Do horses respond differently to threats from the left or the right?

Horses’ eyes are set on the side of the head. Apart from a blind spot directly behind them, horses have a wide field of vision. In front, the visual fields overlap giving about 65 degrees of binocular vision.

To the side, objects are seen by only one eye.

Another interesting feature of equine vision is that (unlike humans) most of the fibres of the optic nerve cross over (“decussate”) so that the brain processes the signals on the opposite side. For practical purposes, objects detected by one eye are seen by the cerebral hemisphere on the opposite side.

In other species at least, the right side of the brain is involved in processes that require rapid responses. The left side of the brain tends to analyse the stimuli before initiating action. Horses show a typical response to danger. Their first thought is to flee. When far enough away from danger, they swing their hind-quarters round so they face the threat.

Scientists in Australia have been looking at whether horses respond differently to a threat depending on which eye first sees it (and hence which side of the brain first deals with the threat). Nicole Austin, a graduate diploma student and Professor Lesley Rogers conducted the research at the University of New England in New South Wales.

A coloured umbrella was used to provide the fear-inducing stimulus. One of the researchers stood five metres away from the horse, opened the umbrella suddenly and walked quickly towards the horse. Each horse was approached (on different days) from in front and from either side. The horses moved further away when threatened from the left. Seventeen horses moved further when approached from the left; compared with only four that moved further when the threat came from the right. Three horses showed no preference.

When the horses could see the threat with both eyes at the same time, they showed no majority preference for turning one way or the other. So the different responses when threatened from the left or right were likely to be due to differences in processing the stimuli in one side of the brain rather than a preference for running away to the right or left. Horses that escaped rightwards (thus choosing to view the threat with their left eye) were more reactive than those that escaped towards the left.

It was also interesting that horses seemed to learn more quickly not to react to a threat if they first saw it with their right eye. Not only was their initial reaction less, they also showed less reaction when later challenged from the left side.

Professor Rogers suggests that knowing horses perceive the world differently on each side may have practical applications. Perhaps horses would be more relaxed and learn more quickly if handled from the right, and encouraged to first experience new challenges with the right eye.

For more details see:

Asymmetry of flight and escape turning responses in horses.
NP Austin, LJ Rogers.
Can wider horses carry more weight?

Research suggests that horses with wider loins may become less sore than other horses, when carrying heavy loads.

Dr Debra Powell and her colleagues at the Ohio State University Agricultural Technical Institute, Wooster, conducted a study in which horses, carrying up to 30% of body weight, were monitored performing a standardised ridden exercise test in an indoor school arena. After five minutes active walk to warm up, the horses were ridden at a trot (3m/s) for 4.8km, followed by 1.6km at a canter (5m/s). This exercise schedule was chosen to simulate a 45-minute work period of work typical of an intermediate-level riding school horse.

The researchers measured heart rate, plasma lactate concentration and creatine kinase. Lactate is produced in the muscles during exercise. At low levels of work the body can metabolise it and so levels in the plasma remain low. As the work level increases the rate of lactate production exceeds the body’s ability to remove it and so concentrations rise. Creatine kinase (CK), an enzyme present in the muscles, is released into the blood as a result of some types of muscle damage.

An animal massage therapist assessed muscle soreness and muscle tightness before and after exercise.

The findings seemed to support the view that horses can carry up to 20% of their body weight without difficulty. There was little difference between all the measures when horses carried either 15% or 20% of body weight. However, when the weight carried increased further, the scientists started to detect differences.

When horses carried 25% or 30% of their body weight their heart rate remained elevated for longer after exercise. The serum CK level was higher immediately after exercise, and 24 and 48 hours later, in horses carrying 30% body weight compared with those carrying 25% or less. There was no change in CK when horses carried 15 and 20%. Plasma lactate levels were higher immediately after exercise and 10 minutes after end of exercise, in horses that had carried 30% of their body weight.

Horses carrying 30% body weight showed a significant increase in muscle soreness and muscle tightness scores. The changes were less marked when they carried 25% body weight.

Are there physical characteristics of the horse that you can use to determine what weight it can be carried?

The study also investigated whether the horse’s conformation affected its weight-carrying capacity. The scientists looked at the horse’s height, circumference of the cannon midway between knee and fetlock, and width of the back (loin) behind the saddle - between the last rib and pelvis.

They found that horses with wider loins showed less muscle soreness and tightness when carrying 25% and 30% body weight.

This was a small study involving only 8 horses. The scientists suggest that further investigations into the value of loin width as an indication of weight carrying ability would be worthwhile.

For more details see:
Mounting method affects saddle pressure.

Back problems are often blamed for poor performance and behavioural problems in horses. An ill-fitting or damaged saddle can cause pain. But does the way the rider mounts affect the horse's back?

Hilary Clayton and colleagues at the Mary Anne McPhail Equine Performance Center, at Michigan State University’s College of Veterinary Medicine, at East Lansing, have been investigating the forces that the saddle exerts on a horse’s back.

Their study looked at how the pressure under the saddle differed depending on whether the horse was mounted from the ground or from a raised mounting block.

Ten experienced riders, of different weights and heights, took part in the study. Each mounted the horse from the ground and from a mounting platform. The horse, a 14 yr riding horse gelding, was clinically sound, had no back problems, and was ridden in a correctly fitting dressage saddle.

A pad placed under the saddle contained an array of pressure sensors. Each individual measurement was analysed to produce an overall picture of the pressure gradients.

The study showed that the horse’s withers play an important part in stabilising the saddle as the rider mounts. There was a marked downward force in the left stirrup as the riders right leg swung upwards. If the area under the saddle was divided into quadrants (inner and outer, front and back) on each side, the peak pressure occurred at the right fore inner (by the withers) and left fore outer quadrants.

Unsurprisingly, the study also confirmed that heavier riders exerted greater pressures on the horse's back. From their results, the scientists calculated that a rider weighing 50kg mounting from the ground would exert a maximum total force of 547N. A 100kg rider would exert a maximum total force of 914N.

However, it is not so much the maximum total force that caused problems. The forces recorded during mounting were actually slightly lower than those recorded when the horse was ridden at a walk, and much lower than during cantering.

Similarly the inertial effect caused by the right leg swinging up was less than that measured during the trot and canter. These pressures were distributed evenly and were only likely to present a problem if the saddle did not fit properly.

More important is the fact that the forces experienced during mounting are asymmetrical - concentrating the pressures on localised areas at the right withers.

The scientists suggest that heavier riders should be encouraged to use a mounting block rather than mount from the ground, regardless of how agile or tall they are. This should help limit the possible harmful effects of mounting from the ground.

Wide, flat withers make it more likely that the saddle will slip towards the side of mounting, warns Dr Clayton. This is especially so when the saddle tree is narrow and sits too high above the withers.

For more details see:

Forces and pressures beneath the saddle during mounting from the ground and from a raised mounting platform.
Are stud fees a good indicator of future success on the racecourse? Not necessarily - according to research carried out at the University of Edinburgh.

The goal of mare owners is to breed successful foals. How can they judge between potential stallions? It is not unreasonable to assume that higher quality stallions command higher stud fees. But does the size of the stud fee give a good indication of the genetic quality of the stallion?

Drs Alastair J Wilson and Andrew Rambaut, working in the Institute of Evolutionary Biology, reviewed the breeding and performance records of over 4000 Thoroughbred racehorses. Their findings were published in the Royal Society’s Biology Letters.

They collected information on lifetime earnings (as an indication of how successful the horses had been during their racing career) and stud fee for 554 breeding thoroughbred stallions. The lifetime earnings of each stallion’s ancestors, both male and female, going back four generations were also noted. This gave them data on over 4000 horses, which they subjected to genetic analysis to see whether success as a racehorse was inherited.

They found that the trait for higher lifetime’s earnings could be passed on from one generation to the next. Heredity accounted for less than 9% of the variation - environmental factors, such as the training regime, choice of races and jockeys, played a more important role. Nevertheless, the fact that lifetime earnings are inherited means that the mare owner has the opportunity to try to select better genes.

On the other hand, although lifetime earnings are heritable, the size of the stud fee is not. The stud fee of the stallion had no effect on the earnings of the offspring. Lifetime earnings and stud fees were related, but this was purely due to environmental factors. There was no underlying genetic component involved.

Indeed, Wilson and Rambaut calculated that for an extra dollar spent on stud fees, you could expect only a $0.02 increase in the lifetime’s earnings of the offspring.

Evolutionary biologists speak of an “honest signal”, a physical characteristic that is a good indicator of the underlying genetic makeup. It appears that the equine stud fee is not an honest signal of the stallion’s genetic quality.

“There are good genes to be bought, but you don’t always get what you pay for” warns Dr Wilson. If the goal is to maximise the lifetime prize winnings of the future foal, stud fees do not accurately reflect a stallion’s genetic quality.

For more details see:

Breeding racehorses; what price good genes?
Biology letters. doi 10.1098/rsbl.2007.0588
AJWilson, A Rambaut
Yeast cultures may help improve the digestibility of low quality roughage in the horse’s diet, according to a University of Georgia study.

Forages such as hay and silage can vary considerably in their nutritional value to the horse. Factors like the species and variety of the forage, stage of growth when cut and method of preservation, influence the nutritional value.

What can be done to help the horse make the most of lower quality forages? It has been suggested that yeast supplements can improve digestibility. However, there have been conflicting reports about their value.

Laura Morgan, working with Dr Josie Coverdale and others in the department of Animal and Dairy Science, at the University of Georgia, Athens, looked at the effect of adding a yeast culture supplement to diets of varying forage quality.

Healthy adult horses were used in the study. They were fed a commercial grain mix, with or without a yeast supplement, with either high or low quality Bermuda grass hay. Bermuda grass is a common pasture grass found in tropical and sub-tropical regions around the world. The “lower quality” hay was, in fact, typical of hay used for feeding horses. The yeast culture*, containing Saccaromyces cerevisiae, was added to the morning grain mix.

Horses were fed according to body weight. The grain and forage rations were fed at 0.43% and 1.35% of body weight respectively.

After allowing time for the horses to adapt to each diet, the scientists analysed faecal samples to calculate the digestibility of the diet.

They found that the quality of the forage influenced how efficiently the horses digested it. Diets based on high quality forage were more digestible than those containing low quality forage. Horses tended to eat more (on dry matter basis as a percentage of body weight) when fed the lower quality forage.

Overall, adding the yeast culture to the diet did not affect grain or hay intake (on a percentage of body weight basis). Nor did it influence digestibility.

But, the scientists did notice an effect when they looked specifically at the low quality diet. The yeast culture tended to increase the dry matter (DM) digestibility. It also tended to increase dry matter intake, and increase the digestibility of NDF (neutral detergent fiber – a measure of the fiber content of the feedstuff), hemicellulose and crude protein.

They suggest that supplementation with yeast culture can be used to improve the digestibility of diets containing low quality forage.

*Diamond V XP Yeast Culture, Diamond V Mills Inc, Cedar Rapids, IA

For more details see:

Effect of yeast culture supplementation on digestibility of varying forage quality in mature horses.
LM Morgan, JA Coverdale, MA Froetschel, I Yoon.
Scientists in Barcelona have described a possible new technique for treating tendon damage.

Tendon and ligament injuries are among the most troublesome problems encountered by equine athletes. Healing is slow, taking up to a year or more. And the eventual repaired tendon is rarely as strong as it was before the injury.

Work carried out at the University of Barcelona raises the possibility of treating such injuries with platelet concentrates.

Dr Marta Prades and colleagues in the Department of Animal Medicine and Surgery gained promising results using platelet rich plasma to treat tendon and ligament injuries. In a pilot study, they treated five horses using the technique. Two had recent damage to a forelimb superficial digital flexor tendon (SDFT); three had long-standing proximal suspensory ligament (PSL) desmitis.

The platelet concentrates were prepared by taking blood from the horse to be treated. Whole blood was collected into tubes containing sodium citrate to prevent it clotting. The platelets were separated from the other components of the blood by centrifugation, and were activated before use by adding calcium chloride. Generally 75ml of blood yields about 5ml of platelet concentrate.

Because the platelets come from the horse to be treated the risk of adverse reaction is minimal.

The prepared platelet concentrate was injected into the damaged tendon under ultrasound guidance using ultrasound to ensure that it was injected at the correct place. The procedure was repeated three times at two week intervals.

The two horses with SDFT damage showed improvement both clinically and on ultrasonography. No improvement was detected in the ultrasound appearance of the (PSL) desmitis cases, although all three cases improved clinically.

All horses returned to previous level of performance within 6 months. No recurrence of the injury within 20 months.

Why use platelets to treat tendon injuries? Platelets supply some of the growth factors that control inflammation and tissue repair.

Dr Prades emphasises that it is not possible to draw any conclusions about whether the treatment is effective or not. However, the procedure does appear to be safe – no adverse effects were noticed in the five treated horses.

She suggests that injecting autologous platelet concentrates could provide a promising new treatment for damaged tendons and ligaments. She suggests that further investigation into the value of the technique would be worthwhile.

For more details see:

Autologous platelet concentrates as a treatment for musculoskeletal lesions in five horses.

At what age do behavioural characteristics become apparent in foals? Can you judge a horse’s future temperament by observing it as a foal?

Researchers at France’s National Institute for Agricultural Research (INRA) have undertaken a major study into temperament in horses. By classifying horses into one of two profiles, they have been able to identify horses that were better suited to certain types of work.

For example, less fearful horses which reacted little to humans, and were not very socially motivated proved to be the easiest to handle and lead outside. These horses would be better suited to leisure riding.

On the other hand, more fearful horses, which reacted more to humans, and were more socially motivated proved to be more difficult to handle. They were more successful over jumps and at dressage. These horses would be more suitable for an experienced rider.

Temperament is the product of various different behavioral tendencies or traits, such as fearfulness, sociability, and aggressiveness. These traits are generally thought to appear early in life and to remain fairly constant as the individual grows. That is not to say that the behaviour is always present from birth. Other factors such as development or experience play a part.

From what age can you reliably assess a horse’s temperament?

As part of their study, the researchers at INRA looked at the way foals responded differently to three behavioural tests at different ages. They studied groups of foals at 3, 12, and 24 weeks old to see if the behavioural responses remained constant or changed with age.

Three tests were used:

- **Human approach.** A researcher approached the foal quietly and slowly. If she was able to get close enough to the foal, she tried to touch it and rest a hand on its forehead for 2 seconds.

- **Novel object.** Two tires on top of each other were placed in the middle of the test pen. Approaching the object is interpreted as an absence of fear.

- **Frightening stimulus/startle test.** A tower of brightly coloured cubes was made to topple over. Running away from the sudden stimulus is taken to indicate fear.

The findings indicated a clear change in response between 3 and 24 weeks. This occurred regardless of the sex of the foal. Human avoidance and novel object approach were almost non-existent in 3 week old foals. But they became more present in older groups. Foals increasingly avoided human contact as they grew older.

On the other hand, significantly more foals in the 24 week old group touched the novel object than did foals in either of the two younger groups. Perhaps as well as testing fear this test is also influenced by a developing curiosity.

The researchers followed a further group of foals and found that, once present, the behavioural traits remained constant. Once the foal started to show a certain behavioural response, it always did so when challenged again later.

What is the practical relevance of this research? Very young foals showed very low avoidance reactions, especially towards humans. This may make them easier to handle. Early handling could be used to familiarise foals with management procedures.

Also, few young foals showed approach or avoidance reactions, which are important criteria for determining the temperamental profile. So it is best to wait until weaning to select foals on the basis of their behaviour.

For more details see:


http://www.international.inra.fr/press/predicting_the_temperament_of_a_horse
Danish research suggests that the presence of a calm companion may help overcome fear in young horses.

The horse’s initial response to danger is to flee. While this may improve the chance of survival in the wild, it is potentially dangerous in the confined spaces more often encountered in the domestic situation. Frightened horses present a risk both to themselves and to their handlers.

Experienced horses are often used to accompany youngsters starting to work in traffic or during transportation. Young horses have to learn to cope with many potentially frightening situations, such as clipping, hoof trimming, shoeing, and visits from the vet. Could calmer horses be used in those situations to help young horses overcome their fear of new experiences?

A study led by Dr Janne Christensen looked at whether horses would react less to a standard frightening stimulus if they were accompanied by a calm horse.

Thirty-six two-year-old Danish Warmblood stallions were involved in the study. They were placed two at a time in a test arena, in the middle of which were two feed containers. Opposite the feed containers was a black plastic bag. This provided the frightening stimulus. While the horses were eating, someone standing out of their line of sight pulled on a piece of string to raise the bag.

One of each pair of horses was the subject of the study and was fitted with a heart rate monitor. Some horses were paired with a “calm” companion that had been trained previously not to fear the moving black bag. Others were paired with horses that had not seen the moving black bag before.

The researchers found that horses paired with a calm companion showed fewer signs of fear. They returned to feeding sooner after being exposed to the frightening stimulus. They also had lower heart rates than did the horses paired with inexperienced companions.

The test was repeated later with the horses being exposed to the fear-inducing stimulus without a companion present. The difference between treatment groups persisted.

So, not only did the horses with calm companions show less fear when exposed to the frightening stimulus, they also seemed to learn from the experience.

Dr Christensen concludes that there seems to be the potential for using social influence for reducing fear in horses. Rather than simply keeping young stock in groups of their own age, it may help to include older experienced horses. It may be possible to use older companion horses to help youngsters overcome fear of practices such as dentistry or hoof trimming, thus reducing the need for sedatives.

She points out that more work has to be done to determine whether gender, age or social standing in the herd affects the value of a horse as a calm companion.

For more details see:

Effects of a calm companion on fear reactions in naïve test horses.
JW Christensen, J Malmkvist, BL Nielsen, LJ Keeling.
Many feed supplements are marketed for calming excitable horses. Do they actually work?

A common ingredient is L-tryptophan, often combined with other “calming” ingredients such as magnesium and thiamine. Although tryptophan has been shown to have a calming effect in some species, there is no convincing evidence that it does so in horses. Indeed, high doses may be toxic. Shetland ponies given high doses (600mg/kg) of tryptophan by stomach tube became restless, had an increased respiratory rate, and haemolysis. Another study found that tryptophan supplementation caused reduced stamina.

The body uses tryptophan to make serotonin, a neurotransmitter. Increased levels of serotonin in the brain have been associated with sedation, increased sleepiness, reduced aggression, and reduced fearfulness.

The rationale for giving extra tryptophan is that it should lead to an increase in serotonin in the brain, which in turn should have a calming effect. But it’s not quite as simple as that. A number of factors may influence the uptake of tryptophan by the brain. For example, the large neutral amino acids (LNAA) (such as leucine, isoleucine, tyrosine and phenylalanine) compete with tryptophan for transport into the central nervous system.

Research carried out by Dr Glenys Noble and others at the School of Agriculture and Veterinary Science, Charles Sturt University, in New South Wales, Australia looked at the effect of tryptophan on horses.

Tryptophan was given as a single dose immediately before a meal of roughage or oats. The dose used (6.3g, equivalent to 12mg/kg) was towards the top of the range of doses recommended for commercial preparations. Indeed, some recommend much lower doses. Horses in a control group were given a syringe of water instead of tryptophan.

The scientists found that a single dose of tryptophan produced a significant increase in the plasma tryptophan concentration. When horses were given tryptophan followed by a meal of lucerne hay, their plasma tryptophan levels increased to over three times untreated levels. Peak levels were reached about 1.5 - 2 hours after the dose was given. The LNAA concentration also rose but the ratio of tryptophan to LNAA remained high for several hours.

Plasma tryptophan also increased when treatment was followed by a diet of oats, but the levels fell more quickly. However, as the LNAA concentration also fell, the ratio of tryptophan to LNAA remained raised for several hours.

So, the plasma tryptophan levels, and the ratio of tryptophan to LNAA, were highest two hours after treatment. In the second part of the study, the scientists assessed the horses’ behaviour two hours after treatment - the time when the tryptophan would be expected to have the best chance of having a calming effect. They watched how each horse responded to being in an empty enclosure and then observed its response to an unfamiliar person and a new object.

They found no significant differences between the treated and untreated horses.

Dr Noble suggests that more work is needed to decide if there is a dose of tryptophan that is both safe and effective as a calming agent for horses.
Horse tapeworms (*Anoplocephala perfoliata*) are not easy to identify in faecal samples. Unlike roundworms, they don’t release eggs regularly. Not only does this make it difficult to identify infected horses; it causes problems monitoring the response to treatment.

A blood test developed at Liverpool Vet School measures antibody to a specific tapeworm antigen. The level of antibody (measured as Optical Density (OD)) gives an indication of the extent of the tapeworm infection - low, medium or high.

It takes time for the horse’s immune system to respond to infection and produce antibodies. It also takes time for the antibodies to disappear after the parasites have been removed.

So, when is the best time to take another sample to see if treatment has been successful? How long does it take for antibody levels to fall after treatment? Answers to such questions were provided by a study carried out by John Abbott and others, which looked at the response to treating tapeworm-infected horses with praziquantel.

All horses in the study had tapeworm ELISA OD greater than 0.2, indicating a moderate level of infection. They were all grazing the same pasture, and had not been treated for tapeworms recently. So all were probably infected.

The horses were divided into two groups according to whether they had tapeworm eggs in their faeces.

The first group, with tapeworm eggs in the faeces, were treated with praziquantel, which is highly effective against tapeworms. The second group received no tapeworm treatment. Both groups were also treated for roundworms with ivermectin.

The tapeworm antibody level fell in the praziquantel treated group, becoming significantly lower than the control group after 4 months. By this stage 75% of horses treated for tape-worm had ELISA OD less than 0.2 (ie zero to minimal infection intensity.)

The researchers warn that it is important not to take a second sample to monitor response too soon after treatment. If a horse has been treated within the past 4 months, a result suggesting a “moderate” level of infection (>0.2 OD) may not indicate current infection. It is likely that the antibodies were produced in response to tapeworms present before treatment was given.

They suggest that the optimal time to monitor the effectiveness of treatment is about 5 months later. This is longer than has been suggested previously.

When should you take samples to look for signs of re-infection? The researchers only detected a significant increase in ELISA antibodies 10 months after treatment. At the same time, 50% of the treated horses started excreting tapeworm eggs in the faeces again.

Current recommendations suggest that horses with high levels of tapeworm infection be treated every six months. But is this too often? These results, obtained under conditions where the horses were probably being re-infected all the time, suggest that 9 months would be an acceptable interval.

Writing in the Equine Veterinary Journal, Abbott and Barrett suggest that you can only be sure that a horse treated over 5 months previously has become re-infected if the OD results indicate a “high” level of infection, or there is an increase of more than 0.2 OD units in paired samples 2 months apart- or there are tapeworm eggs in the faeces.

Why worry about this? Why not just treat horses for tapeworm twice a year anyway? There is increasing concern about the development of resistance to anthelmintics (particularly in the cyathostomins or small redworms). This has led to an emphasis on strategic or targeted treatment. Medications are given only when necessary to try to reduce the risk of resistance developing.

Resistance among tapeworms does not yet seem to be a problem, but there have been reports of redworms becoming resistant to pyrantel - one of the drugs used to treat tapeworms. Minimising its use may slow the spread of pyrantel resistance in cyathostomins.

For more details see:

Serological changes observed in horses infected with *Anoplocephala perfoliata* after treatment with praziquantel and natural re-infection.


The problem of diagnosing tapeworm infections in horses.

JB Abbott, EJ Barrett.


www.diagnosteq.com
As the breeding season gets under way in the northern hemisphere it is worth remembering the increasing reports of the large roundworm becoming resistant to ivermectin.

Worm control routines that have been used successfully for many years may no longer be appropriate. Further evidence that ivermectin is becoming ineffective against the large horse roundworm is presented in a recent report.

The study looked at the extent of Parascaris equorum infection on a Swedish stud farm. It was prompted by the death of a foal that on post mortem examination was found to contain a massive burden of P. equorum. This was despite the foal having been treated regularly with ivermectin.

Dr K Lindgren, of the Swedish Institute of Agricultural and Environmental Engineering, and others, monitored the droppings of 15 foals on a stud farm in Sweden for parascarid eggs. They collected samples on five occasions from late August to November. Foals had been treated with ivermectin every two months from two months of age. Ivermectin is widely used in foals, as it is effective against the small roundworms (cyathostomes) that are often resistant to benzimidazoles such as fenbendazole.

They first found P. equorum eggs in the faeces when the foals were 3-4 months old. Most foals started to excrete large numbers of eggs by the time they were 4 months old. Egg production peaked a couple of months later and then declined.

The adult worms live in the small intestine. They may grow up to 50cm in length. A heavy infection leads to failure to thrive, and may cause intestinal impaction or rupture. Deaths have been reported in foals up to 4 months of age. The females are prolific egg-layers. On a single day, an infected foal can shed millions of eggs to contaminate the environment.

Ivermectin appeared to have no effect on the egg production. Manure samples were taken from the five foals with the highest egg counts ten days after treatment. In four of the foals the egg count had actually increased. However, treatment with either fenbendazole or pyrantel was effective at removing the worms.

The researchers also checked soil samples from the various paddocks in which the foals were kept. The most infected pasture was a permanent grass paddock used by mares and foals all summer. Previously, it had been grazed by horses throughout the year. It had significantly higher egg counts (15 eggs /10g soil) than did a temporary soil paddock and two paddocks used only in the summer.

Adult horses rarely excrete many P. equorum eggs. The likely source of infection was pasture contaminated by foals in previous years.

This study emphasises that a single dewormer cannot be assumed to control all species of worms in foals. Because foals may be infected with both ivermectin resistant P. equorum and benzimidazole-resistant cyathostomes, it may be necessary to use two different compounds to adequately control the parasites.

For more details see:
Parascaris equorum in foals and in their environment on a Swedish stud farm, with notes on treatment failure of ivermectin.
Ivermectin-resistant strongyles.

More depressing news about parasitic worms becoming resistant to anthelmintics has been reported recently.

Ivermectin has been a very successful anthelmintic since it became available over 20 years ago. However, over the past few years there have been reports of the large horse roundworm *Parascaris equorum* becoming resistant to its action. Even more concerning are the early signs of resistance developing in the cyathostomes or small redworms.

A report in the Veterinary Record describes a horse in Australia with a strongyle (cyathostome) infection that was resistant to treatment with ivermectin.

CL Edward and Dr A Hoffman, at the Centre for Environmental Stress and Adaptation Research, in the University of Melbourne’s Zoology Department were looking at the control of horse worms by targeting measures at the free-living stages.

Horses were treated regularly every 4-6 weeks and faecal strongyle egg counts monitored at least 5 days later. One horse caught their attention. It had a high faecal worm egg count despite regular (six-weekly) administration of ivermectin.

Even more concerning was their finding that moxidectin did not appear to provide an effective alternative. An initial treatment appeared to be effective. But after a second treatment, worm eggs were present in the faeces again after only three weeks and continued to rise thereafter. Perhaps we should not be surprised at this, because in sheep, resistance to ivermectin and moxidectin are linked.

Edward and Hoffman suggest the need for an integrated strategy to control parasitic worms, not just relying on frequent regular deworming. They warn that relying on just one worming compound is of concern, especially when it is used every 6-8 weeks. They point out that this practice places a heavy selection pressure for resistance.

Anthelmintic compounds should be used only when significant faecal egg counts are found.

For more details see:

Ivermectin resistance in a horse in Australia.
CL Edward, AA Hoffman