Proper hoof care is an essential part of any management program for horses and central to proper hoof care is a good schedule of trimming and/or shoeing. Neglected or improperly trimmed hooves can cause both chronic and acute lameness. Proper hoof care is simple for the horseowner and the time and money invested will be well worth the lameness prevented.

In general, a horse's "toe" will grow faster than the "heel." If left untrimmed for an extended period of time, the angle of the foot will change, causing the tendons to stretch and putting stress on the upper limb, causing the horse to toe out and even buckle over at the knee.

The goal of proper trimming is to make both the shape and the angle of the foot as normal as possible. Before the feet are trimmed, the horse should be observed both at rest and in motion, and trimmed according to his/her foot structure and axis.

Trimming begins as soon as the foal needs it. Foals that are born early in the season (midwinter) will stay inside for much of the first few months, and therefore won't wear down their feet as quickly as later foals. Their hooves should be trimmed at 6-8 weeks of age.

Foals that are born at the end of the season and are outside most of the time can usually wait until the fall for their hooves to be trimmed. There is no exact rule for trimming foals' hooves and since this is the period of fastest hoof growth, foals should be watched carefully for hoofshape and condition, and any conformational problems. Conformational problems may necessitate earlier and more frequent trimming. However, a veterinarian should be consulted because some conformational problems can be corrected if caught early.

Foals (and their feet) should be handled from an early age in order to prepare them for shoeing and to decrease stress and injury to both the foal and the farrier. Once a horse starts training or working regularly he/she should be shod on all four feet and the shoes should be reset every 4-6 weeks; racehorses generally need to be re-shod at 3-4 week intervals. Shoeing is important for traction, for protection of the feet, and for correcting improper gait. More serious conformational problems may necessitate corrective shoeing. Horses that are worked lightly on soft ground may be fine without shoes and should be trimmed every 4-5 weeks.

During the winter, heel calks will help minimize slipping and if the horse is worked outside, pads are recommended to prevent "balling-up" (accumulation of excess snow under the feet). If the horse will be working on slippery ground, Borium should be applied to the shoes. "Winterization" of horses' feet can prevent injury to both horse and rider.

Keeping a good trimming and shoeing schedule is an important part of being a horseowner and is vital to soundness of the horse.

Diana Lafer, '87, is hoping to go into equine practice upon graduation.
WORMING THE BROODMARE AND FOAL

By Eden Bermingham '88
Special Thanks to Dr. Jay Georgi

Worming both the broodmare and foal is one of the most important preventive measures a breeder can take to insure a healthy foal that will reach its full growth potential. Foals are infected with parasites both pre- and post-natally, and it is up to the breeder to recognize the methods of transmission and how to prevent them before the foal becomes overburdened with parasites.

The two main sources of contamination for the foal are the environment and the dam herself. Since it is often more difficult to directly reduce the amount of parasites present in the pasture and around the stable, it is usually more feasible for horseowners to worm all their broodmares regularly. This indirectly decreases the number of parasites passed on to the soil in the manure. However, it is possible to reduce the environmental contamination within the foaling stall itself by washing the stall, buckets, mangers, and in particular, the mare's udder and teats. This is mainly to decrease the number of ascarid eggs (Parascaris equorum). These eggs have a very sticky and resistant outer layer which enables them to adhere to objects in the stall. A disinfectant like Clorox may also be helpful in that it dissolves the outer layer of the eggs, making them more vulnerable to drying and removal.

Because one of the objectives of a worming program is to reduce pasture contamination, the mare and all other horses sharing a pasture should be wormed at least twice a year, alternating anthelmintics of different chemical nature every six to twelve months to lower the chance of acquired resistance within the parasite population. It appears to be most effective to worm after the frost in late fall and then again in early spring, before the mares are put out on pasture. The most important worming is that done around foaling time, since the adult parasite population is larger and there is an increase in the infective larval stages which are especially dangerous for the foal. As for the foal itself, many breeding farms worm foals over two months old every four to eight weeks. It is very important to treat all the broodmares and all their offspring in order to insure a reduction in pasture contamination, particularly that of strongyle eggs. It is also helpful to put recently wormed horses in a less contaminated field in order to decrease the danger of reinfection.

The three species of parasites that are most troublesome to foals are ascarids, strongyles, and Strongyloides westeri. The ascarids, which live in the small intestine, are very prolific and can cause severe contamination of pastures and barns. The infections are most common in foals and yearlings, which carry heavier parasite burdens than adults. Because they are so numerous and resistant, it is more effective to suppress these parasites with anthelmintics to decrease the initial contamination from the dam.

The most pathogenic parasites of foals are the strongyles that reside in the large intestine. There are two groups -- the large strongyles and the small strongyles. The small strongyles make up 80 percent of the strongyle population, but do less damage than the large strongyles that migrate extensively through various organs and tissues. Although the small strongyles are usually well tolerated, a large increase in their numbers in spring may cause
an inflammation of the intestinal mucosa, resulting in a persistent diarrhea which could prove fatal if untreated.

Among the large strongyles, the most pathogenic is *S. vulgaris*, which can migrate within the arteries of the intestines up to the cranial mesenteric artery (the main blood supply to the intestines), causing arteritis, which may lead to thrombosis and embolism of the blood vessels. This in turn can lead to a decrease in the blood supply to the gut and cause colic. The other large strongyle species found in the foal, *S. endentatus* and *S. equi*, are larger and more difficult to remove with anthelmintics, but their larvae are less destructive. Unlike *Strongyloides westeri*, which is relatively self-limiting, strongyle infection in the foal starts soon after birth and continually increases until adulthood. The initial infection is due in part to coprophagia, in which the foal ingests some of its dam's manure. This behavior not only helps to supply the foal's intestinal tract with bacteria and other normal flora, but also provides the strongyles with a convenient route of entry.

The last parasite described in this article is *Strongyloides westeri*, which is unusual in that it is passed on to the foal in the mare's milk. Larvae which were previously arrested in the dam's tissues start to migrate around foaling time, "leak" into the mare's mammary gland, and are carried out in the milk. Infected foals begin to pass eggs in their manure ten to fourteen days after birth. Diarrhea frequently occurs at this time. Since these two events coincide with the first estrus of the dam (the "foal heat"), nine to thirteen days post-partum, it is thought that parasites may be a contributing factor to "foal heat diarrhea," although the exact cause is unknown. Because of its unusual method of transmission, the incidence of *S. westeri* reaches a maximum between one and nine weeks after birth, then rapidly drops, disappearing at around five months of age when the foal is usually weaned.

There is now a variety of safe and effective anthelmintics to treat both the mare and foal. However, the horseowner should check with his or her veterinarian because some anthelmintics are contraindicated in pregnant mares and in foals.

An alternative method of worming which is more laborious but which could be less expensive in the long run, is to do periodic fecals and worm only those mares that are passing a significant number of eggs. This method is especially useful for determining the level of strongylid infection, but does not indicate the level of arrested larvae, as in *S. westeri*, where a negative fecal is no indication that the mare cannot infect her foal. The more selective worming schedule also reduces the chance of parasite resistance since anthelmintics are used only when needed rather than indiscriminately. The critical number of eggs per gram at which a mare ought to be wormed depends on several factors such as the extent, contamination, and productivity of the pasture, the number of animals on it, and their susceptibility. A suggested number for broodmares with foals in a small paddock is approximately 100 eggs per gram. However, this number should be subject to revision depending on the results achieved and any major changes in management practices.

Whichever worming method the horseowner chooses, the important thing is to adhere to a regular schedule and to take other necessary precautions such as thorough cleaning of foaling stalls and pasture rotation in order to reduce the initial infection of the foals to a manageable level. Although it is impossible to prevent all the avenues of parasite transmission, the horseowner can do much to reduce the parasite burden and produce a healthier foal by becoming aware of the methods of infection and taking steps to minimize the effect on the foal.

Eden Bermingham, '88, is looking forward to a mixed practice with a specialty in equine medicine.
A GOOD SHOT

By Luba Drouin

Establishing an effective vaccination program to meet farm needs can be a dilemma. The vaccination program needed for a single backyard horse differs from that for a horse in competition, which faces a much greater exposure risk. The first step in incorporating a general vaccination schedule is to know what can be vaccinated for and then adopt a regimented schedule to meet individual needs.

TETANUS: Clostridium tetani is an organism that is prevalent in horse manure and elsewhere in the environment. It grows in deep and closed wounds and under such conditions it produces a toxin that has an affinity for the nervous system. Once this toxin reaches the nervous system, the tetanic spasms and stiffness are evident. Horses are especially sensitive to this toxin. The vaccine available for tetanus is highly effective and every horse should be vaccinated annually.

Mares should receive a booster vaccination 30 days prior to foaling so that sufficient tetanus antibody levels are transferred to the foal. This will protect the foal until 2 - 3 months of age at which time the level of antibodies advanced from the mares' colostrum decreases to a non-protective level. A foal can be vaccinated beginning at 3 months of age, followed by a booster one to two months later. The booster is a must! The first vaccination wakes up the immune system; when the booster is given the immune system is ready and produces a much stronger antibody response. It is this second response that produces a protective titer. After the booster, annual vaccination is recommended.

Tetanus antitoxin is not a vaccine and should only be used in injured horses and mares and foals where the vaccination status is unknown. This antitoxin is produced from the serum of horses vaccinated with tetanus toxoid and works by combining with the neurotoxin before it has a chance to reach the central nervous system. The antitoxin provides only temporary protection for the situation at hand. To get good future protection, toxoid vaccine along with the antitoxin should also be given when you are not sure of vaccination status.

EQUINE RHINOPNEUMONITIS: The cause of equine rhinopneumonitis is a herpesvirus type 1 (EHV-1). In the equine population, this virus has three disease manifestations: respiratory disease, abortion, and neurologic disease.

The immunity produced by vaccination or by natural infection appears to be very short lived. Antibody titers disappear in three to four months. This is why horses that have been infected once can contract the disease again. Horses at high risk to contract the disease may be continuously exposed to different animals, and stressful conditions. The best way to protect horses in the high risk group is to vaccinate every two to three months. Vaccination should begin at 3 months of age, followed by a second injection one to two months later. Individual backyard horses may require only annual boosters depending on exposure risk. This is best left to the discretion of the veterinarian who is aware of the prevalence of EHV-1 in your area. There are two types of vaccines available for rhinopneumonitis and only one of these claims to be protective against abortion. When using this vaccine, the pregnant mare should be vaccinated during the fifth, seventh, and ninth months of gestation.

EQUINE INFLUENZA: Equine influenza is a viral disease. This virus is highly contagious and affects mainly the respiratory tract. If animals are rested for sufficient time, recovery is usually uneventful; but if the horse is stressed and returned to work too early, the disease may be complicated by secondary bacterial infection. When a thick nasal discharge is evident, it usually means that a bacterial infection is also present.
Again, as with Rhinopneumonitis, both natural and vaccinated immunity are short lived. In high exposure risk groups, reinfection may occur within 3 months. This is why, in these groups, vaccination may be required every 2 - 3 months. As with the previous vaccines, begin at 3 months of age and follow with a booster 2-3 months later. Mares should probably be vaccinated 30 days prior to foaling so that protective antibodies are transferred to the foal in the colostrum.

**EQUINE ENCEPHALOMYELITIS:** Equine Encephalomyelitis (Sleeping Sickness) is caused by three viruses: Venezuelan Equine Encephalomyelitis (VEE), Eastern Equine Encephalomyelitis (EEE), and Western Equine Encephalomyelitis (WEE). Wild animals and birds are the reservoirs of these viruses. Blood sucking insects, mainly mosquitoes, transmit these viruses from the reservoir animals to the horse. The Eastern form is the most virulent for horses and has the highest fatality rate. Horses should be vaccinated for EEE and WEE. Vaccination can begin at 3 months of age, followed by a 2 - 3 month booster, then annual vaccination before the insect season. These vaccines produce good immunity. VEE is absent in the United States, but it is present in Mexico and because mosquitoes do not respect international boundaries, horses traveling to states bordering Mexico should be vaccinated for VEE prior to transportation.

**STRANGLES:** Streptococcus equi is the organism that causes strangles. Once it gets into the environment, it is very persistent. Vaccination often decreases the severity of a strangles case, but some vaccines produce a swelling at injection sites. It is best to weigh the risks and benefits with a veterinarian regarding individual farm needs.

**EQUINE VIRAL ARTERITIS:** This virus-caused disease can produce a variety of signs from infection without any perceivable signs to edema of the extremities and/or abortions. The strain that first appeared in the 1950's was fatal to many horses. The strain that is causing so much confusion today appears to be different, producing minimal to no signs. Stallions that contracted the virus in recent outbreaks have shed the virus in the semen for up to six months after clinical signs resolved. In this way, the virus is spread to the mare who can take it back to the home farm. What effect this may have on conception or other animals on the farm is difficult to know but serological surveys indicate that large proportions of the U.S. horse population are susceptible to the virus.

EVA is a reportable disease in the state of New York and farms that are found to have EVA outbreaks are subject to quarantine. The New York State Equine Health Council has adopted some specific regulations for the 1986 New York State Thoroughbred breeding season. These regulations at this time apply only to Thoroughbred horses. All Thoroughbred breeding stallions must be tested for EVA status prior to registration for the 1986 breeding season. Special identification forms must be used. If the stallions are negative, then the owners can choose whether or not to vaccinate. Vaccines can be requested from the New York State Diagnostic Laboratory by the veterinarians.

**RABIES & BOTULISM:** Depending on the area of the country and the veterinarian's recommendations, vaccinations for rabies and botulism might also be advisable. A vaccination program will be most effective once practical schedules have been worked out with your veterinarian and then kept to that schedule. A vaccination schedule for a single backyard horse is not the same for a busy show stable or track where horses are exposed to many different viruses. The key to disease control is prevention and a good vaccination program is one of the best methods of disease prevention.

Luba Drouin, '87, worked at the Irish Stud last summer. She is especially interested in equine reproduction.
BREEDING FARM BASICS

By Marc A. Franz, '88
With Thanks to Tom Little, DVM

The day-to-day care of horses on a breeding farm is not much different than that on other farms. However, it does require tight management and special veterinary care if the farms are to be successful. Fertility examinations, lighting, early pregnancy checks, and teasing programs, as well as other routine checks, will help to insure productive breeding seasons.

Fall pregnancy checks are an important aspect of farm management. They identify mares that are not pregnant in time to correct any fertility problems and allow mares to benefit from artificial lighting. The use of artificial light to help induce estrus in mares at the beginning of the breeding season (February 15) is well established. Horses are seasonal breeders, and ovulation is induced by the increase in daylight hours in the spring. We try to hasten the onset of ovulation by using artificial light. This allows additional cycles in which to manage problem mares. It is recommended that lighting be implemented between December 1 and January 1 since it takes forty-five to sixty days to take effect. Sixteen hours a day of total light (daylight and artificial) is adequate. The artificial light should be extended in the evening hours rather than the morning. Recent evidence suggests a two hour "window" of light (two hour exposure to light) between the hours of 11 p.m. and 1 a.m., (or more accurately, beginning 14 hours after sunrise) will have the same effect as 16 hours of light. This is obviously more economical.

A gynecological examination of mares is a standard procedure on breeding farms today. Besides pregnancy detection, the exam allows you to confirm teasing behavior, optimize coitus with ovulation, diagnose and treat infectious and pathological conditions that may affect fertility. A complete exam is not always needed but may include external genitalia examination, rectal palpation, vaginal examination, cytological and bacterial exams, and endometrial biopsy. The first three are done as part of the routine teasing and palpation program on the farm.

The cytological and bacterial exams are procedures to protect other mares and stallions from transmissible diseases. A cytological exam involves microscopic examination of cells obtained from the wall of the uterus by contact of the uterine wall with a sterile swab. It is wise to obtain a culture and cytology smear from any barren mare at the end of the season and before the next season. Incoming mares to be bred on the farm should also undergo cytologic and bacteriologic exams. If a mare has a history of fertility or infection problems, she should be tested even if she was successfully in foal the previous season. The cytological examination is important because of the number of false negative cultures. Bacterial cultures are still important, however, in order to identify any infectious bacteria and their sensitivity to various antibiotics.

The uterine biopsy is a useful diagnostic tool for evaluating infertile or subfertile mares. It has been pointed out that concomitant use of rectal palpation and/or ultrasound may help localize the area to be biopsied. Histopathological results of the biopsy can be correlated with other clinical findings to help diagnose the mare's fertility problems.

Good management includes a good teasing program that the veterinarian can use to correlate with his findings of rectal palpation. Teasing is the introduction of a mare to a stallion to cause the mare to show estrus (sexual) behavior and help determine her sexual stage. A good teaser is a necessity. He must tease the last mare with the same enthusiasm and in the same manner that he teases the first mare. Teasing every other day is generally adequate. It is very helpful if the same person always evaluates the mares' response to the teaser so that the findings will be consistent. A good record of the teasing is important.
allows the veterinarian to look back over several weeks of teasing to predict the mare's estrus schedule.

Stallions also require fertility examinations. The examinations should be done routinely before the season begins and on any stallion thought to be subfertile based upon his conception or live foal rate. An acceptable range is 40% - 60% first service conception rate and 70% live foal rate over the season. This assumes that there was good farm management, and the mares were in good reproductive health. The stallion's reproductive organs -- sheath, scrotum, testes and penis -- should be examined and palpated. A rectal examination of the accessory sexual organs for abnormalities should also be attempted. Bacterial cultures again are useful, especially if a transmissible venereal disease is suspected.

Semen analysis is the most important part of the stallion's fertility exam. This requires collection using an artificial vagina. Standardbred stallions and other horses that are usually used for artificial insemination will be easy to collect. Analysis should be performed on each ejaculate collected during the season. Caution should be used when collecting semen from stallions unaccustomed to the procedure. Important data to analyze from the ejaculate include: gel fraction volume, semen fraction volume, gross appearance, pH, sperm concentration, sperm morphology, other cells present, and percent mobility. From this data the total number of sperm and the live sperm count per ejaculate can be calculated. This will help to assess the stallion's fertility.

New for the breeding farm agenda for 1986 -- in New York State -- are equine viral arteritis (EVA) regulations. EVA can be a sexually transmitted viral disease. Clinical signs may include fever, swelling of the distal extremities, and conjunctivitis. All New York thoroughbred stallions must be blood tested by an accredited veterinarian for exposure to EVA prior to registration for the 1986 season. Stallions that test positive must be test bred to determine whether or not they are shedding the virus. The new regulations also have an effect on which Thoroughbred breeding stallions can be imported into New York State. Detailed information regarding the new regulations can be obtained from your veterinarian, the New York State Diagnostic Laboratory at Cornell, or the New York State Department of Agriculture.

Marc A. Franz, '88, has a special interest in equine breeding farm medicine.
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