Prevalence, Demographics, and Risk Factors for Colic

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Prevalence

Colic is one of the most difficult diseases to study with epidemiologic methods due to the large number of diseases, which create the signs of colic. Making a specific diagnosis is not always possible in horses with colic; therefore classification of the simple colic is a challenge. Information about incidence, mortality, and risk factors is helpful to the clinician in making decisions about individual cases as well as herd problems.

The incidence of colic is relevant to assessing the rate of colic on farms or stables. Out of 100 horses in the general population 4-10 cases of colic is expected in one year.[1 2 3 4] About 10-15% of the colic cases are repeat cases with some horses having 2-4 colic episodes in a year.[1] Most colic signs represent simple colic or ileus with no specific diagnosis identified in 80-85 % of cases. In one cohort study ≈30% of horses with colic were identified by owners but never seen by veterinarians because the colic was transient or resolved by owner treatment. Studies of colic cases diagnosed in veterinary practices have also reported a predominance of simple obstruction or spasmodic colic. Impactions make up about 10% of cases. Obstructing or

strangulating diseases requiring surgery make up a from 2-4% of colic cases though some risk factors in certain populations can increase this rate.[5]

Colic is responsible for more deaths in horses that any disease group except for old age. In the normal farm population, horse mortality from all types of colic was 0.7 deaths per 100 horse-years with a colic case fatality rate of 6.7%. In one study case fatalities were due to stomach rupture, strangulating lesions or enteritis.[6]

The incidence of specific intestinal diseases is not known. Prevalence at university hospitals and some practices rank simple colic and impaction colic as the most common diseases. When the segment of bowel can be determined the large colon is the most commonly affected followed by the small intestine, cecum and small colon respectively.[5] Diseases which cause strangulation obstruction have the highest case fatality rate. Of these the large colon torsion is the most common with strangulation of the small intestine the next most frequent disease category.

Loss of use to colic averaged 2-3 days which is less that that experience with trauma, lameness or neurological disease. The cost of colic in 1998 in the United States was estimated based on a study of 28,000 horses.[3] The value of horses lost was assessed at $70,000,000.00 with total cost to the industry during the year estimated at $144,000,000.00. Though there is no study examining the number of abdominal surgeries performed for colic, an estimate based on the smaller studies, anecdotal numbers of surgeries at clinics, and the total number of horses in the United States is approximately 12-24 thousand annually or possibly as many as 2.7 colic surgeries every hour.

Risk Factors for Colic

Determining the cause of different diseases that cause colic is problematic since only natural disease has been studied. In some cases the cause may be evident such as in the case of grain overload, or an enterolith but even in these cases the mechanism which initiates the problem is often unknown. By determining risk factor the cause may be elaborated, and it is often possible to reduce the incidence of colic be decreasing exposure to the incriminated risk. The amount of risk is stated as the odds that the colic incidence will increase in a group of horses exposed to a particular factor compared to the colic incidence in a group that is not exposed to that factor.

Though not easily controlled, horses that have had a previous colic are 3 times as likely to have a second colic compared to a horse that has never had colic. Said another way, if the colic incidence in normal population of horses that have not had a colic episode is 10 out of 100 in a year, the rate of colic in a population of horses that have had a previous colic would be 30 out of 100 per year. Colic risk can be also be categorized into internal and external risks.

Signalment:

While no breed is immune, observations in several studies have suggested that Arabian horses[7] have more colic when other studies have reported more colic in Thoroughbreds.[3] Standardbred, gaited horse and Warmblood stallions appear to have more inguinal hernias due to the increased size of their inguinal rings. Though rare, the recessive and lethal trait of aganglionosis occurs in paint foals born to overo mares mated with overo stallions and so far the only genetically linked disease recognized to cause colic.

Young and older horses appear to be at less risk of simple colic.[8] Middle age horse have been reported to be at higher risk than older horses.[9] Weanling and yearlings are more likely to have ileocecal intussusceptions and older horses (>12 years) have more strangulating lipomas and colic requiring surgery.[9]

Sex is an apparent risk for some disease such as inguinal hernia in stallions and large colon displacement/volvulus in periparturient mares. Male horses (geldings and stallions) and older horses appear to be at slightly higher risk of entrapment of the small intestine in the epiploic foramen. For the most part male and female horses appear to be equally affected by simple colic which is probably related more to management or activity.

***Diet**:*

Feeds or feeding activity have long been blamed for colic. Course roughage with low digestibility or particularly course fiber is observed to cause impaction colic. Poor dentition has been linked to colic due to poor mastication of food, though this has not been scientifically evaluated.[10] Grain overload increases the risk of colic and laminitis. Feeds such as lush clover and lush pasture have been implicated in causing tympany. Horses fed Bermuda grass hay have an increase risk of ileal impaction[11] and some horses have been reported to have more colic when fed alfalfa hay. Feeding from round bales was also associated with an increased risk.[12]

When investigated by case control and cohort studies, increased amounts of grain, changes in the type of hay and grain during the year all increased the odds of colic compared to horses without grain or changes in feed. One study also reported that daily feeding of concentrate from 2.5 to 5 kg/day and > 5 kg/day to adult horses increased the risk of colic 4.8 and 6.3 times, respectively, compared to horses fed no grain (FIGURE 1). [8] Pellet feeds and

sweet feeds were associated with an increased risk of colic compared to no grain fed or single grain diets. Grain diets are also know to decrease the water content in the colon contents due a decrease in fiber which binds to water. Grain in the diet also increases gas production and is more likely to create the environment needed for tympany and displacements.

Feeding small amounts of grain at frequent intervals has been reported to reduce the fluid shifts in the large colon seen with twice daily feeding. Though no relationship was found between feeding frequency in one study [13], feeding more than twice daily increased the risk of colic in a Virginia-Maryland Study [8]. This increased risk was suspected to be due to an increased daily intake of grain rather than the frequency of feeding.

Environment/Management:

Housing and confinement on the farms in a Virginia-Maryland Study were not risk factors for colic.[8] However, other reports have suggested there is an increased risk of cecal and large colon impaction in horses that have acute decreases in activity, such as curtailing regular exercise or changing from turn out activity to strict stall confinement due to an injury or after surgery. [14] A case-control study in Texas found decreased colic risk with lower horse density on pasture and with availability to a pond and this has been supported by studies from the United Kingdom. [4] Turn out in paddocks without water has been associated with an increased risk of colic. [13] The type of activity is often related to the housing and further investigations into the relationship between housing and type and frequency of exercise is needed.

Management factors are difficult to compare between farms and changes in management even more difficult to detect. The increased risk of colic associated with care by trainers and managers compared to care by owners is supported by two studies. [13 10] These findings suggest

either difference in observation between these two groups or better management by owners in horses with more intensive exercise.

It seems logical that housing and diet or feeding routine may associated with a risk of colic. Anecdotal information from large breeding farms suggest that the routine of feeding horses grain after being brought in from pasture and then keeping them in stalls increases the risk of colic and specifically colon tympany and displacement. By altering the routine by keeping horses turned out after feeding grain decreases the rate of colic albeit based on farm records and veterinarian impression. Similarly when hay is available to horses on lush pasture, the hay will be consumed as part of the diet and colic rate is decreased with horses turned 24 hours per day.

Specific diseases occur in different regions of the world.[5] Grass sickness is diagnosed in the United Kingdom, Europe and South America but not in North America. Ileal impactions are found predominately in the South Eastern United states and Europe. Enteroliths are seen more frequently in California, the Midwest and Florida. Sand colic and impactions are seen where horses graze on pastures grown on sandy soils or where horses are force to eat off the ground which is predominately sand or fine gravel. These diseases do not make up the predominate type of colic, which appears to be simple colic related to universal internal or external factors.

Event Associated Colic Risk

Previous Colic- Horses having a history of colic were at higher risk for more colic episodes. [15 8] Also, horses, which had previous abdominal surgery, were also at higher risk of repeat colic which in most cases is felt to be due to adhesions or bowel scarring with stricture. Horses have a higher rate of repeat colic (1-2) episodes within the first 2-3 months after surgery after which the rate decreases to near normal. Horses with colon impactions had a high rate of

repeat colic. The reason for this increased risk is not known but decreased numbers of neurons in the myenteric plexus of the pelvic flexure and right dorsal colon in horse with chronic colon obstruction may create alterations in bowel motility.

Parasites- Parasites have been related to an increased colic risk by several studies. Obstructions due to ascarids in foals, tapeworm related colic and strongyle infection have all been reported as causes of colic, usually based on small groups of cases. Uhlinger found a decrease in colic after controlling small strongyle infection on several farms with a high colic incidence. [16] Tapeworm infection has also been related to increase colic and specifically with colic associated with diseases of ileum and cecum including increasing the rate of ileocecal intussusception and cecocecal intussusception. [17] Though there are no studies to reflect the incidence or prevalence of colic associated with thrombosis of the cranial mesenteric artery due to *Strongylus vulgaris* larva, the decrease in this disease found at surgery and necropsy appears to parallel the decrease number of horses with thrombus formation at the mesenteric artery with generalized use of ivermectin over the last 20 years.

Cribbing- Recently cribbing, long associated with an increased risk of colic was shown to cause an increased risk of simple large colon obstruction and for entrapment of the small intestine in the epiploic foramen. [18] The act of aerophagia likely creates negative pressure in the abdomen leading to movement of bowel into the potential space within the lesser omental sac. A similar event is speculated for inguinal herniation due pressure change in the spermatic cord when testicles descend after being retracted during breeding.

Pregnancy- The mare has been reported to have a higher risk for colon displacement or volvulus during late pregnancy or lactation. [19] [20] However, all studies have been based on selected populations of mares or in regions with high numbers of broodmares. When compared for exposure for events in a Virginia-Maryland Study, mares had an increased risk of colic from 60 to 150 days after foaling. [8] The physiologic events which predispose to this increased risk are not known, but calcium levels and alterations in diet including increases in energy due to more concentrates in the diet to support lactation may be related to this increased risk.

Exercise/Performance- To date, studies have not fully appraised the risks associated with exercise or activity level. Racehorses, event horse and horses used on endurance rides all have an increase risk of gastric ulceration which can be linked to some colic episodes. Though horses used for racing or eventing had the highest incidence of colic in a Virginia-Maryland study, these activities did not pose an increased risk when compared to other factors. [8] Recent studies found decreased risk for horses on premises which trained horses for eventing versus those stables which were training horses for racing on the flat track.

Horse transport- Horse transport increased the risk of colic risk in several studies. [16] [8] [10] This has been suspected by practitioners, who commonly administer a laxative prior to shipping to prevent colic from impactions. The mechanism or cause of the increased incidence is unknown. When combining risks of transport, feeding grain and cribbing the risk was markedly increased. [6]

Fever- It is logical that horses with infection could have alteration of the gastrointestinal tract predisposing them to colic. Fever within 14 days of a colic episode was highly associated with increased risk of colic in a Virginia-Maryland Study. [8] Since the reported causes of fever in these cases were varied, no specific relationship or cause for each colic was established.

Weather- Veterinarians and owners frequently associate weather changes with increased frequency of colic, but most of the previous studies have been unable to find statistical proof of increased risk. A recent study in Texas found an increased risk of colic associated with weather changes as recalled by owners of horses with colic. [7] Cold weather which affects water intake has been linked to increased impaction colic. When examined as a direct exposure in a Virginia-Maryland study, weather did not appear to be related to the colic. [8] When events were investigated by looking at a 14-day window preceding colic episodes in both horses with colic and controls, low humidity and snow marginally increased colic risk. [8] Owners certainly remember the weather at the time colic occurs but there does not appear to be a clear relationship. In a study in Virginia 7 cases of colic occurred during a snowstorm over a 3-day period. [6] This was unusual as there were only 104 cases of colic in the horses being studied for a full year. What became apparent from records kept by the farms was the change in management due to the new snow. Horses were kept in rather than being turned out, and the diet was not altered even though horses had no turnout our exercise. Most likely the focal increase in colic episodes was not directly related to the weather, but rather due to management changes caused by the weather.

Enteroliths- Enteroliths are made of magnesium ammonium phosphate and often form around a nidus such as a stone or wire. Horses consuming hard water, alfalfa hay and with a higher pH and mineral concentrations of colon ingesta, as well as living in California, are at higher risk for this problem. [21]

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Figure 1: Odds of colic in horses fed concentrate (in kilograms) as part in daily diet compared to horse fed no grain. The stars indicate a significant difference from no grain fed.