



On the question of colic: Are answers beginning to emerge?

In *EVJ*'s last issue, Dr Martin Burton challenged the veterinary world to prepare and publish systematic reviews that will inform veterinary practice [1]. Dr Burton's comments were in response to our publication of our first systematic review addressing interventions for dynamic intermittent dorsal displacement of the soft palate [2]. Clinicians looking for other, similarly robust pieces of evidence in relation to either surgical or medical interventions in the horse are likely to be rather disappointed. Nevertheless, in clinical and applied research relating to colic, numerous groups internationally are working on clinically relevant research questions relating to this major cause of equine mortality. Much early work on colic surgery was published in *EVJ* by Professor Barrie Edwards and his colleagues, eventually going on to establish a huge database on risk factors and outcome following colic surgery in general [3]. There is now a need to refine our questions about colic more specifically to build up evidence that will influence clinical practice.

What are the risk factors and prevalence of colic for horses in specific subgroups?

Parasite infection is recognised as a major risk factor for colic in many age groups and types of horses, and the spectre of multidrug anthelmintic resistance is on our horizon [4,5]. In this issue, Dr Relf and colleagues report that despite awareness of this challenge amongst UK Thoroughbred farm managers and owners, there is now a pressing need to convince them to adopt control strategies that are less dependent on anthelmintics to minimise the development of widespread resistance [6]. Increasing age is significantly associated with colic [7], and geriatric horses are more likely to have more serious forms of colic, which is reflected by increased levels of pain, lack of intestinal borborygmi and abnormal peritoneal fluid when presented to hospital compared with those found in nongeriatric horses [8]. However, the survival of geriatric horses with a strangulating lesion or requiring jejunojejunostomy was not different from that of mature horses with similar lesions, suggesting that age itself did not influence outcome in these conditions. Geriatric horses were, however, less likely to survive surgery for simple obstruction of the large colon, but again this may reflect differences in pathology rather than age *per se* [9]. Crib-biting has been associated with colonic obstruction [10] and epiploic foramen entrapment [11], while a study in a group of horses with various surgical and medical diagnoses showed that cribbing and windsucking were significantly associated with colic in general but not with any specific form of colic [7]. In the same study, investigators were unable to show any relationship between other repetitive behaviours or an anxious temperament and colic [7]. In this issue, Fielding and others report the results of an investigation of colic in competing endurance horses and examine both causes and outcome [12]. The majority were suffering from ileus or nonspecific colic and overall, the prognosis was good. This study is an excellent example of a report focused on a specific type of horse and will be valuable to practitioners working with these specific animals.

What are the likely outcomes associated with specific forms of colic?

Until recently, reports of outcomes associated with colic tended to group many types of colic together. More usefully, recent reports are addressing specific forms of colic. An example is the prospective multicentre study with long-term follow-up on horses with epiploic foramen entrapment by Archer and others, which showed that overall survival for this condition was just under 80% [13]. Lindegaard and others assessed short-term survival in a similar number of horses with nephrosplenic entrapment of the large colon and found that survival with this condition is considerably higher, at around 90% [14], while a smaller study that is valuable because long-term follow-up is included showed that only 55% of horses treated for caecal impaction survived long term [15]. It is well recognised that having had surgical colic, horses are at increased risk of having colic in future. Less well understood is the recent finding that having undergone exploratory

laparotomy for right dorsal displacement of the large colon, a condition which generally has an excellent short-term prognosis, horses are at increased risk of recurrent episodes of colic compared with horses with other forms of large colon displacement [16]. Long-term data on survival and prevalence of complications for specific conditions are much more helpful to clinicians attempting to prognosticate for individual horses and clients than data on survival to discharge and colic outcomes in general. Relatively few studies have addressed the issue of owner satisfaction and the horse's ability to return to athletic activity after colic surgery. In a recent study addressing this question, 86% of horses that survived to 6 months after colic surgery were able to resume or start sporting activity, and the large majority of owners of discharged horses reported that they were satisfied with the outcome [17].

Are there better diagnostic tools to assess colic cases?

Most clinicians would probably concur that the physical findings are the key to identification of horses requiring colic surgery, with the degree and persistence of pain, findings on transrectal palpation, presence or absence of gastrointestinal sounds and nasogastric reflux being the most important. Ultrasonography is used increasingly to assess the gastrointestinal tract and can add considerably to the clinical database [18,19], particularly in foals [20]. Nevertheless, studies comparing various novel biomarkers in surgical and nonsurgical patients continue to be published. From a clinician's perspective, these studies probably serve best to elucidate the metabolic and other derangements that accompany colic rather than offer new tools that can be used to make rapid clinical decisions [21,22].

A more challenging diagnostic problem is how to assess gastrointestinal function when investigating horses with low-grade colic and those that are at risk of post operative ileus. Here again, ultrasonography has shown some promise for assessing colonic wall thickness in the post operative period following large colon volvulus [23] and, although it is a relatively crude tool in this respect, it can be used to assess large intestinal motility [24]. However, more effective noninvasive tools to assess gastrointestinal motility are needed. The lactose ¹³C-ureide breath test offers an effective means of measuring equine orocaecal transit time and can be combined with other breath tests to provide information on small intestinal motility, which may have more widespread application in both clinical and research settings [25,26]. In this issue of *EVJ*, Stokes and others describe the use of a wireless ambulatory capsule to record a variety of parameters, including intestinal transit time, but caution that it may not be sufficiently reliable for clinical use [27].

Can we treat our colic cases more effectively?

Surgeons are currently very slightly ahead of internists in producing randomised controlled studies on colic-related interventions [28], but studies on surgical techniques still tend to use experimental protocols [29,30] or retrospective clinical designs [31]. In the post operative period, mucosal injury and inflammation, endotoxaemia and sepsis remain significant challenges, and our attempts to define the best treatment protocols for critical patients are still largely based on experimental studies. Ischaemia and reperfusion injury, epithelial injury and cyclo-oxygenase-2 (COX-2) expression caused by short-term hypoxia lead to migration of neutrophils and activation of mucosal eosinophils, mast cells and macrophages [32]. In recent years, much emphasis has been placed on the use of cyclo-oxygenase-independent [33] or COX-2 selective anti-inflammatory drugs to control this process, because there is laboratory evidence to suggest that the older, nonselective nonsteroidal anti-inflammatory drugs, such as flunixin, may inhibit mucosal barrier healing [34]. However, the available data are conflicting, and a recent study has shown no detrimental effect of flunixin on ischaemic equine colonic

mucosa [35], leading the authors to question the current emphasis on COX-2 selective drugs. Clinicians should be cautious about extrapolating *in vitro* findings straight into clinical practice, and large-scale, prospective, randomised clinical trials are needed to resolve the dilemma over the potential advantages of COX-2 selective drugs over other nonsteroidal anti-inflammatory drugs, particularly as their use can add considerably to the cost of post operative care.

Lignocaine has been shown to have *in vitro* effects on jejunal smooth muscle [36], but although it is widely used as an anti-inflammatory agent in equine critical patients, in an experimental model no significant differences were found in inflammatory gene expression in lignocaine-treated and control groups in the black walnut extract model of laminitis, calling into question its use as an anti-inflammatory. Likewise, the ideal analgesic for use in colic patients has yet to be established; both xylazine and N-butylscopolammonium bromide have significant cardiovascular effects, which may, at the very least, influence clinical findings, and their effects should be borne in mind when assessing the colicking horse [37]. Opiates have traditionally been avoided for fear of potential adverse effects on gastrointestinal motility, but a recent study has shown that selective μ agonists, without anticholinergic activity, may have less risk than other opiates, but again these studies are based on *in vitro* work and do not yet translate to clinical practice.

Endotoxin can be found in the circulation of some horses for up to 4 days after colic surgery, and in those in which it is found, mortality is higher [38]. Sepsis and infection occur commonly in post operative colic cases, and in an article in this issue of *EVJ*, Freeman and colleagues report that in a retrospective study of over 100 horses, 85% had fever post operatively, while 43% went on to develop infection. This is practical information for clinicians, in that the researchers have shown that peak temperature >39.2°C, onset of fever >48 h after surgery and fever duration of >48 h were associated with infection, and the authors argue that mild fever early after surgery may not require antimicrobial treatment [39]. Finally, looking for future possibilities for therapeutic targets in sepsis and endotoxaemia, a review article in this issue of *EVJ* reviews pattern recognition receptors on host cells that detect pathogens to activate innate immunity, an exciting area of pharmacology that may well have important implications for the future [40].

C. M. Marr, Editor-in-chief
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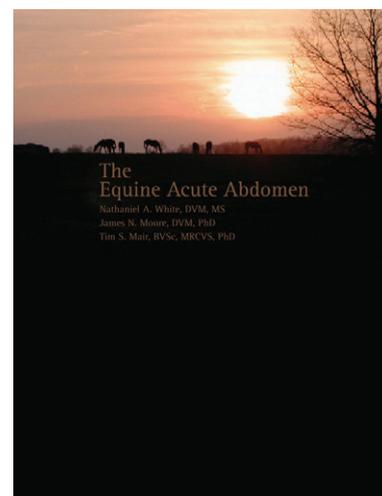
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