This unpublished article, dated June 2001, was first compiled by Kathleen Hentcy, then edited by Robert Cook. A shorter version of the article used to be available online at www.equineresearch.com but this website is no longer operating.

# AN EQUINE RESEARCH REVIEW: Removal of the Bit May Improve the Horse's Welfare and Performance, and the Rider's Safety and Pleasure;

A galloping horse, we learn, breathes entirely through its nose and in time with its stride. The mouth is closed. As the leading foreleg meets the ground, the head and neck swings downward like a pendulum, the contents of the abdomen slump forward - pressing on the diaphragm - and the horse breathes out. The lowered position of the head stretches the elastic 'rope' (the ligamentum nuchae) that connects the back of the skull to the withers and this, in turn, raises the pelvic end of the spine. The momentum generated by this head/neck pendulum (the 'head bob'), in elevating the pelvis, starts the horse's hind legs on their forward swing, with no expenditure of muscle energy. As the hind legs become weight bearing, the ligamentum nuchae recoils, pulling the horse's head up again. The abdominal contents slide back towards the pelvis, flattening the diaphragm, and the horse breathes in. At the same time, elevation of the head starts the forelegs on their forward swing. In this way, according to one researcher, the 'head bob' serves as an energy-conservation mechanism that reduces the work of breathing and locomotion. It enables a horse to gallop 'economically' and to tire less quickly.

At least, that is how a horse is said to gallop **when at liberty**. A ridden horse, however, almost always has a bit in its mouth. The bit, according to the same researcher, often causes the horse pain, interferes with the 'head bob', upsets the natural synchrony between breathing and striding, and breaks the normal seal of its lips. Because of these effects it is postulated that the bit is often responsible for premature fatigue and a long list of disorders. These include the familiar package of problems under the heading 'non-acceptance of the bit' but also problems that have not previously been recognized as being caused by the bit. In the latter group the researcher lists such problems as headshaking, 'thickness of wind', 'roaring,' dorsal displacement of the soft palate (DDSP), epiglottal entrapment, dynamic collapse of the windpipe, exercise-induced pulmonary hemorrhage (EIPH or 'bleeding') and poor performance.

"*Man has used a bit to control the horse for 6,000 years*," says Robert Cook, PhD, F.R.C.V.S, Professor of Surgery *Emeritus* of Tufts University, School of Veterinary Medicine. *"It is hard for us to accept that we have been wrong for so long, but my recent research indicates that a bit is not only unnecessary for control of the horse but is actually contraindicated, counter-productive, and often cruel. It sets-off a cascade of events that can harm the horse from head to hoof."*

The solution, Cook says, is a new bitless bridle. It differs in concept from the existing bitless bridles such as the hackamore, bosal and sidepull, all of which, he says, have limitations and disadvantages. This new bridle consists simply of two loops, one over the nose and the other over the poll. It enables a rider or driver to communicate with the horse painlessly and physiologically by applying a squeeze to one side of its head (for steering), or to the whole of its head (for slowing or stopping). Balancing reflexes and acupressure points may be involved in the mechanism of control. The reins cross beneath the jaw, so that pressure on the right rein, for example, is felt on the left side of the head. In moving away from pressure, the horse turns to the right. Pressure on both reins puts a gentle squeeze on the entire head and triggers what Cook refers to as a 'submit' response. It transmits, he says, the 'halt please' cue.

In addition to reporting his research on the penalties of the bit, however, Cook now sells the bitless bridle[1]. Allan Buck, a dressage trainer in California, developed an early version of the current bridle from an existing halter and, in 1987, asked Cook to endorse it. Cook found the improvement in the first horse he rode with it so impressive that, as a scientist, he wanted to know why the new bridle had the effect it did. Cook said, *"I started to ask myself some fundamental questions, such as, 'What is it that the bit really does to a horse?'"* After three years of study, he invested in the business; made some further improvements in design; and began marketing the bridle on the Internet. He readily acknowledges the conflict of interest but adds, *"I can do more good for the horse and bring more happiness to riders by introducing them to this bridle than I have been able to do in the whole of my previous 49 years as a veterinarian."* It is relevant to mention here that this statement comes from someone who, in 1991, received an international award for 'Outstanding research on diseases of the ear, nose and throat of the horse'. Cook's curriculum vitae is available online at www.bitlessbridle.com

The bit, Cook points out, is an unforgiving foreign body in an exquisitely sensitive body cavity. *"It controls the horse,"* he says, *"at the risk of causing pain, excess poll flexion, partial suffocation and many accidents. Because the horse can evade the bit, by putting the bit between its teeth or under its tongue, control can also be completely lost. Bit-induced pain is a cause of problems such as bolting, rearing, bucking, head shaking, napping, balking, stumbling, pulling and jigging, to mention but a few. Though It has long been known that the bit has many pernicious effects on the horse's mouth, its more wide-ranging and adverse influence on the respiratory, musculo-skeletal and nervous systems has been overlooked."*

Cook observed the physiological benefits that occurred when the bit was removed. He rode the same horse with and without the bit, using what is now called The Bitless Bridle, and then observed 18 other riders repeating the same

[1] The Bitless Bridle Inc., 2020, S. Queen Street, York PA 17403-4829 Tel: (717) 812 1598

protocol. Over three years, he supplemented his own observations with unsolicited evaluations of the bitless bridle on 351 horses, provided by people who had previously used a bit and then the bitless bridle in all disciplines from racing to therapeutic riding. 95% of users reported satisfactory results. These reports are available online at www.bitlessbridle.com and constitute highly recommended reading.

Cook evaluated the bit with regard to the principles of equine physiology and his previous studies of the applied anatomy of the upper airway (see bibliography below). *"The focus of my research",* he said, *"has been the head, neck and chest of the horse, so my recent study of the bit's effect on equine physiology represents a continuation of a life-long interest in this region."* Among other investigations, he 'scoped three bitted horses at rest and during treadmill exercise, noting the airway obstruction caused by bit-induced tongue and jaw movement. Cook also ran exercise trials with four "roarers," first with a bit in their mouth and then with the bitless bridle, noting the lessening of the noise or even its elimination when the bit was removed.

At the Natural History Museum (Smithsonian) and the Museum of Comparative Zoology (Harvard University), Cook surveyed 48 skulls from horses that were 5 years old or older for evidence of bone spurs on the mandible caused by the bit. He compared these with 20 mature zebra skulls. None of the zebra skulls showed any abnormality on the bony 'bars' of the mouth. Five Przewalski horses that had died in the National Zoological Park and eight feral horses from Assateague Island also showed no abnormality, as one might have expected. But of the remaining 35 horse skulls, bone spurs on the bars of the mandible were present in 26 (74%). The famous Thoroughbred racehorse LEXINGTON was one of the 26. A few skulls also had bone spurs on the maxilla.

The excruciating pain that these bone spurs must cause lends credence to Cook's hypothesis that bit-induced facial pain (trigeminal neuralgia or *tic douloureux*) is the most common cause of the headshaking syndrome in the horse. As its name implies, the trigeminal nerve has three branches; mandibular, maxillary and ophthalmic. All the symptoms comprising this syndrome are, he points out, consistent with the hypothesis that the bit is responsible, directly or indirectly, for pain in one or more of these branches. The head tossing and stumbling, for example, is thought to be a central response to severe shooting pains from the mandibular branch of the nerve. The head rubbing, sneezing and snorting are signs compatible with 'pins and needles' or frank pain, referred indirectly from the mandibular to the maxillary branch. Finally, the rapid blinking and sensitivity to bright light is consistent with pain referred from the mandibular to the ophthalmic branch. Unlike the competing hypotheses of allergic rhinitis and photic headshaking, the trigeminal neuralgia hypothesis is easy to test as it predicts that removal of the bit should significantly alleviate or banish the symptoms. Happily, Cook reports that such is the case and that removal of the bit is the most rewarding treatment he has yet discovered for this recalcitrant

problem. Removal of the bit should, in his opinion, be the first step in the clinical work-up of these cases. The validity of a tentative diagnosis of bit-induced trigeminal neuralgia can, he says, be judged by a rewarding response to elimination of the trigger factor.

Some years ago, Cook supervised a veterinary student's slaughterhouse survey of windpipe conformation in 51 horses. All horses were found to exhibit varying degrees of dorso-ventral flattening of the windpipe ('scabbard trachea') at some point on their length, particularly at the entrance to the chest. Twenty-two of 47 windpipes (47%) were flattened throughout their length. He now suggests that bit-induced obstruction of the airway at the level of the throat may be the cause of these common deformities. He believes that the further obstruction resulting from such a deformity would render 'bleeding' and poor performance more likely.

Cook weighed various bits and bit combinations. He found that their weight ranged from 6ozs (180g) for a pony snaffle, to 26ozs (780g) for the combined weight of the bits and curb chain in a double bridle. The bridle and bits for a Standardbred racehorse weighed in the region of 6lbs (2.8 Kg). Cook wonders whether trainers fully realize that they are handicapping the front end of their horses with so much 'lead'.

A pilot trial, by an endurance rider using global positioning system equipment, showed that when the bit was removed and the bitless bridle used, the horse habitually clocked faster speeds at the trot and the canter. Further trials are planned.

According to Cook, it is well known that the cheek pieces of the bit can press the lining of the cheek (the buccal mucosa) against the sharp enamel edges of the cheek teeth, causing painful buccal ulcers. It is equally well known that the bit is frequently responsible for injury to the lips, bruising of the gums, lacerations of the tongue (and even amputation), fractures of the mandible and injuries to the hard palate. What has not been known is that the bit frequently causes bone spurs to develop on the bars of the mouth and that the bit sets up many other counter-productive responses that compromise performance.

*"As soon as a bit is placed in the mouth,"* Cook said, *"the horse is being signaled to think 'eat.' The lip seal is broken, the horse begins to salivate, and to move its lips, jaw, and tongue. These are digestive system reflexes, dominated by the parasympathetic nervous system, which initiates all responses to do with rest-and-relaxation. When a rider mounts, however, the sympathetic nervous system is also triggered. The horse is now being signaled to think 'exercise.' Accordingly, an opposing set of fight-and-flight responses is initiated. In man, for example, these trigger a marked reduction in salivation, leading to the familiar dry mouth. For running, both man and horse need a dry mouth, not a wet one."*

Cook concludes that, when using the bit method of control, horses are being expected – quite unreasonably – to give of their best in terms of athletic performance with these two nervous systems in conflict. The horse, no more than man, is not 'designed' to eat and exercise at the same time and is neurologically confused by the competing signals. The switch-plate anatomy of the throat is such that it can be configured for either eating or exercise but not for both concurrently. For swallowing, the soft palate has to be in the 'up' position (the DDSP position). Conversely, for deep breathing, the soft palate has to be in the 'down' position. Use of the bit, which supports the DDSP position, leads to many pharyngeal problems, gagging reflexes, difficulties in breathing, and – less obviously - difficulties in striding.

According to Cook, because the bit breaks the lip seal, air now enters the oral cavity. At exercise, this leads to many familiar respiratory problems such as DDSP and epiglottal entrapment that have, until now, been of unknown cause. The air, helped along by movement of the tongue and jaw, creeps upwards and invades the oropharynx, the digestive part of the throat the roof of which is the soft palate. Because the soft palate floats upwards on its bubble of air, this reduces the diameter of the nasopharynx, the respiratory part of the throat. Restriction of the airway from this alone interferes with breathing and may precipitate 'thickness of wind' or an actual 'roaring' noise (laryngeal stridor on inspiration and, therefore, asphyxia). But the problem may not stop there, because air in the oropharynx may also break what is normally an airtight seal between the oropharynx and the nasopharynx. When this happens it is followed by dorsal displacement of the soft palate (DDSP) and a racehorse may 'gurgle' and 'choke-up' (suffocate) or simply stop trying. 'Roaring' and DDSP also follows from the horse seeking to evade the bit by retracting the tip of its tongue behind the bit. In this situation it is the root of the tongue that pushes the soft palate up. Exposure of the oropharynx to the drag of the inspiratory vacuum, Cook explains, is the cause of epiglottal entrapment. He comments that it is ironic in view of the bit's long tradition that this Bronze Age device has now to be recognized as an impediment to performance.

Poll flexion, so easily brought about by the bit, is another cause of upper airway obstruction at fast exercise. Cook has already published evidence indicating that upper airway obstruction, from any source, is a cause of EIPH or 'bleeding' and now adds the bit to this list of sources. In terms of importance he places it at the top of the list, ahead of recurrent laryngeal neuropathy (laryngeal paralysis). In articles written since 1997, Cook lists a dozen more problems to do with bad breathing, poor striding and unacceptable behavior, that have not previously been recognized as being caused by the bit. All of these problems can be solved, he says, by removing the bit.

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(The last five articles are available online at www.bitlessbridle.com. The article published in Germany has been translated into English)