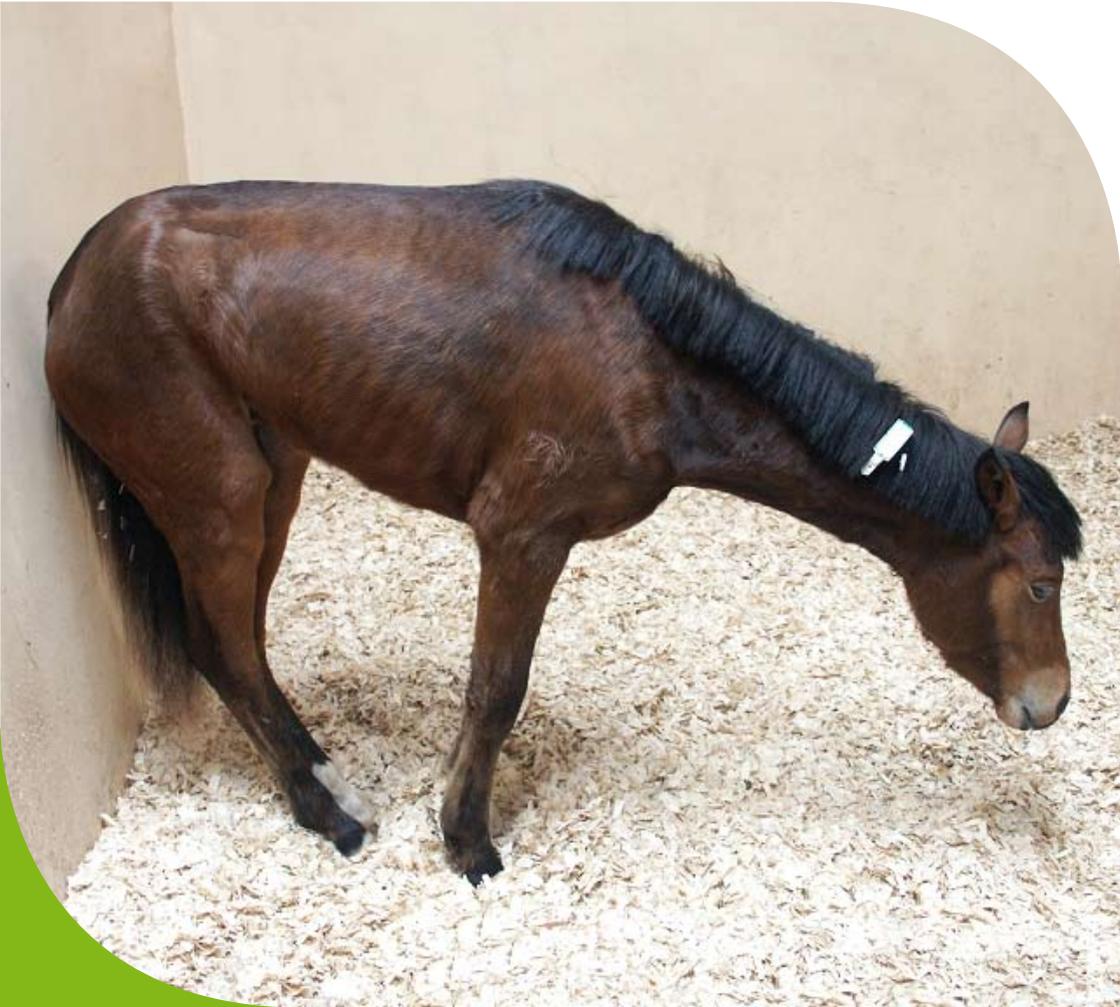




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Management of Chronic Grass Sickness Horses



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Introduction

Grass sickness (GS) has been feared by horseowners since it was first recognised in eastern Scotland around 1907. It claimed the lives of thousands of working horses during the first half of the 20th century and now, more than 100 years later, it is still with us. Today, GS kills horses of all types and breeds across most parts of the United Kingdom and as many as 1-2% of the horse population die from the disease in some areas.

GS has an extremely high mortality rate and significant welfare, emotional and financial consequences. Britain has the highest incidence of GS worldwide, but the disease also occurs throughout most of northern Europe as well as in Chile, Argentina, the Falkland Islands (termed 'mal seco') and Colombia (termed 'tambora').

Interestingly, only a handful of cases have been reported in North America and Ireland, despite significant movement of horses from the UK to these regions. This suggests that the occurrence of GS is more dependent on the presence or absence of an environmental factor than on direct transmission of a contagious agent between horses. A disorder similar to GS affects hares, dogs, cats and rabbits, and possibly also sheep and llamas.

Risk factors

Factors that increase the risk of a horse developing GS are listed in Table 1. As its name suggests, the vast majority of horses that develop GS are grazing part- or full-time (or are being fed freshly cut grass) and the disease can affect horses that have only a few minutes of daily access to fresh grass. A few cases that have had no apparent access to fresh grass have been reported.

Table 1: Factors that increase the risk of a horse developing GS

Horse factors	Young age (peak incidence in 2-7-year-olds), although GS is rare in horses less than six months old
	Good to fat body condition
	Low blood levels of antibodies to the soil bacterium <i>Clostridium botulinum</i>
	Lack of recent contact with a GS-affected horse
Premises factors	Geographical location
	Sand or loam soils
	High soil nitrogen content
	Large number of horses on premises
	Stud farms and livery/riding establishments
	Recent occurrence of GS on premises
Management factors	Rearing of domesticated birds on premises
	Grazing or feeding freshly cut grass
	Recent stressful procedures, dietary change and/or movement to another pasture
	Recent administration of ivermectin (type of wormer)
	Mechanical removal of faeces from pastures increases the risk of GS, while manual removal of faeces reduces the risk
	Frequent chain harrowing
	Soil disturbance
Lack of supplementary feeding with hay or haylage	
Seasonal and weather factors	Spring > autumn > other months
	Cold, dry weather, especially with overnight frosts
	Prolonged dry spells

Disease prevention

Until the cause is known, it is difficult to give sound advice regarding the prevention of GS. It is theoretically possible to reduce the risk of a horse developing GS by avoiding some of the factors shown in Table 1, but the risk cannot be eliminated completely.

In areas where GS is common, stabling horses during the spring and early summer will reduce the risk of disease. Following the discovery of an association with weather, some owners living in high-risk areas now stable their horses in dry weather when a temperature of 7-11°C has persisted for 10 consecutive days. Stabling is particularly recommended for new horses that have been moved onto premises where GS is known to occur. If certain fields are 'high risk' for the disease, they can be grazed by other stock, such as sheep or cattle, especially in the spring. If a case occurs among a group of horses, it is probably best to move the others out of that field, provided this does not involve too much stress associated with transportation or mixing with unfamiliar horses.

Cause of GS

The cause of GS remains unknown, despite almost 100 years of investigation into potential causes including poisonous plants, chemicals, bacteria, viruses, insects and metabolic upsets. However, increasing evidence implicates the soil bacterium *Clostridium botulinum* which, under the influence of appropriate dietary triggers, may multiply and produce nerve toxin within the horse's intestine.

Clinical signs

GS is classified as acute (sudden onset and very severe), sub-acute (moderately severe) or chronic (mild to moderate severity), according to the severity and duration of clinical signs. This classification is somewhat artificial, since disease severity is a continuum, and there is overlap in the symptoms seen with the three forms. GS results from damage to the part of the nervous system that controls involuntary

functions (autonomic nervous system), with the major symptoms reflecting partial or complete paralysis of the entire digestive tract, extending from the throat to the rectum. The signs are listed in Table 2, and illustrated in Figures 1-3.

Table 2: Signs of acute, sub-acute and chronic grass sickness

ACUTE	SUB-ACUTE	CHRONIC
<ul style="list-style-type: none"> • Depression/sleepy appearance • Gut stasis • Difficulty eating and swallowing • Salivation • Reflux of green stomach contents from nose • Distended abdomen • Distended stomach and small intestine • Impacted colon • Colic • High heart rate • Muscle tremors • Droopy eyelids • Abnormal sweating 	<ul style="list-style-type: none"> • 'Tucked up' abdomen • Weight loss • Depression/sleepy appearance • Gut stasis • Difficulty eating and swallowing • Colic • Impacted colon • High heart rate • Muscle tremors • Droopy eyelids • Patchy sweating • 'Elephant on tub' stance • Rhinitis sicca¹ 	<ul style="list-style-type: none"> • Severely 'tucked up' abdomen • Marked weight loss • Depression/sleepy appearance • Gut stasis • Difficulty eating and swallowing • Colic • High heart rate • Muscle tremors • Droopy eyelids • Patchy sweating • 'Elephant on tub' stance • Rhinitis sicca¹

¹ Rhinitis sicca results from drying of the lining of the inside of the nasal cavities. It causes scab formation within the nasal cavities, a characteristic 'snuffing' breathing sound, and probably reduces the horse's ability to smell food (see Figure 3).



Figure 1: Horse with chronic GS, showing droopy eyelids (termed ptosis), which gives a sleepy appearance.



Figure 2: Horse with chronic GS, showing 'elephant on a tub' stance, low head and neck carriage, 'tucked-up' abdomen and dramatic weight loss.



Figure 3; Horse with chronic GS, showing drying and crusting of the lining of the nasal cavities, indicative of rhinitis sicca.

Diagnosis

Veterinary surgeons who have had previous experience of GS can accurately diagnose most (98%) cases of GS solely based on a clinical examination and information about the horse and the circumstances. However, some cases, particularly those with acute GS, present a considerable diagnostic challenge because the clinical signs are variable and common to many other diseases.

Definitive diagnosis may require demonstration of the characteristic microscopic changes to nerve cells in samples of intestine that are collected during abdominal surgery (performed with the horse under general anaesthesia). But the technique is not 100% accurate, as it yields some false negative results.

Treatment

Horses with acute or sub-acute GS should be euthanised on humane grounds once a confident diagnosis has been made, because these forms are invariably fatal. In contrast, many horses with chronic GS, which are less severely affected, will survive.

There is no specific antidote or drug treatment to reverse the nerve damage or its associated complications, and consequently, intensive nursing under veterinary supervision is the mainstay of the treatment. Owners should, however, be aware that survival is largely determined by the severity of the nerve damage and the associated complications, rather than the quality of the veterinary and nursing care. Consequently, even with the best care, a horse may not survive.

A GS case may be managed under veterinary supervision by the owner at the home stables, or may be referred to a specialist veterinary hospital. Referring the case to a veterinary hospital, such as the Dick Vet Equine Hospital in Edinburgh, has a number of advantages, including the availability of expertise gained while working with many GS-affected horses (the Dick Vet Equine Hospital has managed 627 GS affected horses over a 20-year period, including 252 cases of chronic GS, of which 61% survived to discharge). This

experience may aid disease diagnosis, as well as the selection of cases suitable for treatment and the early recognition and prompt treatment of complications. At the Dick Vet Equine Hospital there is a dedicated team of veterinary surgeons and nurses (including the Equine Grass Sickness Fund nurse) who provide 24-hour case care and appropriate follow-up when the horse is discharged from the hospital. The treatment of horses with GS at the Dick Vet Equine Hospital is subsidised by the Equine Grass Sickness Fund.

The advantages of referring a horse to the hospital must be weighed against the disadvantages of moving the horse to an unfamiliar environment. Owners electing to manage horses in their home stables should realise that treating a horse with GS can be an emotionally demanding task, requiring a prolonged and significant time commitment.

When deciding whether to treat a horse with chronic GS or to euthanise it on humane grounds, the horse's suitability for treatment must be considered. While it is difficult to predict whether an individual horse with chronic GS will survive, horses with the following features are less likely to recover:

- **Severe difficulty swallowing**
- **Very poor appetite**
- **Very quiet intestinal sounds**
- **Frequent, moderate colic**
- **Severe rhinitis sicca (nasal crusting, see Figure 3)**
- **Severe weight loss**
- **Severe muscle weakness**
- **Difficulty standing up**

The horse's attitude is also important, and those that appear to 'fight the disease' and to maintain an interest in their food and surroundings are more likely to survive. The horse's age does not appear to have an important influence on survival.

General nursing care

Human contact

Dedication and ingenuity are required to combat declining appetite and depression and the importance of human contact cannot be overemphasised. Regular human contact and frequent walks to pasture are essential to stimulate the horse's interest in its surroundings, encourage feeding, promote intestinal motility and provide gentle exercise.

Horses that are left alone in a stable for prolonged periods of time frequently stand in the corner of the stable without eating. The duration of walking should be tailored to the horse's strength to avoid inducing fatigue. Stabling the horse opposite a healthy companion may encourage eating. Toys, such as feed balls or mineral licks, can improve demeanour.

Grooming

Grooming and gentle massage are beneficial. Sweat patches should be washed and dried thoroughly, but it is probably unwise to wash the whole horse. Plaiting the mane may help to reduce sweat build-up in this area. If the horse is lying down a lot or has diarrhoea, the tail should be plaited.

Rhinitis sicca, which makes breathing difficult and probably reduces appetite by interfering with the sense of smell, is a very difficult complication to manage. While crusts within the accessible part of the nostrils should be cleaned gently and Vaseline applied twice daily, crusts within the deeper regions of the nasal cavities are largely inaccessible. Exercise may help, by causing the crusts to be expelled from the nostrils.

Rugs

Many horses with chronic GS sweat excessively and have a reduced body temperature. Heat and energy loss may be reduced by using a breathable rug (eg Thermatex), which insulates the horse while wicking moisture from the skin to the outer of the rug. When the horse is out at pasture, an

unlined, breathable, waterproof rug is preferable to heavier outdoor rugs.

Stable and bedding

Initially it is preferable to stable horses, but short walks out to grass in hand two to three times daily are important for improving the horse's demeanour and to stimulate intestinal motility. As horses with GS spend considerable periods lying down, they require deep bedding (straw or shavings). When they improve, they can be turned out to pasture for increasing periods, starting with a spell of 20-30 minutes.

Feeding

Diet

Nutritional support is essential to counteract the marked weight loss that characterises GS. Unfortunately, difficulties with eating and swallowing, and a poor appetite, limit the amount and nature of the food that is ingested. Indeed, few horses selected for treatment eat well for more than four days consecutively. Ideally, a high-energy, high-protein diet (12-14%) that is palatable and readily swallowed should be fed in small amounts frequently throughout the day (four to five feeds per day). However, in practice, the selection of food offered is usually dictated by the individual horse's preferences (which do change regularly), rather than being based on nutritional requirements (Figure 4).



Figure 4: A variety of feeds should be readily available at all times

Feeds are often offered warm or tepid in the early stages to improve palatability. It is worth offering food of different consistency to discover what is preferred. Most horses have a preference for a mix of 'soup' consistency, made by thoroughly soaking pellets and/or coarse mix in water, or water supplemented with molasses. At the Dick Vet Equine Hospital, Baileys No. 1 or No. 8, or Dodson & Horrell Build Up are commonly used, but many others are offered. Up to 500ml per day of corn/maize oil can be added to increase the energy density of the diet, but the volume should be reduced if it reduces the palatability.

As it can be difficult to get the horse to eat enough roughage, particularly if it has difficulty swallowing, grass should be offered several times daily, either by grazing in hand for short periods or by offering freshly cut grass. Hay or haylage can be offered, but GS sufferers rarely eat significant quantities in the first few weeks of the disease, and if the horse has a tendency to choke, hay and haylage should be avoided. Chopped alfalfa is a good fibre to feed, because of its high protein content. Succulents such as apples, carrots, sprouts, broccoli and cauliflower, chopped into small pieces, grated or liquidised, can be offered at regular intervals between the main feeds to tempt the appetite.

Over the years, a variety of human foods have been used to stimulate the appetite of horses with GS, including Polo mints, breakfast cereals, Marmite, peanut butter, eggs, jam, Guinness, ice cream, honey, bread, biscuits, molasses, cider vinegar, linseed, milk pellets and rosemary. These have worked in individual horses, with varying degrees of success. Fresh water should always be available ad libitum.

Example of foods that have proved useful

- Soaked, warm sugar beet, with high-energy coarse mix and molasses
- Soaked, warm sugar beet, with beaten raw eggs and Guinness
- Barley or oats soaked well with warm water, with a little bran and molasses
- Well soaked cubes and mix with handfuls of chaff
- Apple mollichop, fed damp or watery
- Mixed fruit and vegetables, chopped small, grated or liquidised: carrots, apples, turnip, sprouts, broccoli, cauliflower
- Porridge, molasses and handful of high-energy coarse mix
- Dodson & Horrell Build Up mix with rosemary
- Ready Brek and foal milk pellets mixed up with warm water
- Grass, thistles, dandelions and clover – hand-picked
- Vanilla ice cream
- Vanilla yoghurt
- Weetabix fed with warm water mixed with coarse mix

Hand feeding

In the early stages, particularly when horses are depressed, hand feeding from a raised bucket is a common practice, as it seems to encourage eating and may aid swallowing. Horses often eat a few mouthfuls from the hand and then proceed to eat from a bucket. Hooking a feed bucket on a stable door may also encourage horses to eat and take an interest in what is going on in the yard.

Syringe feeding

If the horse shows little interest, even when a soaked feed is being hand-fed, the feed can be liquidised and given to the horse using a syringe. This is a labour-intensive task, but some horses respond well to it. Any horse feed that can be pre-soaked to make liquidising easier is suitable.

Nasogastric tube feeding

Most horses with a realistic chance of survival do not require prolonged administration of fluids and/or feeds via intravenous or nasogastric routes. Although short-term nasogastric feeding has proved beneficial in a small number of cases, it cannot be relied on as a long-term means of providing adequate nutrition.

Difficulties associated with this technique include the limited feed composition that can be delivered through a relatively narrow bore tube (Figure 5), the discomfort associated with retaining a tube in the nostrils of horses with rhinitis sicca, and the risk of encouraging reliance of the horse on this method of feeding. Consequently, the small numbers of cases that appear to benefit from short-term nasogastric feeding are those that have shown a recent and significant clinical improvement, but require a transient 'helping hand' to minimise any further weight loss.

Treating a horse in this way should only be attempted under veterinary supervision. Extreme care should be taken when giving food by stomach tube, as large quantities of high-energy, high-protein food can induce life-threatening intestinal bacterial overgrowth, diarrhoea and toxæmia.



Figure 5: Nasogastric feeding

Intravenous fluids

Veterinary surgeons may administer fluid by intravenous drip if the horse is dehydrated and unwilling, or unable, to drink. This usually only provides a temporary improvement in hydration. Horses that are unable to maintain their hydration by voluntary drinking have a very poor likelihood of survival.

Drugs that may be used in the treatment of chronic GS

Veterinary surgeons may recommend the use of some of the following drugs:

Pain relief: Horses with GS often have periods of mild to moderate colic, commonly within an hour or two after feeding. Mild episodes may resolve simply by walking the horse, while moderate to severe colic may warrant pain relief. Those horses that require frequent pain relief to control colic are less likely to survive. Suitable drugs for pain relief include phenylbutazone, flunixin and meloxicam; these should be used according to the manufacturer's recommendations and clinical judgement.

Anti-ulcer medication: Horses with GS commonly develop ulceration of the oesophagus (gullet) and stomach, which causes loss of appetite, colic and depression. Consequently, anti-ulcer medication can be helpful. Omeprazole, used according to the manufacturer's recommendations, is the most effective anti-ulcer medication.

Appetite stimulants: In some cases where the horse has a poor appetite despite being able to swallow, appetite stimulants (eg Valium) may occasionally be helpful. However, the success of such drugs has been very limited and improved appetite is often short-lived.

Corticosteroids: Intravenous dexamethasone (0.1 mg/kg), administered once daily for one to three days, may improve the horse's demeanour and appetite, but because of potential adverse effects, these drugs are frequently used only as a last resort.

Drugs to increase intestinal motility (termed 'prokinetic' drugs): Cisapride, a drug that has been shown to reduce gastrointestinal transit time in horses with chronic GS, was regularly given in the past but its use is now rare because of limited availability, high cost and because in some cases it induced colic (albeit fairly mild and transient). Its effect on survival rate is uncertain.

Lubricants: Liquid paraffin (1-5 litres) may be administered by a veterinary surgeon via a nasogastric tube if required, but this is rarely necessary. Purgatives should be avoided.

Probiotics: Horses with GS have an imbalance in the numbers and types of bacteria within the intestinal tract, because of alterations in intestinal motility and in food intake. These alterations probably affect digestion and in some cases may contribute to development of diarrhoea. Commercially available probiotics, which are feed supplements containing bacteria, yeasts, and/or nutrients, are commonly given to GS horses in an attempt to restore the beneficial intestinal flora. The efficacy of probiotics in GS has not, however, been determined.

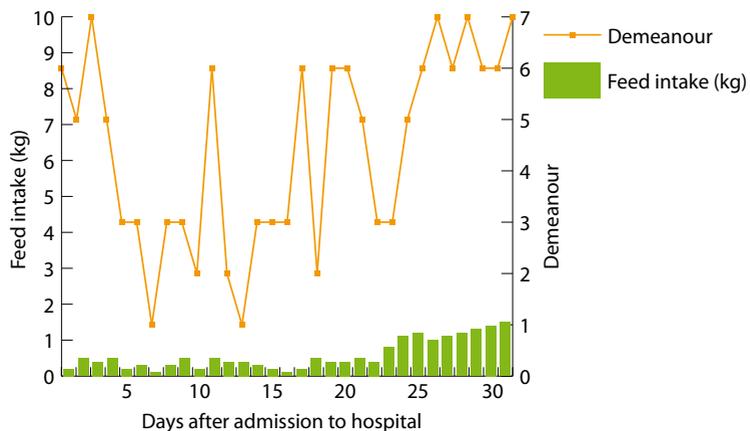
Other drugs: Studies at the Dick Vet Equine Hospital have shown that administration of the antioxidant acetylcysteine, the appetite stimulant brotizolam or a laxative/antioxidant extract from aloe vera, do not give a measurable increase in case survival.

Progress and outcome

Variability in clinical appearance

Typically the demeanour and appetite of a horse with GS will show considerable waxing and waning, with several 'good days' often followed by several 'bad days' (Figure 6). Many horses look dull and depressed when observed alone in the stable, but minutes later, when someone familiar enters the box or the horse is taken out for a walk, the horse's attitude can change dramatically with head up, ears pricked and walking out keenly. Consequently, when assessing case progress, it is important to look at the overall longer term picture (improvement or deterioration) and not to be too influenced by short-term changes.

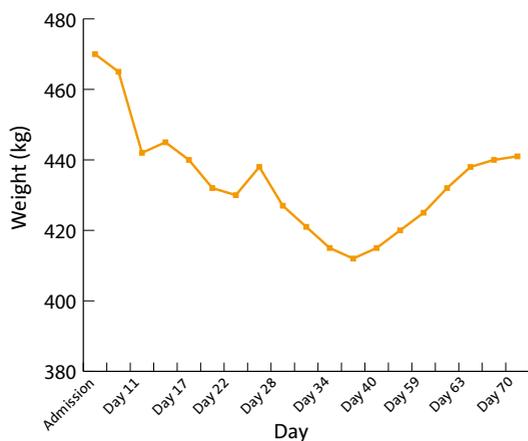
Figure 6: Graph showing the dramatic fluctuations in daily feed intake (kg) and in demeanour (high scores indicate the horse is 'bright') in a horse that recovered from chronic grass sickness. The horse's food intake increased as its demeanour improved



Complications during the recovery period

All horses with chronic GS, even those that survive, will have significant weight loss (Figure 7).

Figure 7: Fluctuations in bodyweight of a typical chronic GS case. This horse lost 58 kg before starting to gradually put on weight



The degree of weight loss may be underestimated if a weight band rather than a weighbridge is used because of the change in body contour. As the recovery proceeds, the horse's appetite will increase, followed by a gradual increase in bodyweight. Complications which commonly occur during the first 2 months of the recovery phase include:

- persistent weight loss
- reduced appetite (approximately 40% of cases)
- debility and muscular weakness
- colic (approximately 25%)
- difficulty swallowing (approx 50%)
- oesophageal choke or spasm
- diarrhoea (approx 30%)
- prolapse of the penis
- inappropriate sweating (approx 65%)
- inhalation pneumonia

Inhalation pneumonia arises due to inhalation of food, saliva, nasal secretions or rhinitis sicca crusts and is probably the most serious and potentially fatal complication. It manifests as a sudden onset of fever, laboured breathing, malodorous breath and nasal discharge. Prompt antibiotic therapy is required. If horses have frequent episodes of oesophageal choke, the diet should be altered to avoid long-stem fibre and sugar beet. Horses with persistent diarrhoea have a poor prognosis.

Timescale for recovery

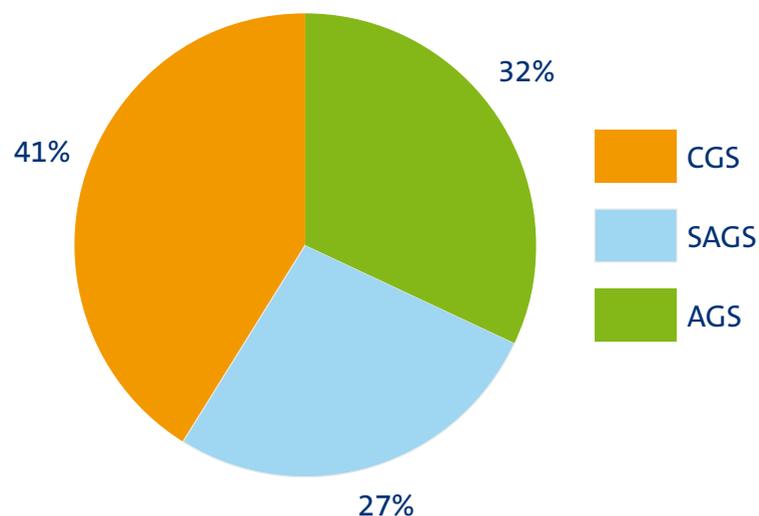
If the horse is progressing satisfactorily six to eight weeks from the onset of GS, the chance of survival is good, and relapses are rare.

The recovery period is usually prolonged, however, with bodyweight being normalised only after three to 18 months. Horses first start to work again between seven and 11 months after returning home, and some horses have returned to a competitive life between seven and 19 months.

Survival rates at the Dick Vet Equine Hospital, Edinburgh

The Dick Vet Equine Hospital has been at the forefront of managing GS for many years. In the last 20 years, 627 horses (Figure 8) with GS have been admitted to the hospital for diagnosis and/or treatment. All of the acute and sub-acute cases were euthanised on humane grounds, because of a hopeless prognosis. However, 61% (155 out of 252) of the horses with chronic GS were successfully returned to the owners.

Figure 8: Proportions of horses with acute (AGS, n=201), sub-acute (SAGS, n=174 and chronic (CGS, n=252) GS that have been admitted to the Dick Vet Equine Hospital over the last 20 years



Residual nerve damage

It is often stated that survivors never fully recover and are consequently unable to perform athletic work. Experience at the Dick Vet Equine Hospital indicates, however, that the vast majority of recovered horses are able to return to work as performance horses, and may even perform successfully as racehorses.

While most horses lead an apparently normal life after recovery from chronic GS, postmortem examination of recovered horses that were subsequently euthanised for unrelated causes has demonstrated a persistent and significant reduction in the density of nerves within the intestine.

It has been speculated that recovered horses may also have a persistent reduction in nerves that control functions in other organs, such as blood vessels and airways, and this could explain why some horses that make an apparently full clinical recovery from GS fail to return to their previous exercise performance level, continue to sweat inappropriately and/or show fatigue at exercise.

Possible recurrence of GS

Several horses that have made an apparent full clinical recovery from GS have had to be euthanised several months (or years) later with a second episode of GS, indicating that recurrence may be possible.

Grass sickness nurse

The dedicated GS nurse at the Dick Vet Equine Hospital is always available to assist the team of veterinary surgeons with the treatment of horses, and to give advice and support to owners who are nursing cases at home. This specialised service has been dependent on funding from World Horse Welfare, the Equine Grass Sickness Fund and from the Dick Vet Equine Hospital (www.dickvetequine.com).

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Further information about GS

The Equine Grass Sickness Fund, a dedicated charity that raises money to support research into GS and the care of horses with this devastating disease, has a very useful website that provides current information about GS (www.grassickness.org.uk). Alternatively, call +44 (0)131 4456257. The site also provides information about supporting grass sickness research.

Equine Grass Sickness Fund
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Pentlands Science Park
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The British Equine Veterinary Association website (www.beva.org.uk) offers information about equine veterinary practices that can provide veterinary care of horses with GS.

World Horse Welfare

For further information about the work of World Horse Welfare, please visit www.worldhorsewelfare.org, or call +44 (0)1953 498682.

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