The University of Georgia College of Agricultural & Environmental Sciences
Cooperative Extension Service

Health Program for Horses

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Contents

Smart horse owners will protect their horse's health by following good feeding and manage-ment practices and by taking every precaution to prevent disease and injury.

Drain stable lots, paddocks and pastures because boggy, stagnant water pools can be sources of insects and diseases. Horses can easily be injured if there are loose boards, wire, trash or parked machinery in their paddocks or pastures. Keep fences in good repair. Do not store pesticides, disinfectants and paints in the barn area.

Health Checks

Check your horse daily. An observant owner or groom will note when a horse is off feed or when it appears sluggish and abnormal. The healthy horse will be alert and active and defecate and urinate normally. Normal respiration can be noted by observing the rhythmic in and out movement of the flank. The average respiration rate for a horse at rest is eight to 16 breaths per minute. Fast, short and jerky movements may suggest difficulty. View runny eyes and thick mucous discharge from the nostrils with suspicion.

If illness is suspected, insert an animal thermometer into the rectum, and wait several minutes before reading. The normal body temperature of a mature horse at rest is 100^{o} to 101^{o} F. Heart and pulse rates vary with the age of the horse. Normal mature horses have a pulse of 28 to 40 beats per minute. Newborn foals have a pulse of 80 to 120; weanlings 60 to 80; yearlings 40 to 60. The horse should be calm, rested and relaxed to obtain an accurate heart rate. To determine the pulse rate, press your fingers against an artery. There are several locations on a horse where an artery can be felt, such as: (1) the back edge of the lower jaw; (2) the inner surface of the groove under the jaw; (3) inside the elbow, up and forward against the chest wall; (4) under the tail, close to the body; or (5) the inside or outside pastern. Practice is usually necessary to locate and feel the pulse easily.

Skin pliability is a test for dehydration. If you pick up a fold of skin on the neck and release it, it should quickly return to its original position. If the horse is dehydrated, the skin returns slowly and tends to stay in a fold.

The color of the mucous membranes and the rate of capillary refill (the rate blood returns to an area) indicate the quantity and condition of the circulating blood. Capillary refill may suggest anemia, colic, congestion and shock. The gums, the inside lips of a mare's vulva, and the nostrils should be pink. A fire engine red color usually

denotes illness. Anemia causes a pale color and lack of circulation causes a bluish-purple color. You can determine capillary refill time by pressing your thumb on the horse's gum and releasing it. It should take about two seconds for the blood and normal color to return to the area. Longer capillary refill times indicate dehydration or a circulatory problem.

Cost of Health Care

The maintenance cost of a horse obviously will vary with the emergency care needed. In surveys conducted across the United States, average veterinary costs for a horse range from $150.00 to $350.00 per year. These costs reflect only the costs of preventive health care such as vaccinations, deworming and a yearly Equine Infectious Anemia (E.I.A.) Coggins test. The dollar value represents about 19 percent of the cost of keeping a horse for a year. If your horse contracts any disease or illness and requires medication and/or surgery, the costs could be in excess of 300 percent of the annual cost of keeping a horse. Therefore, it is important to practice preventive medicine.

Common Diseases and Control

A planned vaccination program can prevent certain diseases or limit their severity. If your horses are not on a routine vaccination program, contact your veterinarian. The veterinarian will recommend a program for your farm and immediate area. Consider the following diseases when planning a vaccination program:

- Botulism (Forage Poisoning or Shaker Foal Syndrome)
- Equine Encephalomyelitis (Sleeping Sick-ness, Blind Staggers, Brain Fever)
- Equine Infectious Anemia (EIA, Swamp Fever, Malarial Fever, Slow Fever, Mountain Fever)
- Equine Viral Arteritis (EVA)
- Equine Viral Rhinopneumonitis (Contagious or Viral Abortion, Snots)
- Influenza (Flu, Two-Year-Old Cough)
- Potomac Horse Fever (PHF, Equine Mono-cytic Ehrlichiosis, Acute Equine Diarrheal Syndrome, Equine Ehrlichial Colitis)
- Rabies (Lyssa, Hydrophobia)
- Strangles (Distemper, Shipping Fever, Barn Fever)
- Tetanus (Lockjaw)

Botulism (Forage Poisoning or Shaker Foal Syndrome) is a disease caused by the toxin of the bacteria, *Clostridium botulinum*. There are three types of toxins (A, B and C) depending upon geographical location. The bacteria live without oxygen, and the spores are readily found in the soil. The horse becomes infected through ingestion, wounds or contaminated feedstuffs. Once inside, the toxin is transported by the circulatory system to the nervous system and produces paralysis. Shaker Foal Syndrome occurs in newborns from two weeks to eight months of age. It occurs sporadically among farms.

Symptoms are a stiff, stilted walk, frequent lying down, dribbling milk from the mouth or muscle weakness. The majority of infected foals die within three days.

Forage Poisoning among adults can occur at any age. The toxin infects the nervous system. Symptoms include loss of tongue and tail muscle tone, spilling of drinking water, food in the nostrils, abnormal chewing, muscle weakness and, finally, total paralysis. In foals and adults, respiratory muscles eventually become paralyzed and death results. There is a rapid onset of clinical signs in most cases. A vaccine is available and should be given to pregnant mares in each of the last three months of pregnancy. Adult horses and foals should also receive the initial two-dose series, followed by an annual booster. The disease can also be prevented by avoiding con-taminated feedstuffs and crowded pastures.

Equine Encephalomyelitis

(Sleeping Sickness, Blind Staggers, Brain Fever) is a viral disease that results in inflammation of the brain's vascular system. This seasonal disease is transmitted by mosquitoes and has an acute onset that is fatal. If affects all ages and types of horses. The horse is a deadend host and cannot pass this virus to another horse. Birds and rodents serve as reservoirs for the virus. The three common viruses are named by their geographical area - Eastern (EEE), Western (WEE) and Venezuelan (VEE). Within one to three weeks, symptoms begin with a mild fever that progresses to loss of appetite, depression, drowsiness, facial paralysis, incoordination and death in two to four days. In the cases of recov-ery, survivors have residual central nervous system signs and are called "dummies" or "sleepers" because of their unsatisfactory response to outside stimuli. The vaccination schedule starts with injections for foals at three months of age and again at four months. A booster is given every year, but horses in south Georgia should have boosters every six months. Control of the mosquito population reduces the transmission of the virus.

Equine Infectious Anemia
(EIA, Swamp Fever, Malarial Fever, Slow Fever, Mountain Fever) is a viral disease that affects mules, horses, ponies and donkeys worldwide. There is a higher incidence where high temperature and humidity occur; conditions that favor its transmission. The virus can be found in the blood, body tissues and secretions such as saliva, feces and semen. Carriers can remain chronic for years. The most effective vector is the horse fly, which acts as a mechanical vector from horse to horse, with the horse fly preferring adult horses to foals.

Symptoms begin after one to three weeks of incubation. Acute infection causes a high fever, depression, rapid weight loss, anemia, and a leg weakness that causes the horse to stand with its hind legs under its body. A pregnant mare can be infected and pass the virus through the placenta to the foal, causing an abortion. Death can occur within three to four days.

Chronic or long-standing carriers have intermittent cycles of infectious signs. They may show no clinical signs of infection or become chronic "poor-doers." Progressive weight loss, pitting edema and periodic anemia lower the horse's resistance, making it susceptible to other diseases. Recovery from the acute or chronic form of EIA results in an asymptomatic carrier that will always test positive. There is no specific treatment nor is there a vaccine. Horse owners are required to have a negative blood test (Coggins) under state regulations. A negative Coggins is required each year for horses that are imported, sold or transferred or in any gathering (show, boarding or trail ride). If the horse tests positive, the animal is per-manently identified, quarantined, euthanized or sold for slaughter.

Equine Viral Arteritis
(EVA) is a contagious disease, especially among certain breeds of horses. The virus is transmitted by aerosol inhalation from respiratory secretions and semen of EVA-shedding stallions. After one to six days, symptoms begin as a serous nasal discharge that can become purulent, and swollen lymph nodes. A cough, fever and depression occur with a notable, severe edema of the abdomen, legs, face and mammary or prepuce/ scrotum area. Abortions develop during or shortly after the febrile period, 60 to 330 days into gestation.

A vaccine is available for horses that may be exposed during breeding seasons. After injection, the horse is quarantined for three weeks while it sheds the virus. A blood test is taken before and after to determine the horse's serum titer to EVA. The vaccine is an annual booster and should not be given to foals less than six weeks old or pregnant mares during the last two months of pregnancy. It is important to identify carrier stallions that are shedding the virus in order to control the spread of EVA.

Equine Rhinopneumonitis
(Contagious or Viral Abortion, Snots) is a disease caused by equine herpes virus Type 1 (EHV-1). Each subtype produces different symptoms: Sub-type 1 is the strain that causes abortions, respiratory, and neurologic disease, while sub-type 2 is just a respiratory strain.

Rhinopneumonitis occurs in horses of all ages but is more common in horses less than three years old. Sporadic outbreaks come from inhalation of the virus particles. After incubation of two to 10 days, symptoms for the

respiratory subtype are a fever of 102° to 107°
F with a bacterial infection or "snots." Recovery provides immunity for only two to three months.

Respiratory problems are more severe in foals, with infections near birth producing weak foals that die within 24 hours. Following a respiratory infection, the virus can cause abortions. Death of the fetus occurs two weeks to four months after exposure to the virus, or during the last three months of pregnancy. Abortion storms have a sudden onset with no additional clinical signs. The foal dies from asphyxiation by the premature separation of the placenta. Occasionally, the virus attacks the central nervous system, causing mild incoordination, paralysis of the rear legs or complete recumbency. Two vaccines are available: a killed vaccine and a modified-live vaccine. The killed vaccine is given to pregnant mares during the fifth, seventh and ninth months of pregnancy. The modified-live vaccine can be given every three months. Foals should be vac-cinated at three months of age and again at four months. Horses should be given boosters every year. Prevention includes isolating arrivals and dividing the horses into small groups. The disease is difficult to confirm by diagnostic procedures unless proper tissue and blood samples are available.

Influenza
(Flu, Two-Year-Old Cough) is caused by two types of viruses: myxovirus A, subtypes 1 and 2. The short incubation period of one to three days produces explosive outbreaks and a rapid spread. Symptoms include fever, a dry, hacking and persistent cough with muscle sore-ness, depression and loss of appetite. Lymph nodes become swollen and legs have edema.

The highly contagious virus is spread by the inhalation of contaminated water droplets moving through the air or from contaminated facilities or objects. A horse can shed the virus for up to eight days. The myxovirus damages respiratory cells, making the horse susceptible to secondary bacterial infections such as bronchitis, pleurisy or pneumonia. Mild cases become severe with stress or adverse condi-tions. Two weeks of rest before resuming train-ing is required for adequate recovery. Failure to rest completely produces a persistent cough.

Antibiotics are necessary for secondary infections. Vaccinations should begin at three months of age and be repeated a month later. Horses with minimal stress or exposure need only a yearly vaccination. Horses that are shown regularly or are constantly in contact with other horses should be vaccinated every three months. Protective immunity is adequate for only six months. Local reactions to the vaccines have occurred in the neck muscles. Hygienic precautions can be taken to reduce the easy spread of the virus by disinfecting vans and by quarantining new arrivals.

Potomac Horse Fever
(PHF, Equine Monocytic Ehrlichiosis, Acute Equine Diarrheal Syndrome, Equine Ehrlichial Colitis) is a seasonal viral disease that is caused by *Ehrlichia risticii*. Small animals may serve as reservoir hosts for this sporadic, summertime disease. Biting insects that allow the virus to live and reproduce are the suspected transmission vectors. PHF parasitizes the monocyte white blood cell in the horse. After nine to 12 days of incubation, the symptoms first appear as depression and transient high fever. This episode may go unnoticed for seven to 10 days, until a loss of appetite, colic, "pipestream" diarrhea and laminitis occur. In half of the cases, the characteristic stool is watery, profuse and nonfetid, causing dehydration. Edema of the legs, abdomen and head indicates poor circulatory and protein balance. The virus crosses the placental barrier and abortions are seen in late gestation. Antibiotics are used in treatment. A vaccine is available for control, with an initial series of two injections. Boosters should be given at least every six months in high-risk areas.

Rabies
(Lyssa, Hydrophobia) is a viral disease that is usually transmitted through the saliva of carnivores. Wildlife (skunks, fox, wild dogs) can bite or lick an open wound to pass the virus. Because skunks are nocturnal animals, their presence in daylight can indicate suspected disease. Racoons are the primary source in Georgia wildlife.

Rabies is more frequent during the spring and summer months, which coincide with the mating season. Symptoms are variable in the horse and appear after an incubation period of three weeks to three months. The

virus irritates the central nervous system and destroys nerves, causing paralysis and death. The paralytic form in the horse may cause lameness or weakness in one leg until the horse becomes recumbent and has convulsions. The dumb form of rabies presents a change in the horse's disposition or a peculiar look in the horse's eyes. The horse appears confused, with its jaw hanging open. It drools and acts choked. The furious stage demonstrates excessive salivation and abnormal aggression, with excitable and exaggerated movement. The horse's actions are uncontrollable. It may run into walls, attack objects or other horses and chew itself. A vaccination is available specifically for horses and should be used in endemic areas where problems exist. One initial injection should be followed yearly with a booster. Observe precautions on suspected horses that display any abnormal behavior or clinical sign.

Strangles (Distemper, Shipping Fever, Barn Fever) is a highly contagious disease caused by the bacteria, *Streptococcus equi*. This hardy organism can survive in water, in pastures and on fences. Younger horses are more susceptible than older horses to the localized upper respiratory tract infection.

After an incubation period of three to six days, symptoms begin with depression and a serous nasal discharge. As the disease progresses, the body temperature rises to above 106^{o} F and loss of appetite occurs. Because the disease can spread rapidly, neigh-boring pastures and horses are easily exposed by infected horses who cough and sneeze the airborne bacteria. The serous nasal discharge turns to a mucopurulent drainage and infected lymph nodes become abscessed. The lymph glands under the jaw swell and create difficulty in swallowing. They are hot, painful and often rupture within seven to 14 days. The horse stands with its head extended, coughs and has a noticeable rattling of the airways. Severe cases may result in complications that produce pneumonia, internal abscesses (bastard strangles) or a vascular reaction (purpura hemorrhagica). Treatment includes isolation, lancing of the abscessed lymph nodes, and antibiotics. Hot compresses, sanitation and nursing care allow recovery with good immunity. Any complication lengthens the treatment schedule by months.

Vaccinations are available to reduce the severity and incidence of strangles, but may cause local reactions at the site of injection. Initially, two to three vaccinations are each given a month apart. Boosters should be done yearly. Prevention is obtained by isolating new arrivals for a month.

Tetanus (Lockjaw) is a disease produced by the bacterium, *Clostridium tetani*. This bacterium can live without oxygen (it is anaerobic) and is a normal inhabitant of the gut tract. Spores can persist for years in soils and horse manure. Bacteria enter the horse through a puncture wound, laceration, retained placenta or umbilicus. The bacteria produce a toxin that affects the nervous system.

Symptoms begin one to three weeks after infection and include stiffness in the legs, inability to eat (lockjaw) and prolapse of the third eyelid. The ears are rigid, and the horse is unable to walk and may stand rigid like a sawhorse. Excitement stimulates exaggerated responses such as muscle spasms, falling and convulsions. Death results from aspiration pneumonia, respiratory paralysis or the complications of recumbency.

There are two vaccines available -- an antitoxin and a toxoid. The antitoxin provides a passive, short-term immunity for immediate protection. It is used for some newborn foals whose dams were not vaccinated a month prior to foaling and for treatment of horses with tetanus. The toxoid produces a longer term immunity. It should first be given to newborn foals at three months of age and again at four months. A booster is continued every year. It can be given before surgery (castration). To boost the antibodies found in colostrum of the mare, she should receive a booster 30 days prior to foaling.

Internal Parasites

An internal parasite is a small organism that lives in and at the expense of a larger organism; the host or, in this discussion, the horse. The symptoms of internal parasitism include weakness, unthrifty appearance, emaciation, potbelly (large, distended abdomen), tucked up flanks, rough hair coat and slow growth. The horse may lose its desire to perform and seem lazy. Some symptoms of acute parasitism are colic, diarrhea, cough and lameness.

Many internal parasites can affect horses of all ages. However, most internal parasite control programs are geared toward:

- Ascarids - large roundworms
- Strongyles - large and small bloodworms
- Bots
- Pinworms
- Strongyloides-threadworms
- Stomach worms
- Tapeworms

Ascarids
(large roundworms) when mature, are 12 to 15 inches long, pencil-shaped parasites that primarily affect sucklings, weanlings and yearlings. Older horses generally develop an immunity to ascarids. Large numbers of thick-shelled eggs are laid by each female worm and these eggs are very resistant to adverse envir-onmental conditions. Contaminated premises including stalls, paddocks and pastures provide a source of infection for foals for several years. When a horse ingests the eggs, they pass into the small intestine, where they quickly hatch into larvae. These larvae penetrate the intestinal wall, enter the blood stream, and migrate to the liver, heart and lungs. Larval migration produces scar tissue in these vital organs that, though not necessarily fatal, does impair organ function. The larvae eventually emerge into the bronchial tubes, where they are coughed up, swallowed, passed into the intestine and develop into adults.

Symptoms of ascarid infection in foals include unthriftiness or poor growth, a pot-bellied and roughened haircoat appearance, lassitude and loss of appetite. Table 3 lists the anthelmintics (dewormers) effective against ascarids.

Strongyles, (bloodworms, red worms and pali-sade worms), are the most serious threat to all horses' health. Approximately 40 plus species exist, varying in size from barely visible to almost two inches long. Three species belong to the large strongyle group and include *Strongylus vulgaris*, *Strongylus edentatus*, and *Strongylus equinus*. They inflict much more damage than the small strongyles. Mature, large strongyles attach to the mucosa of the cecum and large colon, where they suck blood and cause damage to the mucosa. Eggs that are laid by the mature large strongyles pass out with the feces. The eggs hatch into larvae in one or two days. In about one week the larvae become infective and the horse consumes these larvae while grazing. Once inside the horse, they migrate to various organs and tissues. Migrating larvae of the large strongyles cause inflammation of the lining of the arteries, producing dilatation (aneurism) and occlusion (thrombosis) of these vessels. These lesions can cause colic, lameness and occasionally death. *S. vulgaris*
symptoms may also include a sudden onset of fever, inappetence, weight loss, depression and diarrhea mixed with longer intervals of constipation.

Although large numbers of small strongyles may occur, the harmful effects of this group are much less than those of the large strongyles because migrations of small strongyle larvae are limited to the intestinal lining. Except for a few species, mature, small strongyles are not attached to the intestinal mucosa and do not suck blood. Anthelmintics effective against strongyles are listed in Table 3.

Bots are not true worms but are the larval stage of a fly. Two species, *Gasterophilus intestinalis* (the common bot) and *Gasterophilus nasalis* (the throat bot), are prevalent in horses. A third species, *Gasterophilus haemorrhoidalis*
(the nose bot) may be present, but is rarely reported. The fly, which is active from midsummer to the first killing frost, deposits pin-head sized, pale yellow eggs on the forelegs. Some eggs may be found on the withers and belly. When the horse licks these areas, the warm moisture from licking stimulates egg hatching. The larvae penetrate the tongue and oral mucous membranes. The larvae migrate through these membranes and eventually appear in the stomach, where they attach themselves to the wall. The larvae cause ulcerations of the gums around the molars that are caused by the burrowing. Common bot larvae also burrow in the tongue and may cause lesions of the tongue. Lesions may also occur in the stomach where the bot larvae attach. Occasionally, a pit of

attachment may

Table 1. Common Diseases

Disease	Clinical Signs	Treatment	Prevention
Tetanus	Stiffness, prolapsed third eyelid, anxiousness, "sawhorse stance," recumbency, respiratory failure	Immediate wound care tetanus, antitoxin penicillin, muscle relaxants, supportive therapy	Yearly vaccination
Equine Encephalomyelitis	Fever, inappetence, somnolence, depression, neurologic signs, dementia, weakness, blindness, circling, facial paralysis	Supportive therapy	Yearly vaccination; north Georgia once, south Georgia twice (one just prior to mosquito season)
Influenza	Fever, inappetence, hacking cough, complications: bronchopneumonia, myositis, myocarditis	Complete rest for 2 to 6 weeks, antibiotics for secondary complication	Vaccination
Equine Rhinopneumonitis	**Young Horses:** fever, depression, mucoid nasal discharge, complications: secondary bacterial infections	Will usually resolve in 2 weeks, anitbiotics for secondary complication	**Young horses:** Vaccination
	Broodmares: abortion in last trimester of gestation	Isolation	**Broodmares:** Vaccination with killed product at 5, 7, 9 months of gestation; or modified live vaccine every 3 months throughout the year
	Adults: neurological signs; ataxia, posterior paralysis may follow previous respiratory or abortigenic signs of disease may occur spontaneously	During early stages, corticosteroids may help; nursing care total recovery	**Adults:** immunization program
Strangles	**Young horse:** fever, depression, inappetence, lymph node enlargement and abcessation, anemia, complications: persistent local lymph adenopathy, formation of abscesses in veisceral lymph nodes with peritonitis, pneumonia, pleuritis, septicemia, purpura hemorrhagica, obstructive pulmonary disease	Complete isolation, drainage of abscesses, drug of choice is penicilling, use is controversial	Hygienic measures extrememly important because organism may live in environment for a year; vaccine recommended in areas where disease is prevalent

Rabies	Behavioral changes, unexplainable clinical signs, rapidly progressing neurological signs	No specific treatment, precautions	Vaccination
Equine Infectious Anemia	Fever, inappetence, weight loss, weakness, anemia	None	Yearly Coggins Test, isolation, insect control
Equine Viral Arteritis	Fever, depression, nasal discharge, edema, abortion	Isolation, supportive therapy	Vaccination
Potomac Horse Fever	Depression, fever, inappetence, colic, profuse diarrhea	Supportive therapy	Vaccination
Botulism	Weakness, stiff- gaitedness, sudden onset, difficulty breathing, death	Antitoxin early, supportive care	Vaccination

perforate and result in peritonitis. Rupture of the stomach wall may occur when the wall is heavily infested with bots. Anthelmintics effective against bots are listed in Table 3.

Pinworms *Oxyuris equi* and *Probstmayria vivipara*, referred to as the common and the minute pinworm respectively, occur in the colon of a horse. The minute pinworm (*P. vivipara*) spends its entire life cycle in the host. The common pinworm is much larger; up to three inches long. The eggs of *O. equi* are laid in the large colon and pass out in the feces, or the female worm may crawl out the anus and deposit eggs on the skin around the anus. The eggs develop rapidly to contain infective larvae, which, if ingested, will develop in the colon to fourth-stage larvae in three to 10 days without invading the mucosa. The pinworms are sexually mature in about five months, when the cycle can start over. The principal effect of pinworm infestation is anal irritation caused by deposits of eggs and ruptured females. Tail-rubbing and loss of hair from the tailhead are signs of pinworms. Pinworm larvae feed on the mucosa of the colon. This, however, is not manifested by any clinical signs. For the most part, pinworms are more irritating than harmful. Anthelmintics effective against most other internal parasites are also effective in controlling pinworms. (See Table 3).

Strongyloides westeri or the intestinal thread-worm, inhabits the small intestine of foals. Eggs from *Strongyloides*
may first appear in the feces of two-week-old sucklings. The infestation of foals comes from the mare's milk. The infections in the foal's small intestine induce an immune response that results in the disappearance of egg-laying females after a few months. Therefore, a low prevalence of infection is typical for old weanlings and yearlings, and feces of mature horses are devoid of *Strongyloides* eggs. Foals may also ingest infective larvae from the environment. Diarrhea is the most common sign of threadworm infestation in foals. This diarrhea often occurs around the foal-heat scour period. Anthelmintics effective against *Strongyloides* are listed in Table 3.

Stomach worms.
Two kinds of nematodes par-asitize the stomachs of horses. The first kind, the spirurids, contains the species *Habronema muscae, Draschia megastoma*, and *Habronema majus*. The other is the minute stomach worm, *Trichostrongylus axei*. This is the only worm that infects horses, cattle and sheep. As the name indicates, these parasites are found in the stomach of the horse. Eggs are laid and pass out with the feces. The maggots of flies that breed in horse manure eat the eggs. Maggots become adult flies which deposit the infective larvae on skin secretions. The horse then licks and swallows the larvae. They mature and the cycle starts over. Stomach worms can cause an inflammatory reaction in the lining, leading to gastric irritability and digestive disturbances. Larvae may invade the eyes and cause a persistent conjunctivitis. Pulmonary abscesses result when larvae invade the

lungs. Larval infections can enter wounds or abrasions of the skin, producing lesions commonly called "summer sores," characterized by granulomatous tissue and slow healing.

The minute stomach worm (*T.axei*) can contribute to gastric irritability, poor digestion and sometimes colic. See Table 3 for approved anthelmintics.

Tapeworms. *Anoplocephala perfoliata*
is found in the lower jejunum, ileum and proximal colon. The life cycle of tapeworms involves an intermediate host (orbatid mites) that exist as free-living forms on pastures. Horses become infected when they ingest infected mites. It takes about two months for the adult tapeworm to develop. General symptoms of tapeworm infection include digestive disturbances and poor growth or unthriftiness. A large number of tapeworms can cause severe ulcerations. The ulcerations may lead to cecal perforation, occlusion of the ileocecal orifice and intus-susception (telescoping) of the terminal ileum and cecum, leading to colic. See Table 3 for approved anthelmintics.

Deworming Program

Before purchasing any of the anthelmintics (dewormers) listed in Table 3, consult your local veterinarian. He/she can tell you how often to deworm and what anthelmintics to use, as well as how often to rotate anthelmintics. As a rule, deworm every 30 to 60 days if you have a heavy concentration of horses. Table 3 lists various classes of dewormers and whether they are effective against the internal parasites discussed. Current recommendations are to use a different class of dewormer during the year, rotated with the ivermectin class. Use ivermectin after the first frost and again in June or July. It is wise to count fecal eggs occasionally or when you think you are having resistance problems. A heaping tablespoon of fresh manure is an adequate sample. Until it is examined, put the sample in a clean, airtight container, refrigerated and labelled with your name, address and telephone number and the name of the horse from which the sample was taken.

Control of internal parasites includes more than a regular deworming program with the proper anthelmintics. Reduction or control also includes proper management. Feed horses from mangers and troughs rather than from the ground to prevent fecal contamination. Remove manure from stalls and paddocks at least weekly. If possible, twice weekly or even daily removal is preferred. Rotate pastures whenever feasible and avoid over-stocking and over-grazing. Practice composting or other disposal methods of used bedding and manure to prevent contamination of grazing areas with worm eggs. Scatter manure in pastures with a harrow to dry out feces and expose eggs to the environment. It is best to vacuum concentrated areas of feces in pastures. Keep the general area clean and free from materials that encourage fly populations. Quarantine new horses upon arrival to your farm or stable and deworm them before allowing contact with other horses. The objective is to reduce the exposure to parasites. This can be accomplished by treatment and management practices aimed at all stages of a parasite to interrupt its cycle of development.

External Parasites

External parasites do not usually cause the damage to horses that internal parasites do. However, in some cases an infestation of a particular external parasite may cause irritation, a dull hair coat, anemia, weight loss and a general unthrifty condition. Types of external parasites that may be found on horses include:

- flies and gnats,
- lice,
- ticks, and
- mites.

Many kinds of flies are found around or on horses. Flies that suck blood are horse flies, deer flies, black flies, biting midges, mosquitoes, horn flies and stable flies. There are four stages in a fly's life cycle: egg, larva, pupa and adult. Growth occurs during the larval stage. Transformation into the adult stage occurs during the pupal

stage.

Horse fly
eggs are deposited in a variety of aquatic or semiaquatic areas including water, water's edge, flooded forest floor, salt marsh, plant debris and, although rare, pastureland. Generation time varies from one year to two or three years.

Deer flies
normally deposit eggs on vegetation around the water's edge or in salt marshes. Horse and deer flies are painful biters, causing extreme annoyance and blood loss (up to 0.5 cc per fly) with more blood loss following the bite due to oozing. EIA transmission by these flies is also a concern. Control is difficult because of the larval habitat. These flies do not normally enter structures. Provide pastured horses space and structures for sanctuary during heavy attacks to help alleviate the control problem.

Mosquitoes and black flies
develop in water. Black flies require moving water. Areas that can breed black flies are streams and pond overflows. Black flies are seen biting horses on belly lines, between the back legs and in the ears.

Mosquitoes breed in standing water, tree holes, flood zones, old tires, cans and barrels. Control mosquitoes by eliminating their breeding sites. Mosquitoes are vectors of equine encephalomyelitis as discussed in the disease section.

The **horn fly**
resembles a small stable fly and is present in large numbers on horses maintained with or near cattle. Horn flies deposit their eggs on fresh cow manure. Hundreds of flies may be found feeding upon a horse's shoulders, neck, withers and abdomen, taking 20 to 30 blood meals per day. These flies often congregate around hair loss areas and cause severe dermatitis identified by ulcers and crust.

The **stable fly**
resembles the house fly but can be recognized by its prominent bloodsucking mouth-part. The optimal environment for stable fly larval development is hay contaminated with urine, water and manure. Considerable blood loss and annoyance can be produced by the stable fly. These flies may contribute to the transmission of swamp fever and are vectors of "summer sore" as discussed in the Internal Parasites section under stomach worms. Stable flies feed on the legs and abdomens of horses.

Other biting flies such as biting midges can become quite numerous on horses, especially in swamp and marsh areas where these insects breed. These flies congregate mostly on the underside of horses, where they cause extreme irritation and blood loss. To achieve control, pasture horses away from wooded areas during periods of heavy attacks and treat horses with insecticides every day or two.

The **house fly**
is a nonbloodsucking parasite. House fly larvae develop best in manure but can develop in a wide variety of organic debris. These flies transmit stomach worms and have been incriminated in the transmission of more than 60 vertebrate pathogens by body part contamination, regurgitation and defecation. The house fly causes considerable irritation to the horse, particularly when it feeds on lacrimal secretions around the horse's eyes.

Stable fly and **house fly**
control starts with good stable and pasture management. Eliminate breeding sites of these flies when possible. Remove breeding materials at least every seven days because these manurebreeding flies have life cycles of seven to 21 days. Inhibit fly development by keeping manure and other fly breeding materials dry. Design paddock areas to promote adequate drainage and eliminate wet areas where fly breeding is likely to occur. Good drainage away from manure piles promotes drying and helps reduce fly breeding. Properly maintain automatic waterers to prevent leakage. If very carefully managed and made an integral part of an overall Insect Pest Management Program, parasites and predators of house flies can be used to aid in a house and stable fly control

program.

Face flies
are nonbiting flies that breed in fresh cattle droppings. They congregate around the horse's head, where they feed on liquid secretions around the eyes and mouth. They are associated with numerous eye problems, and large numbers result in annoyance. Control face flies by treating a horse's face on a daily basis with wipe-ons and sprays or exclude them with face guards.

Lice
can be found on all parts of the horse, but are usually first noticed on the head, neck, mane and tail. There are two types of horse lice. One is the **horse-biting louse** *(Bovicola equi)*. These lice are chestnut brown except for the abdomen, which is yellow with dark crossbands. They are very flat with a broad, rounded head and slender legs. The biting louse has chewing mouthparts and feeds on dry skin scales and hair. Lice spend their entire life cycle on the horse. Biting lice lay their eggs around the angle of the jaw and on the flanks. Eggs hatch in five to 10 days, and nymphs begin feeding immediately, maturing in three to four weeks.

The second type of horse louse is the **horse-sucking louse** *(Haematopinus asini)*. This louse is about 1/8-inch long and is a dirty gray color. It has a very broad abdomen that contrasts with its long narrow head. Eggs will hatch in 11 to 20 days. The newly hatched nymphs suck blood immediately and complete their development to maturity in two to four weeks. Sucking lice are more common than biting lice. Sucking lice are very irritating and cause the horse to rub excessively, often rubbing off patches of hair. When large numbers of lice are present the horse may become anemic. Louse infestations are more commonly seen on horses fed inadequate diets. They cause weight loss and stunted growth. Lice are not considered important in the transmission of equine pathogenic agents.

Mange or itch mites
can infest horses and heavy infestations result in severe dermatitis because these mites tunnel in the upper skin layers and suck blood and cause secondary infections. Careful treatment is necessary for control. The infested area and sur-rounding areas on the horse must be thoroughly treated initially and again seven to 10 days later.

Ticks,
unlike lice, are not species specific, so the same types of ticks that attack other animals will also attack horses. Ticks cause irritation, restlessness and spread of horse diseases. Ticks can be vectors of sleeping sickness, Lyme disease, piroplasmosis and EIA. Heavy tick infestations may cause anemia. One species of tick is a frequent invader of the ears. Because of the irritation, the horse may have droopy ears and become head shy. Adult female ticks lay eggs on the ground and then die. The eggs develop into larvae (seed ticks) that climb up on grass or shrubs where they latch on to a passing host. As each develops into a nymph, it sucks blood. Adults may mate on or off the host and ticks can survive for long periods off the host. Remove single ticks by swabbing them with cotton soaked in alcohol or chloroform. Because ticks breathe through spiracles (holes in their abdomens), they are suffocated by the alcohol or chloroform. Insecticides can also be used to treat ticks directly. Ticks should not be grasped with an unprotected hand; instead, use tweezers to remove ticks.

Insecticides
- Wettable powder formulations (WP) are preferred over emulsifiable concentrate solutions (EC) because certain solvents in EC solutions, even upon dilution with water, may cause damage and skin irritation to some horses. Exercise caution when purchasing or using any insecticide on horses. Make sure the insecticide is labelled for use on horses and follow label directions closely. Many horse owners complain there are no effective insecticides, particularly fly sprays, for horses. This is probably the result of a resistant fly population. To help slow down the development of resistance, do not treat with two classes of insecticides simultaneously, because flies may develop resistance to both classes at the same time. Instead, treat with a specific class of insecticide for several months to a year. Then switch to another class of insecticide before resistance is developed by the flies. As pointed out in the discussion of stable flies and house files, control should involve more than the use of insecticides.

- Properly remove and dispose of fly breeding materials at least every three to seven days.
- Design stables, paddocks and pastures to allow easy and thorough waste removal and prope
- drainage.
- Correct improper drainage and structural problems that allow waste accumulation in existing operations.
- Remove manure and other fly breeding materials within three days after animals are removed from barns, run-in sheds or dry-lots.
- Ensure thorough cleanup of all potential fly breeding areas.
- Use insecticidal control in conjunction with good sanitation, moisture control and mechanical control. Insecticidal control should never be the sole means of control.
- Residual insecticides, space sprays, fogs, mists, fly baits and fly traps aid in the reduction of adult flies. Begin their use early in the spring when fly populations are small.

Colic

Colic is a general term indicating abdominal pain. Colic can originate from the stomach, the small intestine or the large intestine. Colic of various types is considered to be the number one killer of horses. Because of the organs involved in colic, there are many types of causes of colic. The main causes of colic are intestinal distension and reduced blood supply to the intestinal tract. Peristalsis of the intestine is reduced and distension will occur due to reduced movement and absorption of water and nutrients. Distension and reduced blood flow may be due to digestive disturbances, intestinal obstructions, internal parasites, or twisted intestine (torsion and volvulus).

Digestive colic may result from a horse overeating, a sudden change in diet, consumption of moldy feed, a heavy meal before work, and feeding or watering before proper cooling after work. Intestinal obstructions may result from sand impaction, foreign bodies, and impactions caused by poor quality hay. Horses kept in sandy environments and fed on the ground or over grazed pastures are prone to consume more sand, predisposing them to sand impactions. Foreign bodies such as rubber fencing and carpeting may provide a nucleus where minerals are deposited until a large foreign body is formed. This foreign body is often referred to as enterolith (intestinal stone) and may or may not have another foreign body as its core. Mature, highly fibrous hay has been implicated in impaction colics. Water deprivation and stagnant warm water may contribute to impactions.

Internal parasites, especially Strongyles, may reduce blood supply to the intestine due to the migration of larvae in the walls of the arteries. As the larvae migrate, the walls of the vessels become roughened and scarred. Clots form on the roughened areas and may reduce the size of an important branch of the artery. Ascarids (roundworms) may cause blockage of the small intestine in young horses. Bots in large numbers may cause blockage of the stomach.

Twisted intestine is a condition in which a portion of the small or large intestine is twisted on itself partially or completely. Twisting may result from rolling or from another cause such as a buildup of gas causing the distended intestine to twist. There is no simple cause effect explanation of colic, because many of the effects on the stomach, small intestine and large intestine are related. For example, blockage or impaction at the junction of the small and large intestines may be due to reduced blood flow because of strongyle larvae migration or due solely to sand impaction.

Signs of colic will vary according to the severity of the particular conditions. Very few horses exhibit all the signs at one time. Signs associated with mild to moderate pain include:

- pawing the ground,
- restlessness,
- lack of appetite,
- looking toward the flank,
- stamping the hind feet, and
- lying down.

With more severe, unrelenting pain, horses may:

- paw the ground,
- kick violently,
- sweat profusely,
- lie down and get up frequently,
- roll or lie on their backs,
- sit like a dog,
- have an elevated temperature,
- have an increased respiration rate,
- have an elevated heart rate, or
- have few or no gut sounds.

A horse showing severe signs of colic should be seen by a veterinarian immediately. In cases of mild pain, the veterinarian should be consulted as to the best course of action. Avoid administering drugs because certain drugs can mask clinical signs of colic, making an accurate diagnosis difficult. A horse does not need to be walked if it is lying quietly and not attempting to roll or to continually get up and lessen his chance of survival if surgery is required.

You can keep incidence of colic to a minimum by following sound management practices such as:

- supply plenty of fresh, clean drinking water,
- avoid sudden changes in diet,
- feed at regular times and intervals,
- feed good quality forages free of mold, weeds and foreign objects,
- plan a proper deworming program
- check the teeth routinely and float file, if necessary,
- minimize unnecessary stress, and
- know what is abnormal and normal for your horses.

Colic will probably never be totally eliminated; however, the severity and incidences can be reduced.

Care of the Teeth

A good horse owner will check his horse's teeth once a year or more. It's especially important to examine the teeth when the horse keeps turning his head, slobbing, or tugging at the bit, indications of teeth problems. It is advisable to remove the wolf teeth, which are small teeth that are found on the upper jaw in front of the premolars. These teeth are difficult to see, but are felt easily. Place your thumb on the gums of the bars of the mouth. Run your thumb back toward the premolars. If a horse has wolf teeth you should feel a sharp, small, pointed tooth just before your thumb touches the side of the premolar. Wolf teeth are easily removed because they have shallow roots. It has been estimated that 60 to 80 percent of all male horses have wolf teeth whereas only 20 to 30 percent of all female horses have wolf teeth. Wolf teeth are the first thing to check for if your horse has biting problems. Many farms routinely remove wolf teeth from young horses before they go into training.

Most of the horse's tooth care involves floating of the premolars and molars. The upper jaw is approximately 30 percent wider than the lower jaw. Consequently, the molars wear unevenly with time. The upper molars will develop points on the outside and the lower molars will develop points on the inside. It is a theory that mastication (chewing) of feed is affected and therefore digestibility of feed is reduced. Horses that drop large quantities of feed from their mouth when eating may be candidates for floating. Floating involves the use of floats (rasp-like tools with handles) to file or remove the points that have developed on the molars. If not filed, the sharp points may cause discomfort by cutting the inside of the cheeks when the horse chews or is ridden with a bit.

At times horses have infected teeth that will need removal but, fortunately, this is rare. An abscessed tooth will emit a foul smell and generally cause swelling that can be observed on the horse's face. In addition, there may be a nasal discharge that is unrelated to a respiratory disease. An inexperienced horse owner should ask a veterinarian to look at the teeth when the horse is being treated for other ailments or when a problem is suspected.

Table 2. Equine Vaccination Schedule

	Initial Series	**Foal**	**Weanling**	**Yearling**	**Adult**	**Mare**	**Stallion**
Tetanus Antitoxin	1500 units	At birth		- - - - Injury, surgery, wound treatment - - - - -			
	SC, IM	No Colostrum					
Toxoid	Two injections IM, one month apart	3 mos of age	Booster	Annual Booster -			
		4 mos of age				30 days pre-partum	Prior to breeding season
				- - - - - Injury, surgery, wound treatment - - - - -			
Influenza	Two injections IM	3 mos of age	Booster	Annual Booster -			
	One month apart	4 mos of age		or Pre-exposure (training,shows) every 3 mos		30 days pre-partum	Prior to breeding season
Encephalomyelitis	Two injections IM	3 mos of age	Booster	Annual Booster -			
	one month apart	4 mos of age		or Epidemic (S.Ga. semi-annual)			Prior to breeding season
Rhinopneumonitis	Two injections IM	3 mos of age	Booster	Annual Booster -			
	one month apart	4 mos of age		or Pre-exposure (training,shows) every 3 mos)		Pregnancy Every 3 mos. 5, 7, 9 mos.	Prior to breeding season
Rabies	One injection IM	3 mos of age		Annual Booster -			
							Prior to breeding season
Strangles	Three injections IM	2 mos of age	Booster	Annual Booster -			

Shaker Foal Syndrome	Three injections IM, Pre-partum, one month apart		Annual Booster Pre-Partum
Potomac Horse Fever	Two injections IM	3 mos of age	- - - - - - - - Semi Annual Booster - - - - - - - - -
		4 mos of age	
Equine Viral Arteritis	One injection IM, Pre-Breeding Note: Quarantine for 3 weeks		Booster prior to breeding season (monitor blood titer)

Table 3. Effectiveness of Equine Anthelmintics

Class & Drug	Trade Name	Bots	Ascarids	Small Strongyles	Large Strongyles	Pinworms	Strongyloides
Avermectins							
Ivermectin	Eqvalan	X	X	X	X	X	X
Ivermectin	Zimecterin	X	X	X	X	X	X
Benzimidazoles							
Fenbendazole (FBZ)	Panacur		X	X	X	X	X
Mebendazole (MBZ)	Telmin		X	X	X	X	
MBZ+TCF	Telmin-B	X	X	X	X	X	X
Oxfendazole (OFZ)	Benzelmin		X	X	X	X	
OFZ+ TCF	Benzelmin Plus	X	X	X	X	X	X
Oxibendazole (OBZ)	Anthelcide EQ		X	X	X	X	
Thiabendazole (TBZ)	Equizole		X	X	X	X	

TBZ+ PPZ	Equizole-A		X	X	X	X	X
Organophosphates							
Dichlorvos	Cutter Dichlorvos						
(DDVP)	Horse Wormer	X	X	X	X		
Trichlorfon (TCF)	ComBot	X	X			X	
Piperazines							
Piperazine (PPZ)	Piperazine 34%		X	X	50	50	
Pyrimidines							
Pyrantel	Strongid-T, P or C	X	X	X	X	X	
(RT)	Imathal-Equine						
Phenylguanidines							
Febantel (FBT)	Rintal		X	X	X	X	
FBT+TCF	Combotel	X	X	X	X	X	

Table 4. External parasite control on horses, recommended insecticides and mixtures

Insecticide preparations that contain a combination of ingredients are available for use on horses. Included in the insecticide preparation may be insecticides, synergists, repellants and carriers. Additionally, insecticide concentrates can be obtained for making external parasite control preparations.

External Parasites	Insecticide[1]	Formulation & Mixing Instructions	Application Instructions & Use Restrictions
Flies: biting midges, black flies, deer flies, face flies, gnats, horn flies, horse flies, lice, mosquitos, punkies, ticks, wound-infesting larvae (screw-worms)	coumaphos (CO-Ral) OP, LE	**Fly control:** 1% dust ready-to-use no mixing required **Screwworm and ear tick control:** 5% dust ready-to-use no mixing required **Fly, lice and tick control:** 0.06% to 0.125% WP or EC spray Mix 1 or 2lbs. of 25% WP in 50 gals. water OR mix 2 1/2 to 5 oz. of 11.6% EC in 4 gals. water **Screwworm control:** 3% spray foam ready-to-use no mixing required	**Dust:** Apply 2 ozs. per animal, but no more evenly to infest areas. Repeat as needed. Provide thorough ventilation while dusting. No waiting period between application and slaughter. **Dust** lightly in ear for ticks. For wound-infesting larvae, treat wound thoroughly. Repeat as needed for ear ticks and wound-infesting larvae. Provide through ventilation while dusting. No waiting period between application and slaughter. **Spray:** Apply higher concentrations for ticks. Treat wounds for wound-infesting larvae. Treat animal thoroughly. Do not treat animals less than 3 months old. Do not treat sick, convalescent or stressed horses or those that have been treated with other drugs. Do not treat horses intended for slaughter. **Spray:** wound treatment for wound-infesting larval control on horses. No waiting period between application and slaughter.

cypermethrin SP, ME	**Fly control:** ready-to-use	**Mist spray or wipe-on:** Apply mist spray to horses as needed every 5 to 14 days. Not for use on horses intended for human consumption.
fenvalerate 8.0% Collar/Brow Band (Ectrin, Fly Guard) SP, LE	**Fly control:** ready-to-use	**Collar/Brow band:** Apply one per animal when flies reach damaging levels. Remove when control begins to drop off and during cooler months of the year. Due to fly resistance problems, don't reapply except during alternate years.
fenvalerate 10% WDL (Ectrin) SP, ME	**Fly control:** 0.12% spray, Mix 1 qt. of 10% WDL in 25 gals. water or mix 2 ozs. of 10% WDL in 1 1/2 gals of water	**Mist spray:** Apply 8 ozs. as light spray with attention to head and legs. Repeat as needed. Do not treat animals intended for slaughter.
malathion 57% EC (Cythion) OP, LE	**Fly control:** 0.5% or 0.6% spray. Mix 1 gal. of 57% EC in 100 gals. water **Fly control:** 4% or 5% dust, ready to use, no mixing required	**Spray** animals thoroughly. Apply about 2 qts. of spray per mature animal. Apply every 3 weeks if needed. Do not treat animals under 1 month old. No waiting period between application and slaughter. **Dust:** Apply 1 to 1.5 oz. per animal. Repeat, if needed, every 10 to 14 days. No waiting period between application and slaughter.
methoxychlor 5.0% EC (Purina Horse Spray Concentrate Insecticide) CH, LE	**Fly control:** Mix 1 pt. of 5.0% EC in water to make 1 gal. of mixture **Fly and lice control:** Mix 1 qt. of 5.0% of EC in 9 qts. water	**Sponge-on:** Apply 1 pt. to 1 qt. per animal to infested areas (ears, neck, back - but not under the saddle, belly and legs). Treat as needed to maintain control. No waiting period between application and slaughter. **Spray** entire animal until hair is wet to the skin. Apply 1 pt. to 1 qt. per animal. Treat as needed to maintain control. For lice, retreat in 10 days. No waiting period between application and slaughter.
methoxychlor 0.5% + butoxypolypropylene glycol 10.0% + pyrethrins 0.05% + synergist (Horse Spray and Rub-on) CH + R + NP, LE	**Kills and repels flies:** Ready-to-use, no mixing required.	**Spray and wipe-on:** Apply up to 2 ozs. per day. Do not spray feed or water.
methoxychlor 5.0% + butoxypolypropylene glycol 50.0% concentrate (Purina Horse Spray)	**Kills and repels flies and lice:** Sponging mix 1 pint concentrate in 7 pints water. Spraying mix 1 quart concentrate in 9 quarts water.	**Sponge On:** Treat haircoat in the region of the ears, neck, back (not under saddles) and legs. **Spraying:** Spray entire animal to dampen haircoat or wet the skin. Apply pint to 1 quart per animal.
permethrin 5.7% EC (Insectrin, Insectaban, Overkill) SP, ME	**Fly, mange, tick and lice control:** Mix 1 pt. of 5.7% EC in 12 1/2 gals. water **Lice control:** Mix 1 pt. of 5.7% Ec in 25 gals. water **Fly and ear tick control:** Mix 1 pt. of 5.7% EC in 1 1/4 gals. water	**Spray** 1 to 2 qts. per animal over whole body surface. For mange, lice, and scabies control, thoroughly soak animal and apply a second treatment 14 days later. No waiting period between application and slaughter. **Spray** until animal is thoroughly treated. A second application is recommended 14 days later. no waiting period between application and slaughter. **Spray mist:** Apply 1 to 2 ozs. per animal. Spot treat back, face, legs and ears. Do not use on horses intended for human consumption.
permethrin 10.0% to 11.0% EC (Atroban, Overkill, Permectrin II) SP, ME	**Fly and lice control:** Mix 1 pt. of EC in 25 or 50 gals. water (1 oz. in 6 qts. water).	**Spray:** Use high concentrations for stable flies and face flies. Apply directly to animals at 1 qt. to 2 qts. per animal. Light rates are for horn fly control only. Repeat as needed but not more often than once every 2 weeks. Do not contaminate feed or water.

	permethrin 0.25% Dust (Horse Lice Duster) SP, ME	**Fly and lice control:** Ready-to-use dust.	**Dust:** Apply 2 ozs. of dust per animal by shaker can over the head, neck, shoulders, back and tailhead. Repeat as necessary.
	permethrin 0.4% to 1.0% ready-to-use spray or wipe-on (Expar, Hard Hitter, Hunter, Tech-Trol) SP, ME	**Flies, lice and tick control:** Ready-to-use when purchased. No mixing required.	**Spray or wipe-on:** Apply as needed. Do not soak hair or skin. Pay particular attention to legs, shoulders and necks. Do not get in animal's eyes. Do not treat horses intended for human consumption.
	permethrin 1.84% Pour-on (Poridon Insecticide Pour-on) SP, LE	**Aids in fly control:** Ready-to-use when purchased. No mixing required.	**Pour-on:** Apply 2 to 4 ozs. per animal. Start by pouring a line bead from the poll, along the neck, and continue posteriorly down the back parallel with the spinal column or apply as a wipe-on.
	permethrin 25% WP (Permectrin) SP, ME	**Fly, lice, tick & mite control:** Mix 6 ozs. (21 level Tbs.) of 25% WP in 19 gals. of water.	**Spray:** Spray to run off or use 1 gal. spray mix per head. Do not spray feed or water.
	pyrethrins + synergist NP, LE	**Fly control:** 0.05% to 0.2% plus synergist mist spray. Ready-to-use. No mixing required.	**Spray or wipe-on:** Apply mist spray or wipe-on to wet the ends of the hair but not enough to wet the hide (1 to 4 fl. ozs. per animal). Direct application will kill ticks. Repeat as needed.
	pyrethrins 0.4% + synergist EC (Repel-X) NP, LE	**Fly and tick control:** Mix 1 pt. of 0.4% EC in enough water to make 1 gal. of mixture. For horse flies, deer flies (Tabanids), stable flies and ticks, mix 1 pt. of 0.4% EC in 2 qts. water.	**Spray or sponge-on:** Apply heavily to wet animal every 3 to 4 days or as needed to control flies and ticks. Do not use on animals intended for human consumption. Avoid getting into animal's eyes.
	pyrethrins 0.36% + synergist spray (Swat) NP, LE	**Fly, lice, tick and flea control:** Ready-to-use when purchased. No mixing required.	**Spray or wipe-on:** Apply to wet hair but not skin of animal. Remove access dirt and dust before treating. Repeat as needed. Do not treat horses intended for human consumption.
	pyrethrins 0.05% + synergist 0.5% + permethrin 0.1% to 0.5% ready-to-use spray (Flycycle 2, Repel-X) NP + SP, LE		
	resmethrin 0.5% + butoxypolypropylene glycol 10.0% (Super Shield II) SP + R, LE	**Fly control:** Ready-to-use. No mixing required.	**Spray or wipe-on:** Apply to wet hair but not the skin of animal. For maximum protection apply 4 to 6 ozs. to animal and repeat every 2 to 3 days if needed. Do not use on horses intended for slaughter.
	resmethrin 0.554% + butoxypolypropylene glycol 11.0% (Fly Repellent) SP + R, LE	**Fly and tick control:** Apply by spray or wipe-on. Mix 4 ozs. of concentrate in 28 ozs. of water to make one quart.	**As a wipe-on:** Dampen a soft cloth and rub over hair after cleaning debris from animal. **Apply spray** mist to horse's coat. Pay particular attention to legs, shoulders, and neck while avoiding eyes. Do not use on horses intended for slaughter.
Flies: biting midges, black flies, deer flies, face flies, gnats, horn flies, horse flies, lice, mosquitos, punkies, ticks, wound-infesting	tetrachlorvinphos (Rabon) OP + pyrethrins (NP) + synergist (Flycycle 1, Purina Fly Screen) LE	**Fly control:** Available in ready-to-use gels, wipe-ons, aerosol sprays, and dust formulations. Primarily for temporary relief.	Prior to application, brush dirt and dust away from the hair coat. Treat areas that need protection. Apply up to 1 to 2 fl. ozs. per animal. Do not wet the skin of the animal - only the hair should be treated. Apply as needed for protection. No waiting period between application and slaughter.

larvae (screw-worms)			
	tetrachlorvinphos 0.475% to 2.468% Horse Feed Supplement (Rabon, Equitrol, Vita-Plus with Equitrol, Drive with Equitrol) OP, LE	Manure breeding flies: Ready-to-use feed supplement. Each horse must consume 70 mg. tetrachlorvinphos per 100 lbs. of body weight daily.	**Feed additive:** Follow feeding instructions on the label. Each horse must consume sufficient quantities if adequate control is to be achieved. Do not feed to horses intended for slaughter. This product must be supplemented with other fly control products.
Mange: Sacroptic or Psoroptic	lindane (restricted use) CH, ME	0.03% to 0.05% spray or dip Mix 1/4 to 3/4 lb. of 25% WP in 50 gals. water.	For best results, dip or treat animal with 2 qts. spray. Re-treat after 7 days. Do not treat sick or otherwise weakened animals. The waiting period between application and slaughter is 60 days.
	malathion OP,LE	When applied as for flies, will provide marginal control if great care is taken to thoroughly treat infested area.	
	permethrin 5.7% EC (Purina Hard Hitter Stable Spray, Insectrin Insectaban) SP, LE	**Fly, mange, tick and lice control:** Mix 1 pt. of 5.7% EC in 12 1/2 gals. water.	**Spray** 1 to 2 qts. per animal over whole body surface. For mange, lice and scabies control, thoroughly soak animal and apply a second treatment 14 days later. No waiting period between appliction and slaughter.
Bots:	dichlorvos (Equiguard, Horse Wormer) OP,ME	17.5% PVC pellets 1 packet (19.5 grams) per 300 lbs. animal body weight.	Give to individual horses in half the grain portion at a single feeding to ensure maximum bot removal. Withhold water 4 to 6 hours before and 3 hours after consumption of drug. Do not treat sick animals. Do not give with or within 1 week of the administration of tranquilizing drugs or other internal parasite drugs. Do not treat horses intended for human consumption. Veterinary consultation is recommended.
	ivermectin (Eqvalan, Zimecterin) ME	1.87% oral paste, ready-to-use when purchased, no mixing required.	Follow directions on pre-filled syringe. Do not treat horses less than 4 months of age.
	trichlorfon (Anthon, Dyrex, Combot Paste, Negabot Paste) OP,ME	40% oral paste Administer 16 mg./lb. orally 12.3% liquid, ready-to-use when purchased, no mixing required.	Treat 30 days following first killing frost. Repeat after 3 to 4 months, but never more frequently than every 30 days. Do not treat sick animals, horses to be used for food, colts less than 4 months of age or mares in the last month of pregnancy. Do not give horses intravenous anesthetics, especially muscle relaxants, within 2 weeks of treatment. Be sure to follow label directions carefully. Consult with veterinarian.

[1]OP=organophosphate; SP=synthetic pyrethroid; CH=chlorinated hydrocarbons; NP=natural pyrethrin; CR=carbamate;LE=less effective or effectiveness not determined; M=more effective; R=repellant

Table 5. Fly control in horse facilities -- residual (contact) or bait sprays [1,2]

Insecticide	Spray Concentration /Mixing Instruction	Methods of Application and Safety Regulations
dimethoate (Cygon) 2 lbs. (23.4%) a.i. per gal. EC, OP, ME	1% spray. Mix 1 gal. of 2 lbs. per gal. EC in 25 gals. water.	Direct a coarse, wetting spray to surfaces in horse operations where flies congregate, to include ceilings, walls, fences, posts, floor and manure. Apply to point of runoff (1 gal. per 500 to 1,000 sq. ft.). Do not contaminate feed or drinking water. Do not apply as a space spray. Repeat as needed. Do not apply directly to animals. Remove animals before spraying and return them after spary dries.

fenvalerate (Ectrin) 10% WDL, ST, ME	Mix 1 qt. of 10% WDL in 10 or 25 gals. of water (longer residuals results from higher concentrations).	For spraying horse barns. Spray to point of runoff (approx. 1 gal. of finished spray per 500 to 1,000 sp. ft.). Repeat in 14 to 30 days if needed. Spray ceilings, walls and walkways. Do not treat horse barns of horses intended for slaughter.
malathion (Cythion) 5 lbs. a.i. per gal. premium grade 57% EC, OP, LE	Mix 1 qt. EC in 12 gals. water.	Same as methods of application and safety restrictions for dimethoate above. Remove all animals less than 1 month of age before treating.
menthoxychlor 2 lbs. a.i. per gal. (25%) EC or 50% WP, CH, LE	2.5% to 5% spray. Mix 1 gal. EC or 4 lbs. WP in 10 gals. water.	Same as methods of application and safety restrictions for dimethoate above. Remove animals before spraying. When spray dries, animals can be returned.
permethrin (Atroban, Ectiban, Insectrin, Overkill, Permaban, Perm-ectin) 5.7% Ec, 11% Ec or 25% WP, SP, ME	5.7% Ec is ready-to-use as a mist spray OR mix 1 qt. 5.7% EC in 12 1/2 gals. water OR mix 6 ozs. 25% WP in 11 gals. water OR mix 1 pt. 11% EC in 10 gals. water.	Apply as a residual surface spray to fly resting areas. Do not spray manure or litter. Do not apply directly to horses. Apply 5.7% EC undiluted at 4 ozs. per 1,000 sp. ft. of surface area or apply diluted WP and EC mixtures at 1 gal. per 750 sq. ft. Do not apply more often than once every 2 weeks.
tetrachlorvinphos, stirofos (Rabon) 50% WP, OP, LE	1% or 2% spray. Mix 4 to 8 lbs. WP in 25 gals. water.	Same as methods of application and safety restrictions for dimethoate above.
tetrachlorvinphos, stirofos (Rabon) 2 lbs. a.i. per gal. (23%) + dichlorvos (Vapona) 0.5 lb. a.i. per gal. (Ravap) (5.7%) EC, OP, ME	1.25% to 2.5% spray. Mix 1 gal. or 2 gals. Ec in 25 gals. water.	Same as methods of application and safety restrictions for dimethoate above.

[1] Residual sprays can be applied as spot sprays to control maggots in manure accumulations.

[2] ME=more effective; LE=less effective or effectiveness not established; OP=organophosphate; CR=carbamate; SP=synthetic pyrethroid; NP=natural pyrethrum; CH=organochlorine, chlorinated hydrocarbon.

Table 6. Fly control in horse facilities -- space sprays (fogs or mists) and baits[1]

Insecticide	Spray Concentration & Mixing Instructions	Methods of Application & Safety Precautions
Space sprays[2]; fogs or mists		
dichlorvos (vapona or DDVP) 1% ready-to-use animal spray solution (Stable & Horse Fly Spray) OR 2 lbs a.i. per gal (23.4%) EC, OP, LE	0.5% or 1% ready-to-use fogging solution OR mix 1 pt. EC in 3 gals or 6 gals water.	Apply 1 pt. 1% solution or 1 qt. 0.5% solution per 8,000 cu. ft. as a fog or mist. Repeated applications will provide adult fly suppression. Do not use more often than once every 24 hours. Do not use if animals have been treated with other insecticides within 8 hours. Do not apply directly to animals. Close all doors and windows when fogging. Do not contaminate feed or water.
naled (Dibrom) 1% ready-to-use spray, OP, LE	1% ready-to-use	Apply 1 fl. oz. per 3,000 cu. ft. As fine atomized spray. Safety restrictions same as for dichlorvos above.
permethrin 5.7% EC, SP, ME	Mix 1 pt. 5.7% EC in 6 gals diesel or mineral oil	Apply fog at 4 fl. oz. per 1,000 cu. ft. of air space in confined facility. Repeat as needed.

pyrthrin (0.1 to .75%) + synergist (0.5 to 3.75%) NP, ME	ready-to-use	Apply fogs or spray mists at 1 fl. oz. per 1,000 cu. ft. as fine atomized spray. Repeat as needed.
Baits - methomyl (Apache, Golden Malrin, Purina Tailspin Fly Bait) CR, ME	ready-to-use	Scatter on floors, walkways, etc., throughout operation but away from animals. Apply lightly (about lb per 500 to 1,000 sq. ft.) until flies suppressed. Wear rubber gloves when applying baits. Do not allow workers on treated floors without shoes. Do not allow animals to come in contact with baits.
trichlorfon (Sugarcide) OP, LE	ready-to-use	Apply and follow precautions as for methomyl above.

[1]ME=more effective; LE=less effective or effectiveness not established; OP=organophosphate; CR=carbamate; SP=synthetic pyrethroid; NP=natural pyrethroid; CH=organochlorine, chlorinated hydrocarbon

[2]Space sprays are designed to kill adult flies that are present when the fog or mist is applied. There is little or no residual insecticide deposit remaining after the application unless synthetic pyrethroids are applied. Fogs or mists must come in contact with the fly. These materials are especially effective in enclosed areas where air movement is minimal. Heavy mists can offer some adult house fly kill in open areas.

Trade and brand names are used only for information. The Cooperative Extension Service, University of Georgia College of Agriculture does not guarantee nor warrant published standards on any product mentioned; neither does the use of a trade or brand name imply approval of any product to the exclusion of others that may also be suitable.

Attention! Pesticide Precautions

1. Observe all directions, restrictions and precautions on pesticide labels. It is dangerous, wasteful and illegal to do otherwise.
2. Store all pesticides in original containers with labels intact and behind locked Doors. **Keep Pesticides out of the Reach of Children.**
3. Use pesticides at correct label dosages and intervals to avoid illegal residues or injury to plants and animals.
4. Use pesticides carefully to avoid drift or contamination of non-target areas.
5. Surplus pesticides and containers should be disposed of in accordance with label instructions so that contamination of water and other hazards will not result.
6. Follow directions on the pesticide label regarding restrictions as required by state and federal laws and regulations.
7. Avoid any action that may threaten an endangered species or its habitat. Your county Extension agent can inform you of endangered species in your area, help you identify them and, through the Fish and Wildlife Service Field Office, identify actions that may threaten endangered species or their habitats.

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