summer months but occurs in spring as well.

**Monitoring:** Symptoms include diarrhea and scours in calves.

**Chemical Control:** There is no chemical control for salmonella.

**Biological Control:** There are no biological control agents available.

**Cultural Control:** Limit exposure to salmonella by keeping feed and water free of contamination. Watch new animals for illness before introducing them to the herd and isolate diseased cattle. Make sure cattle have clean feed and water sources. Keep cattle healthy with proper nutrition, good care at stressful times, and give newborns plenty of colostrum. Prevent and control other diseases that make cattle more susceptible to infection.

### **Foot Rot <sup>30, 31</sup>**

*Bacteroides melaninogenicus*  
*Fusobacterium necrophorum*

Two bacteria work together to produce foot rot, which is characterized by lameness, fever, reddening between the toes, swelling, spreading of the toes, and a foul odor. It spreads via walking on the ground, in manure, and on bedding. It only enters the herd by the introduction of new, infected cattle. Consult a veterinarian. Foot rot is present year-round, but it is more common in warm, wet weather.

**Monitoring:** Prevention is the best option. Watch cattle for signs of infection. Trim and treat the feet of new cattle and re-examine them during the 15- to 30-day isolation period.

**Chemical Control:** Clean and disinfect the hoof. Administer antibiotics (penicillin, oxytetracycline, and sulfonamides). If animals do not respond to treatment within three days, foot rot may not be the correct diagnosis.

**Biological Control:** There are no biological control agents available.

**Cultural Control:** Trim the feet once or twice a year (disinfect tools between animals), and do **NOT** buy lame animals from infected herds. A dietary zinc supplement may help prevent infection. Treat cows with zinc sulfate or copper sulfate footbaths. Improve drainage on the property to reduce softening of hooves. Reduce hoof damage and bruising by smoothing rough ground. Provide soil mounds to give the cows a dry place to rest, and provide good nutrition. Keep cattle on a smooth, dry surface while they are convalescing.

**Pinkeye, *Moraxella bovis* <sup>32</sup>**

Pinkeye is a contagious disease of the eye caused in part by a bacterium that is vectored by face flies. Other eye irritants include bright sunlight and weeds. Pinkeye is painful and can lead to blindness if left untreated. Pinkeye is more common in the summer but can occur at any time. It is more prevalent in young animals because they lack resistance. Infectious bovine rhinotracheitis, or IBR, has similar symptoms except for ulcerations (usually). Fevers, nasal discharge, and coughing are present instead. Cattle with dark pigmentation around the eyes are less likely to contract the infection.

**Monitoring:** Symptoms include watery, cloudy eyes, squinting, and ulcerations on the cornea.

**Chemical Control:** Injectable or topical antibiotics, such as oxytetracycline (LA200), are helpful. Insecticides can be used to control the flies that vector the infection, and vaccines are used to prevent pinkeye. Early treatment nearly guarantees success.

**Biological Control:** There are no biological control agents available.

**Cultural Control:** Use eye patches or shade as treatment options. Clip weeds to reduce eye irritation,

and provide good nutrition to boost the immune system. Use gloves when examining infected livestock, disinfect equipment, and isolate infected cattle to avoid contaminating other animals.

## VIRAL DISEASES

### Bluetongue Virus <sup>33, 34</sup>

Bluetongue virus is spread by biting midges between late summer and early fall. Sheep are more commonly affected, although cattle can contract the virus. Less than 5% of cattle usually become symptomatic. Bluetongue virus may cause infertility, abortions, stillbirths, or congenital defects in calves.

**Monitoring:** Inspect flocks for suspicious symptoms including panting; high fever; hemorrhaging or open sores on the tongue, mouth, or nostrils; redness of the skin, face, neck, or body; a swollen, reddish blue tongue; lameness with a swollen, reddish blue area at the base of the horns and coronary bands of the feet; foot lesions; weakness; and hair loss.

**Chemical Control:** No chemical controls are available for cattle. Vaccines are available for sheep.

**Biological Control:** No biological controls are available.

**Cultural Control:** To prevent bluetongue virus, keep animals in during the night and at dawn, keep cattle away from sites with biting insects, take the herd to higher altitudes, and eliminate biting gnat breeding areas.

## Nematodes and Sporozoans

### NEMATODES

#### Brown Stomach Worm, *Ostertagia ostertagi* <sup>35, 36</sup>

The brown stomach worm is the most important internal parasite of cattle in Virginia. Cattle are most vulnerable to infection when they are less than two years old. Older cows are resistant to infection and do not benefit from deworming treatment; however, younger cattle will be less likely to become infected if older cows are treated.

**Monitoring:** Symptoms include diarrhea and weight loss. Consult a veterinarian if these symptoms appear.

**Chemical Control:** Avermectin and Benzimidazole are effective dewormers for dairy cattle. Consult a veterinarian for deworming strategies.

**Biological Control:** No biological controls are available.

**Cultural Control:** Deworm calves and put them on safe pastures that have not been grazed for at least 12 months or were used to grow small grains from a prepared seedbed. Put only well-fed, healthy, mature cattle on a pasture that might be contaminated. Do NOT overgraze pastures. This forces cattle to eat closer to the ground, thus picking up more worms.

## SPOROZOANS

### Coccidiosis, *Coccidia* <sup>37</sup>

Coccidiosis is more frequent in young calves, but older cattle can be affected. Calves become infected on pastures or in feedlots contaminated by infected cattle. Coccidiosis can result in death, either directly or through secondary infections like pneumonia.

**Monitoring:** Signs include diarrhea, loss of appetite, weight loss, rough coat, and emaciation. Lethargy causes animals to defecate without getting up, which soils their hindquarters. Fecal material may contain blood, mucous, and tissue (epithelial lining).

**Chemical Control:** Separate parasitized animals and treat them with a coccidiostat.

**Biological Control:** There are no biological controls available.

**Cultural Control:** Reduce moisture in the pasture by making sure it is well drained. Raise waterers off the ground, and minimize grazing near water sources. Well-fed cattle are less susceptible to infection.

## Weeds <sup>38, 39, 40, 41</sup>

Virginia has 1.5 million acres of steep pastures that must be properly managed to ensure their continued use as forage sites for livestock. Weeds are not as palatable as other forage, they make pastures less attractive and nutritious, and they reduce yield. Undesirable plants can have three kinds of effects on livestock: 1) they can be toxic or cause photosensitization, 2) they can lead to reduced foraging and production, or 3) they can cause meat and dairy products to be off-flavored. Toxic and/or photosensitizing plants include black locust (*Robinia pseudoacacia*), buckeye (*Aesculus* spp.), cherry (*Prunus* spp.), sorghum or Johnson grass (*Sorghum* spp.), fescue (*Festuca* spp.), yew (*Taxus* spp.), Jimson weed (*Datura* spp.), nightshade (*Solanum* spp.), oak (*Quercus* spp.), perilla or purple mint

(*Perilla frutescens*), poison hemlock (*Conium maculatum*), rhododendron (*Rhododendron* or *Kalmia* spp.), water hemlock (*Cicuta* spp.), white snakeroot (*Eupatorium* spp.), milkweeds (*Asclepias* spp.), bracken fern (*Pteridium aquilinum*), and some clover (*Trifolium* spp.), among others. Plants that interfere with foraging behavior and production efficiency typically have spines or are difficult to digest, such as spiny pigweed (*Amaranthus* spp.), thistles (*Cirsium* spp.), and dandelions (*Taraxacum* spp.). Plants that give meat and dairy products a bad flavor include wild garlic (*Allium vineale*), yarrow (*Achillea millefolium*), and wormwood (*Artemisia* spp.).

**Monitoring:** Observe cattle for abnormal symptoms including diarrhea, vomiting, tremors, convulsions, staggering, anemia, excess salivation or "foam" around the mouth, paralysis, thirst, loss of appetite, weakness, bloat, difficulty breathing, rapid breathing, or photosensitivity. An oily coat, heavy breathing, and "rosy" mucous membranes are symptoms of prussic acid poisoning, caused by eating sorghum that contains high levels of cyanide. Wild cherry also contains cyanide, and the mucous membranes will turn bright red. If an animal dies suddenly, have its stomach contents checked. If a poisonous plant is identified, remove other livestock until all plants are destroyed.

**Chemical Control:** Consult an Extension agent, identify the weed, and treat it with an appropriate herbicide.

**Biological Control:** Biological control agents are available to control some troublesome pasture weeds. Consult an Extension agent for more information.

**Cultural/Mechanical Control:** Well-managed pastures are not as hospitable to the growth of weeds. Keep weeds mowed down or pull them from the ground. Keep supplemental feed on hand so that animals do not grow hungry enough to eat poisonous plants. Control weeds by fertilizing and managing desired plants into a thick, healthy stand. Do **NOT** overgraze nutritious plants; this gives weeds an opportunity to flourish. Use many types of livestock that will consume all types of plants, either together or in succession. Clip annuals at the early bloom stage before seed production. If clipping or grazing cannot control weeds, only then use herbicides.

## Vertebrates 13

### Rodents

Norway Rat, *Rattus norvegicus*

House Mouse, *Mus musculus*

Rodents are a year-round problem in livestock facilities. They cause sanitation problems and food contamination or loss. Rats eat 1-2 oz. of food per day while mice consume only a tenth of that. In large numbers, rodents can cost farmers a lot of money. Rats and mice also cause structural damage to buildings by chewing on wood and cinderblock, removing insulation from the walls for their nests, and

stripping wiring, which can lead to fires. Rodents are also vectors of diseases (e.g., leptospirosis), and their bites can lead to injury or infections. Their reproductive potential is very high; rodents produce four to eight generations per year. Rats and mice need three things to survive: food, water, and a nesting site. Rats need a water source more than mice, which can extract enough moisture from their food. Rats typically live in underground burrows near foundations, feed bins, or secluded areas near livestock facilities. Mice can live nearly anywhere.

**Monitoring:** Look for signs of infestation, including droppings, structural damage, burrows, tracks, or rodents themselves. Treat if pests are present.

**Chemical Control:** Anticoagulants are used most commonly in livestock facilities. Different formulations such as tracking powders, bait pellets, chunks, and concentrates are available. Follow label directions explicitly; otherwise, rodenticides are ineffective and dangerous. Rats do not take baits as readily as mice, unless the baits are left in their path and better food is unavailable. Place baits in locations where rodents travel or congregate such as along walls, in corners, or in concealed places.

**Biological Control:** Cats and predatory birds can help control small rodent populations. Poisoned rodents should be removed quickly to prevent secondary poisoning.

**Cultural/Mechanical Control:** Keep facilities clean and free of debris, remove spilled grain, mow around buildings and waste lagoons, install gravel barriers around buildings, and use rodent-proof food storage bins. Snap traps, glue boards, and live traps are only useful in areas where rodent infestations are low.

## Birds

Birds that nest in, or near, dairy facilities may cause damage or carry various pests and diseases. Dairy cattle that are exposed to avian tuberculosis may test positive for bovine tuberculosis and be slaughtered unnecessarily. Bird droppings corrode farm equipment, and nests plug drains/gutters. Birds will also destroy insulation. Avian pests include pigeons, European starlings, house finches, and house sparrows.

**Chemical Control:** Avitrol is a RESTRICTED USE pesticide that may be used to control birds.

**Biological Control:** Natural enemies of pest birds include predatory birds and cats.

**Cultural/Mechanical Control:** Clean up spilled grain, store grain in pest-proof containers, use covered feeding troughs that exclude birds, and keep water at a level deep enough that birds cannot stand in it, but shallow enough that they cannot drink it by perching on the lip. To keep birds out of buildings, hang plastic strips in doorways, use wire and mesh to seal openings, and cover rafters with netting. To keep birds from nesting or roosting, change the roosting ledge angle to at least 45°, install porcupine wires, use electronic bird-control devices, install catwalks, or use chemical perch repellents. Other methods to control birds include destroying nests, puncturing eggs, and trapping.

## Chemical Vertebrate Pest Control

The list below contains all of the products available to producers for vertebrate pest control in cattle production along with the recommended application rates. REIs are not listed here because the Worker Protection Standard (WPS) only covers pesticides that are used in the production of agricultural *plants*, not animals.

- **Aluminum Phosphide** (*Weevil-Cide Pellets*) - Inorganic
  - For control of rodents on agricultural premises, follow label directions. **RESTRICTED USE PESTICIDE.**
- **Avitrol** (*Avitrol Corn Chops Bird Repellant*) - Organic
  - For control of birds on agricultural premises, follow label directions. **RESTRICTED USE PESTICIDE.**
- **Brodifacoum** (*D-Con Bait Pellets II*) - Anticoagulant Rodenticide
  - For *bait control* of rats on agricultural premises, place 4-16 baits per placement at 15-30 ft. intervals. For control of mice, place 1-2 baits per placement at 8-12 ft. intervals. Maintain bait supply for 10-15 days, or until rodent activity ceases.
  - **Bromadiolone** (*ROC-622 Rat & Mouse Bait Packs*) - Anticoagulant Rodenticide
  - For *bait control* of rats on agricultural premises, place 3-10 packs per placement. For control of mice, place one pack per placement. Maintain bait supply for 10-15 days, or until rodent activity ceases.
- **Bromethalin** (*Clout All Weather Bait*) - Benzenamine
  - For *bait control* of rats on agricultural premises, place 2-12 baits at 20-30 ft. intervals. For control of mice, place 1-2 baits at 8-12 ft. intervals. Maintain bait supply for at least one week, or until rodent activity ceases.
- **Difethialone** (*D-Con Rat & Mouse Bait Blocks*) - Benzothiopyranone
  - For *bait control* of rats on agricultural premises, place 6 to 23 blocks per placement, spaced at 15 to 30 ft. intervals. For control of mice, apply one or two blocks per placement, spaced at 8 to 12 ft. intervals. Provide an uninterrupted supply of bait for 10 to 15 days, or until rodent activity ceases.
- **Diphacin** (*Ramik Green Mini Bait Packs*) - Anticoagulant Rodenticide
  - For *bait control* of rats on agricultural premises, place 3-10 packs per placement. For control of mice, place 1-2 packs per placement, spaced at 8-12 ft. intervals. Maintain bait supply for 10-15 days, or until rodent activity ceases.
- **Warfarin** (*Ra-Mo-Cide WF*) - Anticoagulant Rodenticide
  - For *bait control* of rats, place 2-5 packs per placement, providing a supply of bait for at least 10 days. For mice control, open the pack and apply 0.25-0.5 oz. of bait at 8-12 ft. intervals.
- **Zinc Phosphide** (*Eraze Rodent Pellets*) - Inorganic
  - For *bait control* of rodents on agricultural premises, follow label directions.

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## **On-Line Resources**

- "Insects and Related Pests of Man and Animals"  
<http://ipm.ncsu.edu/AG369/index.html>
- Virginia Agricultural Statistics Service  
<http://www.nass.usda.gov/va>
- Virginia Tech Pesticide Programs  
<http://www.vtpp.ext.vt.edu>
- Virginia 2005 Pest Management Guides  
<http://www.ext.vt.edu/pubs/pmg/>

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42. Image Credit: Multimedia and Photography Unit of the Department of Communication Services, North Carolina State University, Raleigh, NC.