

# A Positive Reinforcement Rein: Rule-changer and game-changer for horsemanship?

by Fridtjof Hanson<sup>1</sup>

*"The slaves of custom and established mode, with pack-horse constancy we keep the road"*

– William Cowper, 'Tirocinium'

## SUMMARY

A bit is widely considered an indispensable part of a bridle, yet clearly this is not so. Horses have been ridden with and without a bit since and before the Bronze Age. The author observes that a steel-tipped rein invades a body cavity; causes pain; is inaccurate as a messaging system; frequently causes harmful, unintended consequences; carries a high risk of injury/accident to horse and rider/driver; degrades athletic performance; and constitutes a breach of the privilege that a horse grants us. In striking contrast, a positive reinforcement rein is non-invasive; painless; accurate; can do no harm, even when used by a novice; causes no unintended consequences; lowers risk; permits maximum athletic performance; and promotes harmony and partnership. In the author's opinion, a bit is an unnecessary and inhumane impediment. Repeal of the mandatory-bit rule is recommended. Allowing bit-free horses to compete in all equestrian disciplines will, it is urged, have the further beneficial effect of:

- Bringing about a major improvement in horse welfare and quality of life.
- Reducing the prevalence of bit-induced diseases that are currently common in horse sports generally, but racing in particular (e.g., 'bleeding,' ridden horse lameness, catastrophic injuries and sudden death).
- Increasing the overall safety of equestrian sport by reducing risk for both horse and rider/driver.
- Improving the general public's perception of all equestrian disciplines.
- Justifying the continuance of horse sport's social license to operate.
- Increasing the value of Thoroughbred and other bloodstock.
- Slowing the decline of attendance figures at racetracks.
- Slowing the decline of Thoroughbred and harness horse breeding.
- Increasing a racetrack's gaming 'handle' and state/government income.
- Enabling a racehorse to be retired from racing in good health; eligible for a life after racing.
- Promoting the general public's participation in and benefit from horseback riding as a healthy, life-enhancing exercise.

In sum, the metal bit is a device that was introduced in the Bronze Age to weaponize the horse for war; ratified for racing by a rule made in the 17th century; 'grand-fathered' in without verification and automatically made mandatory, without dispute, in the 19th century by most subsequently developed horse sport administrations, worldwide. Mandatory-bit rules have remained 'on the books' ever since.

## INTRODUCTION

Dressage arose from the impact of the Renaissance on horsemanship when, after the dark and warlike Middle Ages, riders first recognized that horses responded better to kinder methods, and that the practice of horsemanship could be elevated from the brutality of war to the status of an art. Historically, metal bits were developed in the Bronze Age, to weaponize the horse for war. Later, during the heavy armor period of history, bits became progressively more severe. Thankfully, this trend was halted with the more enlightened attitudes of the Renaissance. However, bits were not abolished and the horse continued to be used for war, where coercive measures were still 'de rigueur.'

Today, the horse has finally been 'demobbed.' His status has risen from that of an animated power-unit to that of a companion animal, sporting partner or – in the case of dressage – a dancing partner. The time has long passed for an assessment of both the tools we use and our methods, so that the horse is no longer condemned to slavish servitude. Bill Noble, in the January 2019 issue of New Zealand's *Horse and Pony* – when discussing the 'image' problem that dressage faces – made a valid point when he wrote; "*The dressage world seems to underestimate Joe Public's ability to sense the comfort levels of horses.*" I agree. While neither 'Joe' nor 'Josephine' are privy to the finer points of dressage, they have no difficulty in interpreting a horse's body language.

In the absence of any scientific evidence to validate use of the bit, rules mandating its use are unjustifiable. Use of the bit was critiqued twenty years ago (Cook 1999) and again four years later (Cook, 2003, Cook and Strasser 2003). Since then, evidence has been published of pain and behavioral disturbances caused by the bit (Cook and Mills, 2009, Cook and Kibler, 2018); physical damage to the horse's lips, tongue, gums, jawbone and teeth (Cook 2011, Tuomola et al 2019); and pressure damage (i.e., barotrauma) to the lungs (Cook, 2016). The mandatory-bit rule was challenged once more two years ago (Cook, 2017) and again this year, with evidence sug-

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gesting a connection between bit-induced pain and lameness under saddle, upper airway obstruction, exercise-induced pulmonary hemorrhage, negative pressure pulmonary edema, small airway disease, sprained tendons, catastrophic breakdowns and sudden death (Cook 2019a, b).

Two leading animal welfare scientists carried out a review of the literature and concluded that there was a “*potential for ridden [bitted] horses to experience three forms of breathlessness; unpleasant respiratory effort, air hunger and chest tightness*” and that “*... most horses exhibit clear behavioural evidence of aversion to a bit in their mouths, varying from the bit being a mild irritant to very painful. This in itself is a significant animal welfare issue that should be addressed*” (Mellor and Beausoleil 2017).

Testimonial evidence relevant to equine welfare has been given at U.S. Congressional and State Hearings (Lyons 2012, 2019a, b).

This article describes what I, after almost a decade of testing different ways of doing without the supposedly indispensable bit, have found works best for my horses. Introduced below is a minimal yet highly accurate bit-free, rope rein and chinstrap that, in my experience as a lifelong horseman, provides infinitely better signaling than a bit-and-strap rein. To avoid misunderstandings, I should emphasize that there is no equivalence between the non-leverage chinstrap here proposed and a leverage-based curb chain.

My U-turn in thinking about horsemanship owes a lot to my background. By training, surgeons are highly critical of the quality of their tools and the way they are used. I apply this same approach to my horsemanship. Discovering the principles of natural horsemanship totally changed my attitude to horses and my life. Being brought up in the authoritarian culture of military horsemanship, I was disappointed with the results I was achieving. This started me on a new path of learning, the result of which led me to question the received wisdom of tradition and adopt an evidence-based approach.

I have always been an avid reader of books on horsemanship. Two quotes from ‘the masters’ have made a deep impression on me:

1. Franz Mairinger (1983), trainer of the first-six Australian three-day-event teams: “*There is no other creature so misunderstood abused and mistreated that still tries to do its best under the most difficult of circumstances.*” This book published posthumously, is a tribute from his many pupils and associates.
2. Tom Dorrance (1910-2003), a founder of the ‘Natural Horsemanship’ movement, memorably advised: “*In a dispute between the human and the horse, I will be the horse’s advocate and will prove to you that the horse can do no wrong*” (Hunt and Hunt, 1978).

Starting from this foundation, the following experiences were like seed falling on fertile soil. First came Pat Parelli, next came Monty Roberts. The revelation of liberty work, communicating with gesture alone, was truly astounding (e.g., Field 2014). To discover that it was possible for me to learn the ‘language’ of the horse and

‘speak it’ effectively was the turning point in my life with horses. I was, at last, able to forge a willing partnership and avoid coercion.

Over the years, it became increasingly obvious to me that I was on the edge of a vast, yet poorly understood, reservoir of equine talent that was available by tapping into the innate good nature and willingness of this flighty free-spirit. I realized this could be achieved, with time and patience, by allowing the horse to make the right choice “*of his own accord*” (Hunt and Hunt 1978). This required abandoning the coercive short-cuts that are so typical of mainstream horsemanship. It also required a better understanding of the evolved behavior of the horse in the wild. We humans are so impatient, presumptuous and demanding of our equine ‘property.’ But once we relinquish our claim to superiority and authority, and treat the horse as an equal (and their inferior in many respects), we have a happier, more confident and increasingly capable partner.

Then came the challenge that prompted me, finally, to discard the bit. Out hunting, one day in 2005, my 6-year-old Thoroughbred, an off-the track racehorse and ‘bleeder,’ simply ‘exploded’ when, after a brief pause in the run, the hounds picked up the scent again. It was a spectacular meltdown, with a sudden, violent and dangerous reaction to the bit. After much head tossing, and repeated rearing, with the probability of my horse eventually falling over backwards, I dismounted. Nevertheless, his rearing continued. He finally swung away from me; the bitted bridle broke in many pieces; and he galloped off.

Looking back, I recognize that, with regard to the bit, horses can have a ‘long fuse’ and that there may come a time when they detonate like a barrel of fireworks. After this frightening episode, and with the same horse, I tested a succession of bit-free bridles. First came the crossunder, followed by the bosal, the hackamore, the Bedouin bridle and finally, in 2015, a laughingly simple rein-accessory I was introduced to by a New Zealand farmer, Felix Hunger, now to be described. This was new to me, as I imagine it will be to readers.

My serendipitous meeting with Felix, at a trekking club event where I was riding with a Bedouin bridle, was a further landmark in my long-standing collaboration (since 2010) with another kindred spirit, Bob Cook, an emeritus professor of veterinary surgery at Tufts University, USA. Bob is a pioneer in understanding what this ‘out-of-sight/out-of-mind’ metal rod does to a horse. Together we had embarked, in 2013, on a pilot study with myself as the test pilot, aimed at understanding more about how the bit interfered with the horse’s airway. We both recognized the extreme vulnerability to obstruction of the horse’s long, narrow and highly mobile airway; something that is seriously underestimated and cannot be over-emphasized. Not only does the presence of the bit sabotage the full and sustained opening of the throat airway, but the horse’s fear of and instinctive aversion to a foreign body in its mouth triggers reflexes that instantly destroy the horse’s poetry of motion and its very birthright – its freedom to breathe (Cook 1999).

From the horse’s point of view, the difference between experiencing a bitted rein’s control-and-coercion and a bit-free rein’s friendly

comfort is likely to be the difference between someone who hammers on his 'door' (i.e., mouth) then breaks it down with a mind to murder, rape and pillage, and a friend who tinkles his 'door-bell' to give him a gift. For these reasons, I choose to use the word 'communication' (in the sense of sharing, conversing and conferring) rather than 'control' (as in power, authority, and restraint).

When we all finally become aware of how the bit hurts and handicaps a horse and we discard this gratuitous impediment to its welfare and athleticism, a second renaissance for the horse will have been launched in all those disciplines for which the bit is now mandated. In racing, for example, I predict that the record books will be rewritten. But welfare improvements alone are something that the horse most desperately needs and we must provide. To follow Shakespeare's lead, no horse in the 21st century should have to "*draw its breath in pain.*"

## SPECIFICATIONS FOR THE NEW REIN

### HEADPIECE



Figure 1. A tied-cord halter.

**b. Four bronze snap-hooks:** Length 8 cm; weight c.75g; with 'D' rings large enough to allow the free passage of the doubled chinstrap.

**c. Two stainless-steel rings,** c.3 cm internal diameter.



Figure 2. Chinstrap.

This could be one of many halters or non-leverage bit-free bridles, as long as it has a noseband. The headpiece I have often used, and the one depicted here, is a tied-cord halter: inexpensive and perfectly adequate (Fig. 1).

### CHINSTRAP

The chinstrap, one of two key features of the new rein, provides the critical interface between rider and horse (Fig. 2). It comprises:

**a. A length of nylon strap** with a snap clasp<sup>2</sup>: Maximum length c.55 cm, width 2 cm. The one I use is marketed as a dog collar (large size).

These components from any hardware shop are arranged in a sequence that turns a dog collar into a benign 'curb' strap. When fitted, the buckle lies on the outer branch of the collar, not against the horse's skin.

The entire chinstrap, with four snap-hooks and rings attached, weighs 350g and provides the 'weight' (i.e., the plumb bob) of this new weighted rein. For comparison, bits range in weight from c.180g for a snaffle to c.3Kg for the two bits and a curb chain of a double bridle.

### ROPE REIN

The rope I use is the core of a 'kernmantle' rope, a mountaineer's or tree-climber's rope. For both activities, it is regarded as a safety rope. For example, mountaineers need to be aware of what their partner (who is often-invisible on the other end of the rope) is doing in order to give him the right amount of slack. It is this *two-way communication* between athletes that gives a kernmantle rein one of its three main advantages for riding or driving over, say, a leather rein.

Kernmantle ropes are constructed of various materials; mine are polyester. They have an interior plaited core (the kern or kernel) for tensile strength and flexibility, with a woven exterior sheath (the mantle) to protect the core from abrasion. For illustrative purpose, the pictures show the core only but, in use, I cover the core with a rubber mantle; the inner tube of a racing-bicycle tire. Rather than use the mantle that comes with the rope, a rubber tube provides protection from abrasion without restricting the core's valuable 'ballooning' quality when used as a rein (Fig. 3).

It is this quality that provides the instant release so important to horsemanship. The core provides a little elasticity to the rein which makes it delightful to use and is wonderful for transmitting the faintest of signals. Because the rein has a little bulk and 'feel,' it also provides an enhanced sense of 'connection' between horse and rider.

The weight of the rein illustrated, without the mantle, is c. 250g. Its ends are heat-sealed and firmly tied to the 'D' rings of the lower pair of snap-hooks on the chinstrap. The upper pair of snap-hooks are hooked on each side of the noseband.



Figure 3a. Core of kernmantle rope in 'neutral' state (no tension or compression).



Figure 3b. Core, when just slightly compressed, as though the rider was releasing chin pressure with a faint 'push' on the reins.

<sup>2</sup>Fastex ® NZ



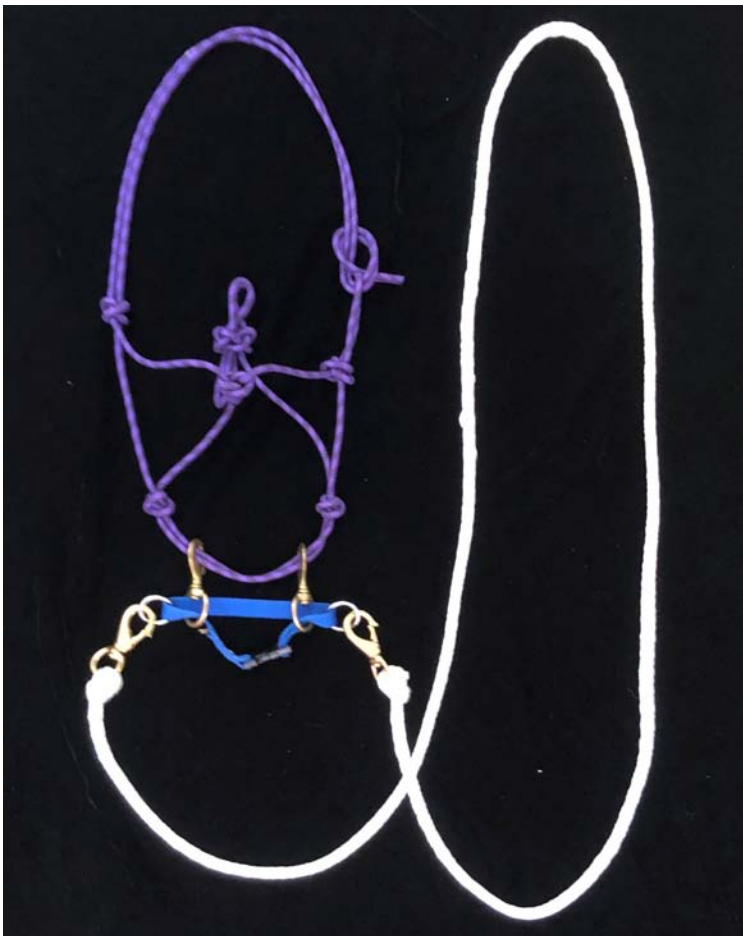


Figure 4a. All three components assembled.



Figure 4b. Showing the chinstrap's plumb line hanging vertically.



Figure 5a. Fitted on a 21-year-old, 16.1 hand, Andalusian gelding. Note that the top of the lower snap-hook lies adjacent to the corner of the horse's lips. There is slight tension on the rein and the chinstrap is engaged, touching the skin immediately behind the chin.

Figure 5b. Chinstrap and noseband. >



Figure 5c. Close-up of chinstrap. Some whiskers are present but the horse has not been in the recent owner's possession long enough for these to have yet grown back abundantly.



### FITTING

In order for the rein to function correctly, careful fitting is necessary. **Six stages** can be described:

**Stage 1:** Invite your horse to drop his head into the noseband of your headpiece and slip the poll strap over his ears.

**Stage 2:** Adjust the cheek straps of the headpiece so that the bottom edge of the noseband comes to lie two fingers-width above the base of the nasal bone's peak, located as follows. Place the thumb and second finger of the left hand, say, in the upper limit of the soft skin of the false nostrils. Using your right hand to do the measuring, there should be a two-finger width between the tips of your left hand's finger and thumb and the bottom edge of the noseband, which will be lying on solid bone (Fig.6).



Figure 6. The peak of the nasal bone is at the extreme top left of the image.

Using a tied-cord halter, the noseband should rest on the bridge of the nose, solely under the force of gravity and the weight of the rein. With other types of bit-free headpiece, any chinstrap that is part of the noseband should be loose, without any contact with the bottom edge of the jawbone.

**Stage 3:** Attach the reins to the stainless-steel rings of the chinstrap.

**Stage 4:** Adjust the length of the chinstrap so that, under slight rein pressure, it contacts the whiskered skin of the chin just a finger's breadth above the chin groove, i.e., a little above the level where the curb chain of a double bridle contacts. In the absence of pressure, the chinstrap lies free of the bottom edge of the jawbone. Only its front edge touches the skin of the chin. The length of the chinstrap should be adjusted for each horse so that it is long enough to provide for quick release. On the other hand, it should be short enough to keep the rein's snap hooks as close as possible to the corners of the horse's lips (Fig 5b).

**Stage 5:** Check that the slightest pressure on one or both reins causes the chinstrap to elevate and come in contact with the whiskered skin below the bottom edge of the jaw, and drops again instantly when rein pressure is released.

**Stage 6:** Lead your horse out into the yard or paddock and, from the ground, check that he responds quickly and willingly to pressure-and-release rein cues for turning in both directions, and backing-up a few steps.

Correct fitting is critical but not difficult to obtain. If the noseband is placed too high, the rein loses the advantage of an increase in the sensitivity of skin close to the muzzle; too low and it could obstruct the nostrils and interfere with breathing. The length of the chinstrap should be adjusted for each horse so that, with a loose rein, there is little or no contact and the chinstrap hangs freely, with its plumb line vertical under the weight of a loose rein. At the onset of any rein tension, the chinstrap should make contact with skin. During a ride and a momentary use of a vigorous rein cue, the rider may see a slight wrinkle of the skin of the nose but, during regular signaling, there will be little or no movement of the noseband.

## HOW DOES IT WORK?

The horse is a prey animal. His ability to move, with lightning speed if necessary (as in the startle response), is key to his survival. The last thing he wants to do is fall. In order to stay upright, his ability to balance is as important to him as breathing and, on a temporal scale, more urgent.

In a thought experiment, imagine yourself sitting at the oars in a canoe. The river now becomes turbulent and, suddenly, to the prow of the boat is added a bowsprit with, impaled on the spar's tip, a horse's head – as from *The Godfather*. What balancing act would you perform, in order to stay afloat?

Yet this is what a horse does with consummate ease, every minute of every day, in spite of his heavy head and long neck, as long as:

1. A momentarily unbalanced rider is not using the bitted rein to correct her own loss of balance (Fig 7).

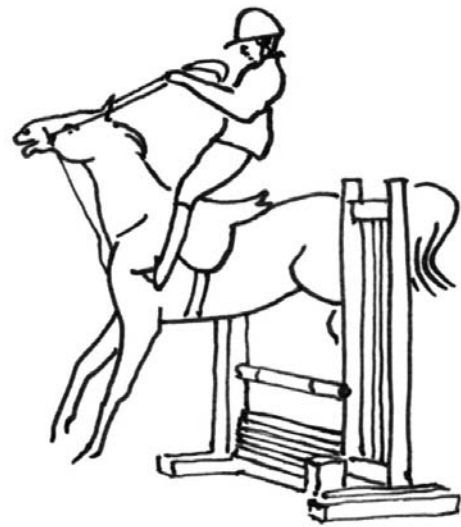


Figure 7. A show jumper balancing herself by using the reins at the horse's expense.

2. A rider is not using a bitted rein to pull her horse into a frame, i.e., dictate a horse's head position by 'main force' (i.e., military-style, mechanical force) with constant pressure for periods of time (Fig. 8).



Figure 8a. Bit-induced hyperflexion ('Rollkur').

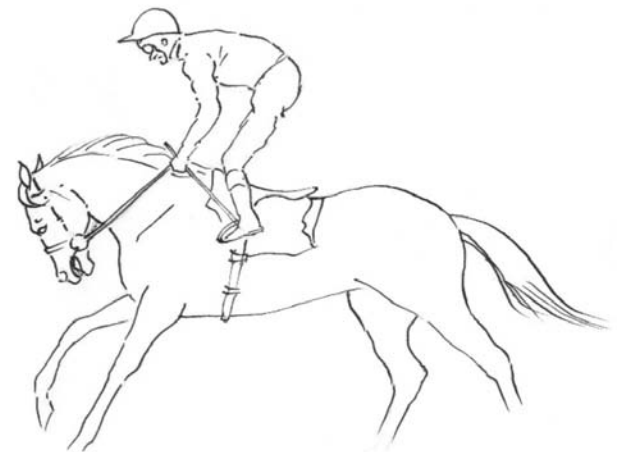


Figure 8b. An exercise rider 'bridging' the reins during a training gallop, unintentionally causing pain, airway obstruction and lung damage.



On the move, a horse can balance perfectly well (maintain 'self-carriage'), even when ridden or driven, as long as painful pressure on his mouth from rein tension does not make it difficult for him to breathe.

3. A race rider (e.g., exercise rider or jockey) is not using the reins to rate his horse (i.e., hold him in), supposedly to save a horse's energy – perhaps for the final stretch in a race or to prevent a horse from doing too much in a workout before a big race (Fig. 9). Though it is standard practice, the unintended consequence is that such a practice limits a racehorse's energy (i.e., 'curbs' his quota of oxygen due to partial suffocation).



Figure 9. A workout. The reins are under extreme tension, bit pressure will be high and the horse will be experiencing pain. Understandably, his mouth is gaping. Such a horse will be experiencing airway obstruction and suffering lung damage from barotrauma.

4. Being prevented from extending his head and neck at the gallop, so essential for proper breathing and striding (Fig. 10). The two are synchronized; if he can't breathe he can't stride. Shorter, snatched and choked breaths equates to shorter strides and less speed. Using more of his energy for breathing, a horse has less energy for galloping – hence disappointing performance, but the horse is not to blame.



Figure 10. A workout runaway, not under 'control by the bit'

On the move, a horse can balance perfectly well (maintain 'self-carriage'), even when ridden or driven, as long as painful pressure on his mouth from rein tension does not make it difficult for him to breathe. A horse's sense of balance is an important part of a much larger sense, sometimes referred to as the 'sixth sense.' As a man of medicine (a surgeon), let me correct the false perception that such a *soubriquet*<sup>3</sup>, with its faintly unbelieving overtone, tempts us to dismiss as being something that only weird people possess and is, anyway, not 'real.' The scientific name for this sense, so essential to balance but also to posture and the coordination of movement, is proprioception or kinaesthesia. Sadly, neither of these names is much help to a non-medical reader which only adds to the difficulty in understanding how important a sense it is and what it does. A common-or-garden name is needed – perhaps "Shut-Eyed" sense would suffice.

Proprioception, essential to very survival, is a sense possessed by every animal that moves. Indisputably, a horse is such an animal. It is the sense that keeps us aware of where our bodies are in space and how much precisely-judged muscular effort is needed, and for how long, to keep any movement of all the different parts properly synchronized. Close your eyes and do your morning exercises. What you now 'feel' is proprioception. With our eyes shut, it tells us what our limbs are doing in relation to different parts of each limb, the other limbs and the rest of our body. It provides horses with a continuously updated stream of information, every millisecond, about the 'what' and the 'how much' of 'happenings' in their muscles and joints.

So why am I telling you this? My answer is because the proprioceptive nerves in a horse's head are especially sensitive (think of the spook reflex, headshaking and trigeminal neuralgia). The whole of body skin is a sense organ but, with regard to the head, the skin of the muzzle, lips and chin is super-sensitive. A horse feels his way around his world with that portion of his head which he could dip into a pint pot. And where are those specialist tactile hairs we call whiskers longer and more densely packed than anywhere else? Answer: the chin and nearby bottom edge of the jawbone. As Shakespeare described love's 'feelings,' this region in the horse is "*more soft and sensible, than are the tender horns of cockl'd snails.*" And talking of which, the spiral cavities of the inner ear, called 'cochlea' (Latin: *snail*), are the headquarters of balance. Now you will see why a rein that just caresses this area is so interesting?

Bit pain seriously interferes with proprioception. In a test population of 66 horses, bit pain was found to be a common cause of behavioral (i.e., movement) problems such as head shaking and lameness of many kinds. These 'under saddle' behaviors were considered to belong to the same class of behaviors 'at rest' such as crib-biting and weaving, i.e., *stereotypic* movements (Cook and Kibler 2018).

Figure 5c shows that the hair and whisker-bearing skin of the muzzle is physically encircled by the chinstrap in its 'southern hemisphere' and the noseband in its 'northern hemisphere.'

<sup>3</sup>Two French words for *under* and *brisket* interpreted literally (though not anatomically correctly) as a *chuck under the chin* (Webster's).

For a rider/driver, the principle of a weighted chin strap – operated by a ‘feeling’ rein – is the same as is, for a carpenter/bricklayer, the plumb line. It is the way for determining and achieving a ‘standing upright’ position, i.e., a vertical reference line. The horse’s sense of balance tells him instinctively in what position his whole body should be in order to stay upright, whether at rest or on the move. During ridden/driven exercise, his head position will be that in which the plumb line of the chinstrap, an imaginary line through the long axes of the upper and lower snap hooks, is vertical. As the word indicates, the horse will be ‘aplomb.’ The horse knows perfectly well what he has to do in order to stay standing. It is the responsibility of the rider/driver to not interfere with his instinctive minute-to-minute, constant corrections.

Knowledge of the horse’s needs helps horsemen to understand that constant rein pressure of any sort is counter-productive. If the rider wishes his horse to change direction or speed the rider can do this most of the time (if the seat or leg aid is not already sufficient) using this chinstrap rein, with a brief nudge. The horse is so sensitive that a nudge is generally more than enough. At no time, should a rider attempt to dictate a horse’s head position by manual force; something that is too readily achievable with the leverage force and pain of a bit. A major advantage of a chinstrap rein is that, even in an emergency, with short-sharp nudges to the bridge of the horse’s nose, a rider is not attempting and, in fact, cannot anyway use the rein for mechanical restraint of a horse’s head position. The reins are for signaling not suffocating. A judge could use the plumb line as an ‘inclinator’ of rein tension, and a camera will record changes with still or video photography.

The chinstrap lies free of skin except at its front edge. Any momentary rein tension is transmitted to the whiskered skin on the bottom edge of the jawbone. At all times, it is never more than a gentle ‘push’ (i.e., touch) signal. Any ‘pull’ is always transient.

The design provides the option of a rein cue being delivered either to the chin predominantly and just a little to the bridge of the nose, or – more equitably – to both chin and nose. In other words, two distinct classes of signal. First and foremost, in regular usage, it is one of positive reinforcement, eliciting a minimal pain-free signal that – to an observer – might be imperceptible. It may, nevertheless, invoke the horse’s ‘seeking’ (comfort/curiosity) and dopamine-based emotion, otherwise called the *pleasure or reward center*, i.e., as opposed to the phrase ‘punishment and reward’. The second class of signal is one of minimally aversive negative reinforcement. Both classes incorporate the rein’s unique feature of providing instant release.

## POSITIVE REINFORCEMENT

A momentary squeeze from a rider’s hand to one or both reins is transmitted by a more or less invisible ‘vibration’ conducted through the rope rein to the chinstrap in touch with the highly-sensitive whiskered skin of the horse’s chin. Such a signal is given by applying momentary tension to a previously loose rein and will have, it is presumed, greater clarity for the horse than an otherwise similar but ultimately a desensitizing signal from a rein constantly under tension. Most of the time, a rider should be riding ‘on the buckle’ (i.e., with a loose rein). In my three years of trials (2016-2019) of this new rein on a number of my different but highly ‘forward’ horses (one

Thoroughbred cross, one Arab and one warmblood), this has been quite sufficient for well over 90% of my riding time during trekking, beach gallops and endurance races.

## NEGATIVE REINFORCEMENT

During infrequently experienced occasions when, because of some externally-generated environmental hazard, deceleration or a complete stop of an excited horse is required from a full gallop, one or more short-sharp tugs has always been sufficient to regain stimulus control. Generally, one vigorous but quick application of rein-to-nose pressure has been enough. Even when two or three repetitive but distinct ‘reminders’ were needed, the duration and severity of such pressure would be trivial compared with similar pressure from a bit. Crucially, the new rein provides instant and complete release between tugs. The rider releases *before* the horse has time to oppose him and trigger a tug-of-war that the rider is destined to lose. Nothing impresses nature’s premier flight animal more than a quick and timely release.

A naysayer might comment; “*That is not going to be as effective as a metal bit in the mouth...it won’t hurt enough!*” Sadly, such a comment betrays a fundamental misunderstanding of how horses learn. For successful and harmonious communication between horse and rider, there can be no pain. A follow-up question might be, “*So why will this encircling signal be so effective?*” A fair question, and the answer:

- a) I am no longer able to hurt the horse (a good thing) and I signal most of the time with little more than a vibration of the weighted rein.
- b) If needed, I can use a stronger signal, quickly and briefly; more humanely and effectively than with prolonged traction on a bit.
- c) Timing is everything in horsemanship.

The question also betrays an unfounded reliance on the myth that a bit controls a horse, and an inappropriate emphasis on a rein cue for this purpose. The advice (admittedly ‘*more observed in the breach than in the observance*’) is that the correct sequence of applying the aids is seat - legs - hands. A hand-aid should be the last to be applied; it is the least important of the three aids.

From the horse’s point of view, the difference between experiencing a bitted rein’s coercion and a bit-free rein’s friendly comfort is likely to be the difference between someone who hammers on his ‘door’ then breaks it down with a mind to murder, rape and pillage and someone whom he knows, tinkling his ‘door-bell’ to give him a gift. For this reason, I choose to use the word ‘communication’ rather than ‘control.’

For most riding disciplines, the seat is the most important aid for slowing and stopping. For flat racing and harness racing, a seat-aid is unavailable. In any bit-free racing future, horses could be trained to respond to a verbal cue for slowing and stopping, as well as to the new rein’s touch-cue (see Mayhew quote below).

My experience is that the new rein is astonishingly effective, even on the most mettlesome of horses – and I certainly have one. The new rein is far safer and more humane than any bitted rein I have ever tried.

Experiencing a horse's sensitivity and willingness to comply with the mere touch of a chinstrap has taught me to appreciate that the horse is an even more sensitive and cooperative partner than is widely recognized.

A second main advantage is that the new rein steers (lateralizes) astonishingly well. I recognized this especially when experimenting with various bit-free bridles for driving. I used very light reins (nylon webbing) that slid easily through saddle terrets (as needed for harness horse racing). Again, why so effective?

My guess is that the horse's supreme tactile organ, its muzzle, works best when used in an encircling 'hug.' Accurate steering is crucial to carriage driving when, for example, negotiating narrow gateways, but equally crucial for 'defensive' driving in harness horseracing. For riding, the ideal rein needs to be soft and pliable, with a little 'body,' so that it can be 'flicked' easily.

A third advantage of the new rein is worth repeating. The new rein is *proprioceptively conductive*, and it is this that ensures two-way communication between rider/horse and horse/rider.

The features of a weighted rein, of which in my opinion the new rein is a prime example, are familiar to Western horsemen, especially in the cutting discipline. Here the horse's speed of response in anticipating a cow's movement is far quicker than that of the rider's, so a rein that provides communication-without-restriction allows a good cow-horse to really show what it can do, free of rider interference. There is no reason why this valuable feature of Western horsemanship should not be applied to European riding; dressage in particular, but indeed to all disciplines, including racing.

For comparison purposes, you could think of the Bedouin bridle's padded chain noseband as allowing a rider to communicate easily with the 'northern hemisphere' of the horse's muzzle, whereas the chinstrap communicates with the even more sensitive and unpadded 'southern hemisphere.'

Of all the headpieces I have tested, my personal preference now is to use a Bedouin style headpiece (without the chain) in combination with the new rein and chinstrap (Hanson and Cook 2005).

Over a period of time, it's no exaggeration to say that I have noticed a total and hugely beneficial change in the attitude of a previously bitted horse, when going bit-free. Clearly, it also has major emblematic significance for the horse.

The compelling anecdotal evidence has now been supported by peer-reviewed numbers (Cook and Kibler 2018). But it still, probably, has to be seen, heard and felt by every additional open-minded rider to be believed. Using a small, noseband-mounted voice recorder, I have become aware that the very slightest pressure on a bit momentarily interrupts a galloping horse's rhythm of breathing. The observation opens a whole field of study.

Photographs of my horse's footprints in the sand when at full gallop on the beach, with and without a bit, revealed something else of interest. Whereas a bitted horse's total line of travel can be straight enough, when the same horse on the same day is bit-free, he feels as though he is swaying less from side to side, i.e., he seems to have a cleaner arrow gait. This would also be worth study.

## DISCUSSION

Over a hundred years ago, a perceptive graduate of the Royal Veterinary College, London wrote "*Save when needless severity urges timidity to madness, the horse is naturally obedient. This is the instinct of the race. ... All its learning is attention to the sounds of the human voice. It is guided by touches. ... Let every owner of a horse treat his slave with gentleness. ... Above all things, let no individual employ the reins as an instrument of torture*" (Mayhew 1890). I agree.

Experiencing a horse's sensitivity and willingness to comply with the mere touch of a chinstrap has taught me to appreciate that the horse is an even more sensitive and cooperative partner than is widely recognized. His lips, tongue and gums are sense organs evolved to finely differentiate between the soft and subtle, touch and taste, of young herbage. Submitting these sense organs to the pin-point pressure and random velocity of a metal rod must be rather similar to how we feel if, unthinkingly, we put on a set of headphones without realizing that the volume control is switched to maximum. To the horse, rein tension on a bit may feel as though his head is being blown off.

Temple Grandin (2005) wrote, "*Compared to humans, animals have astonishing abilities to perceive things in the world. They have extreme perception. Their sensory worlds are so much richer than ours it's almost as if we're deaf and blind ... they don't have ESP [extrasensory perception], they just have a super-sensitive sensory apparatus.*" Late in my riding career, but thankfully, I too have come to realize that the horse's sense of touch is, indeed, immensely more sensitive than ours. In addition, as Grandin emphasizes, some of their other senses are also attuned to information that we miss.

## RULES, SCIENCE, AND LEARNING THEORY

Rules of organizations, like the laws of countries, have always needed to be updated from time to time, in order to keep them consistent with advances in science, changes in ethical standards and other shifting sands of culture. With regard to horse sports, it is no wonder that rules drawn-up in the 17th century are now out-of-sync with science. This has come about, not because of delay on the part of administrations so much, but rather the extraordinary length of time it has taken for science to be applied to a custom that is older than civilization. Clearly, it behooves us now to catch-up as quickly as possible, in order to correct problems whose origin can now be traced back to a simple lack of investigation.

Over the last 20 years, new evidence has placed horsemanship in this anomalous position. The contradictory situation has arisen because, chronologically, science has contributed to the art of horsemanship only very recently.

First came the rules for competitive equestrian sports. Early racing rules were likely to have been considered c.400 years ago, sometime in the reign of good King Charles. Whether or not rules at that time contained a written mandatory-bit rule, it can be assumed that use of the bit was taken for granted, unquestionably adopted and customary.



In the 18th century, when Britain's Jockey Club was founded, bit usage was probably more formally established. Since then, as other competitive horse sport disciplines were formalized in the 19th and 20th centuries, most of their administrations followed 'standard practice' and mandated bit usage. An exception was show jumping. Pony Clubs, worldwide, are independent of the *Federation Equestre Internationale* (FEI), but they too have aligned their rules with the FEI, as have 4H organizations. As a result, even novice competitors are required to use a piece of equipment that jeopardizes the safety of themselves and their horses.

As already reviewed, scientific evidence relative to rein-aid communication was not brought to bear on this topic until the start of the present century. Since then, learning theory has also been applied to horsemanship (McGreevy and McLean 2007, Hawson et 2010, McLean and McGreevy 2010, ISES 2018). On first glance, the principles of learning theory as applied to the horse sound rational, except that well-meaning attempts to apply them are prevented by the mandatory-bit rule for most equestrian sports. For example, the very first of ten principles states that application of the theory takes note of the ethology of the horse, i.e., its behavior and social organization. It recommends that fear responses are to be avoided. But bits are a major cause of fear in competition horses (Cook and Kibler 2018). Pain and fear are inimical to learning.

The relatively recently founded International Society for Equitation Science (ISES) endorses the minimal use of aversive stimuli (i.e., the bit) and defends negative reinforcement in referring to 'pressure-and-release.' But another word for bit pressure on bone is pain. Gum on the bars of the mouth is the highly sensitive 'skin' of the jawbone and pain, in turn, causes fear. As explained recently in non-technical language, the bit is horsemanship's 'elephant-in-the-room' (Cook 2019a and b).

In sum, the answer for all competitive sport is to repeal mandatory-bit rules and allow the use of positive reinforcement. The new rein permits this and, at the same time, places a built-in monitor on the degree of pain used when environmental circumstances (over and above rider-inflicted circumstances) arise. The chinstrap can cause no pain and the amount of pain caused by a bit-free bridle's standard noseband is limited. Any inflammation that could conceivably be caused is likely to be transient and soon corrected. In three years of trials, I have never seen any discernible damage to the bridge of the nose. For example, even if a rider should lose her balance when using the chinstrap bridle, and tugs hard and long on the rein, the horse will nonchalantly shrug off this passing incident – without it causing him the sort of pain that, with a bit in his mouth, might have triggered rearing or bolting.

In fairness to early horse sport administrators, we need to put ourselves in their shoes and recognize that the intent behind most rules for horse sports when they were first drawn-up was to promote the general good; to keep things running smoothly; to prevent harm to persons and property; for supposed safety; and to deter chaos. Mandatory-bit rules were undoubtedly stipulated with good intent. It was assumed then and is still a myth widely assumed today, that bits control horses. But evidence shows that the myth is wrong. Horses can and should be ridden without bits. Bit-free horses do not cause chaos. Mandatory-bit rules degrade the welfare of horses and the welfare of those that ride them. In some countries such rules may now violate the laws of the land with regard to animal cruelty.

## CAN THE NEW REIN BE EFFECTIVE FOR DRIVING?

Yes, it is extraordinarily good – not only because of its stopping power – but especially for its accurate lateralizing property. It is far superior than anything you can achieve with a bit. Its impact on the harness racing system is likely to be impressive. But for driving, the reins need to be as light as possible, because of their length, and because they have to run through terrets on the top of the sulky 'saddle.' Light nylon strapping is perfectly adequate (Fig 10b).

## COULD THE NEW REIN ALSO BE USED FOR RACING?



All photos courtesy Fridtjof Hanson

Figure 10b. Kerstin Kemlen in Sweden is someone with an intense interest in harness horse equipment who has been brainstorming with Bob Cook for many years, and with whom I too have been in touch more recently. The photograph shows a chinstrap rein which she has been testing as a driving rein with promising results. My feeling is that the particular bridle shown might be yet further improved with the addition of a pair of rein snap-hooks.

Yes. It is my belief that a second renaissance in horsemanship will happen, not at the dressage-end of horsemanship, but at the other end – racing. Why? Because the ability of a racehorse to breathe freely is a limiting factor in a horse's performance. Also, because racing is currently in an existential crisis that requires urgent remedial action (Cook 2019b). Conveniently too, the grading of racing performance lends itself perfectly to data analysis. Speed trials will be a foundational source of evidence. The moment it becomes possible, with reliable data (and probably long-before, because trainers are always looking for 'an edge') to uncover the serious handicap to performance that the bit presents, the 'cat will be out of the bag.'

The best and safest way to demonstrate the advantage of bitlessness (and calm the widely-feared but unjustified assumption that bit-free horses will be out of control) is for the industry itself to take possession of well-designed bit-free racing trials. This should include

# Mandatory-bit rules were undoubtedly stipulated with good intent. It was assumed then and is still a myth widely assumed today, that bits control horses. But evidence shows that the myth is wrong.

independent behaviorists and other specialists. At this critical moment for racing in California, for example, with the Breeder's Cup taking place this November, a statement of intent – issued not later than October – by the State of California, to establish bit-free racing trials starting next year (2020), might be enough as a short-term measure to ward off the current risk of a ban being imposed on racing in the state. It is something the industry could legitimately point to when the next racehorse death occurs.

It might be claimed that the U.S. racing industry already has such a defense in the yet-to-be-ratified Barr/Tonko Horse Integrity Act. Unfortunately, as has been pointed out, there are serious weaknesses with this bill (Lyons 2012, 2019a and b). Such a law would not in anyway address the root cause of the manifold bit-induced problems that currently bedevil horse racing worldwide (see 'Conclusions'). I am not suggesting that repeal of the mandatory-bit rule would eliminate the present widespread practice in the U.S. of trying to mask unsoundness with legal and illegal drugs. Nevertheless, it is true to say that the introduction of permissive medication with a diuretic ('Salix'), on the false premise that it prevents 'bleeding,' marked a moment in the history of U.S. racing when illegal medication also escalated. Far better to remove a cause than to strive ineffectually for palliation. 'Bleeding' requires a rule change; *management*, not medication.

The protocol for bit/bit-free trials should be professionally compiled and monitored. Ideally, they should eventually include unschooled, medication-free foals. Because of the urgency of the situation, these will have to follow in due course. The first objective will be to demonstrate racing's tangible commitment to long-term safety and welfare.

Welfare issues concerning use of the bit are an urgent problem, internationally (Cook 2019b) but in whichever country trials are carried out, these should certainly include one or more racing jurisdictions in the USA. Tackled professionally and ethically, the present crisis in racing represents an opportunity which could lead to a paradigm change in all of horsemanship, worldwide. There is nothing to lose and everything to gain by racing being seen to be making a genuine and committed effort to further explore the cause of the high frequency of catastrophic breakdowns and sudden death.

Before this process can even start, something else needs to be urgently achieved. It requires a change of attitude of horse sport administrators in general but especially racing's administrators. The theory that 'bleeding' in the racehorse could be caused by upper airway obstruction was first advanced over 30 years ago (Cook et al 1988). In the interval since then, no evidence has been published to refute the theory and the evidence in support (much of it cited above) has been steadily mounting. It has been proposed that:

- Exercise-induced pulmonary hemorrhage (EIPH) is no longer the most appropriate name for this ubiquitous scourge of racehorses.

- Airway obstruction in man is a rare but life-threatening disease, well-recognized as negative pressure pulmonary edema (NPPE). I agree.
- EIPH in the horse should be renamed NPPE.
- As in man, upper airway obstruction is the cause but, unlike in human medicine – where NPPE is rare and accidental – in the racehorse, it is ubiquitous and, albeit unintentionally, mandated by the racing industry itself.
- A common cause of upper airway obstruction *is the bit*.

My experience as a surgeon/horseman is entirely consistent with the bit-induced/asphyxia theory of 'bleeding.' As this theory has been available for discussion for so long, how is it that it is not even being discussed? With all the administrative pondering about the permissive use of a diuretic ('Salix') for bleeding racehorses, the word 'bit' has not yet been mentioned? As the theory is testable and could lead to a solution, I urge that discussion of this theory should be aired with all speed. If stakeholders in racing have some valid evidence for refuting this theory, it should be published as a matter of urgency. If they have no such evidence, we should hear what reasons they have for not even considering the conspicuous presence of an oral foreign body as the possible cause.

- First, trials need to be conducted to test the theory and introduce trainers and riders to the new rein and, necessarily, a new way of riding.
- Secondly, rules will need to be updated to allow bit-free racing.
- Thirdly, and of prime importance, exercise riders and jockeys and indeed riders in all disciplines, need to learn the new language of bit-free communication. This has to be based on the attainment of an independent seat, i.e., a rider who is not reliant on using the reins to balance. Amazingly, most jockeys and exercise riders, most of the time, use neither a seat-aid nor a leg-aid. With short stirrups, they stand in the stirrups and balance on their feet. Nevertheless, there are times when, with bridged reins, they lean on the horse's neck, with reins of fixed length, maintaining constant contact (pressure) on the horse's mouth.
- Fourthly, all the benefits of bit-free riding will not become fully apparent until it can be applied to horses that have never ever had a bit in their mouth, and have not been permanently damaged (physically and emotionally) by bit usage.

In the meantime, there is every reason to expect that the welfare and safety advantages already manifested by Thoroughbreds, Quarter horses and harness horses in disciplines other than racing would apply to racing. A recent study indicated that 71% of 283 Thoroughbred racehorses exhibited conflict behaviors at the starting gate (Pearson 2018). Three of the four behaviors listed in the study (i.e., stopping, backing-up and rearing) have been shown to be elicited by the bit (Cook and Kibler 2018).

## CONCLUSION

Horses have been ridden with and without a bit since and before the Bronze Age. I observe that a steel-tipped rein invades a body cavity; causes pain; is inaccurate as a messaging system; frequently causes harmful, unintended consequences; carries a high risk of injury/accident to horse and rider/driver; degrades athletic performance; and constitutes a breach of the privilege that a horse grants us. In striking contrast, a positive reinforcement rein is non-invasive; painless; accurate; can do no harm, even when used by a novice and causes no unintended consequences; lowers risk; permits maximum athletic performance; and promotes harmony and partnership. In sum, a bit is in my opinion an unnecessary and inhumane impediment. I recommend the repeal of mandatory-bit rules. Allowing bit-free horses to compete in all equestrian disciplines would, I believe, have the further beneficial effect of:

- Bringing about a major improvement in horse welfare and quality of life.
- Reducing the prevalence of bit-induced diseases that are currently common in horse sports generally, but racing in particular (e.g., 'bleeding,' ridden horse lameness, catastrophic injuries and sudden death.
- Increasing the overall safety of equestrian sport by reducing risk for both horse and rider/driver.
- Improving the general public's perception of all equestrian disciplines.
- Justifying the continuance of horse sport's social license to operate.
- Increasing the value of Thoroughbred and other bloodstock.
- Slowing the decline of attendance figures at racetracks.
- Slowing the decline of Thoroughbred and harness horse breeding.
- Increasing a racetrack's gaming 'handle' and state/government income.
- Enabling a racehorse to be retired from racing in good health, ready for a life after racing.
- Promoting the general public's participation in and benefit from horseback riding as a healthy, life-enhancing exercise.

In sum, the metal bit is a device that was introduced in the Bronze Age to weaponize the horse for war; ratified for racing by a rule made in the 17th century; 'grand-fathered' in without question and made mandatory in the 19th century by most subsequently developed horse sport administrations, worldwide. Mandatory-bit rules have remained 'on the books' ever since.

Sadly, while horse and man might seem to have evolved as perfect partners, the human propensity for violence and coercion has blocked this symbiosis. Instead of trying to dominate the horse, we should seek partnership; remembering that, in a true partnership, benefits are mutual. Instead of putting a bit in a horse's mouth to try and force it to cooperate, we should use a bridle that connects us benignly so that we can invoke a horse's innate good nature and

willingness to cooperate. The bit disqualifies us from this possibility because it is a weapon of war. A cautionary approach is recommended with regard to the unpredictable behavior of a bitted horse; such a horse is akin to an unexploded grenade.

One discipline, in one country, has demonstrated how a rule change to permit bit-free competition might first be introduced on a probationary basis and then confirmed. Congratulations and thanks to Dressage and the Royal Dutch Equestrian Federation for setting a good example by responding to the 'Rollkur' problem and allowing bit-free dressage. The American Association of Western Dressage and also the North American Western Dressage of America have permitted bit-free dressage competition since their foundation in 2010. To rescue horseracing, the mandatory-bit rule should be repealed.

In case governing bodies of racing and horse sports are still hesitant about the wisdom of a bit-free option in the rules, I will end by quoting the advice of an author of many helpful books on horsemanship (Jahiel, 2001):

*"By giving up the use of a bit, you don't sacrifice any control – but you DO make it less likely that the horse will bolt, buck or bite because of mouth pain. One of the great myths of horseback riding is that the bit stops the horse. A bit can hurt a horse, frighten a horse, cut through the horse's tongue, or otherwise damage the horse. A bit can be used to signal a horse, crudely and harshly or gently and lightly, depending on the skill of the rider. But no bit ever stopped a horse. All the bit can do is to help you tell the horse that you would like it to stop. – and you can say that just as clearly WITHOUT a bit."*

A name for the new rein is needed. As it is not less than 90% non-aversive, I propose '**positive reinforcement rein**.' In my experience, the new rein is ideal, allowing horse and rider to 'keep in touch,' like two climbers on the end of a rope. It is simply a way to say 'hello'; to reassure; to share information; and to ask politely, with a chuck under the chin, "*this is what I would like you to do.*"

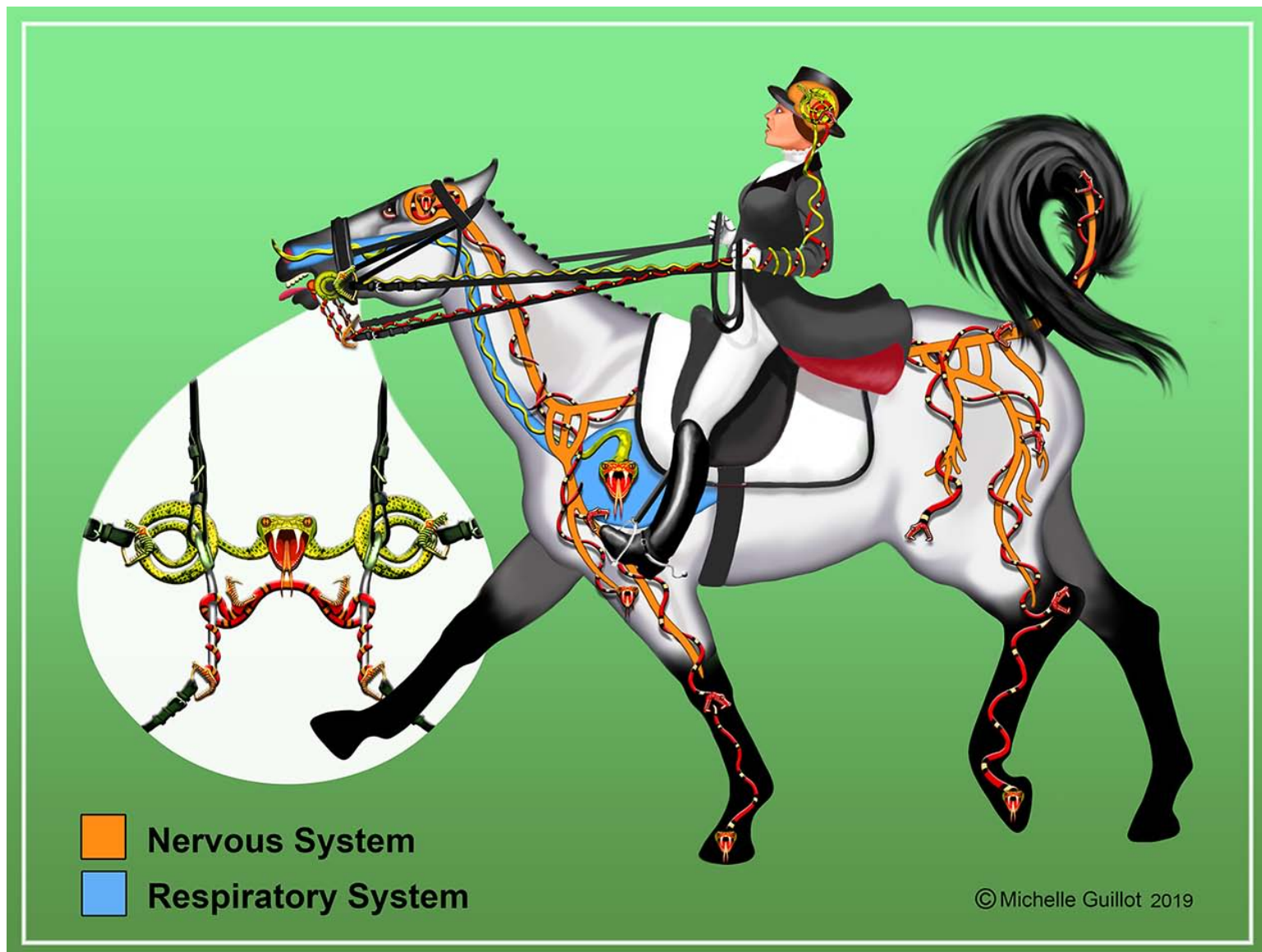
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## REFERENCES

- Clarkson, N (2015): Chomping at the bit: Have we had it wrong all along? Horsetalk.co.nz New Zealand.  
<https://www.horsetalk.co.nz/2015/12/01/cho>
- Cook, W.R. (2003): Bit-Induced Pain; a cause of fear, flight, fight and facial neuralgia in the horse. *Pferdeheilkunde*, 19, 1-8
- Cook, W.R. (1999): The Pathophysiology of Bit Control in the Horse. *Journal of Veterinary Science*, 19, 196-204
- Cook, W.R. (2003): Bit-Induced Pain; a cause of fear, flight, fight and facial neuralgia in the horse. *Pferdeheilkunde*, 19, 1-8





**Figure 11.** Michelle Guillot's design serves to summarize a bit's negative effect on the whole of a horse, its rider and any discipline for which it is mandated.

**On the horse:** Positive punishment, e.g., pain, fear, high-alert, apprehension, spookiness, depression. Cascade of broken lip seal, mouth vacuum dissipated, soft palate elevated, airway strangled, lungs waterlogged and 'bleeding,' breathing-and-striding uncoupled, spine stiffened, exhaustion, stumbling, falls, breakdowns, catastrophic injuries, sudden death.

**On the rider:** Pleasure spoilt by a horse's negative behavior, loss of control, gait abnormalities, frustration, disappointment, poor performance, injury, fear of riding, expense.

**On the discipline:** Reduced participation, lower income, charity status jeopardized, bad publicity.

Cook, W.R. (2011): Damage by the bit to the equine interdental space and second lower premolar, *Equine Veterinary Education*, 23, 7, 355-360

Cook, W.R. (2014): A hypothetical etiological relationship between the horse's bit, nasopharyngeal asphyxia and negative pressure pulmonary edema (bleeding). *Equine Veterinary Education*, 26, 381-389 DOI:10.1111/eve.12196

Cook, W.R. (2016): Bit-induced asphyxia in the racehorse as a cause of sudden death. *Equine Veterinary Education*. 28, 405-409 <http://onlinelibrary.wiley.com/doi/10.1111/eve.12455/abstract>

Cook, W.R. (2017): Man bites horse: Bit rule examined. *Natural*

*Horse Magazine*, Summer issue #3, 2015 Volume 17,2 <https://bitlessbridle.com/wp-content/uploads/2017/10/15MANBITESHORSESubmission.pdf>

Cook, W.R. (2018): Fifty years of recurring struggles with recurrent laryngeal neuropathy. *Equine Veterinary Journal*, 50, 870 <https://doi.org/10.1111/evj.12981>

Cook, W.R. (2019a): Horsemanship's 'elephant-in-the-room' – The bit as a cause of unsolved problems affecting both horse and rider. Weltexpress: <https://en.weltexpress.info/2019/02/15/horsemanship-elephant-in-the-room-the-bit-as-a-cause-of-unsolved-problems-affecting-both-horse-and-rider/>

Cook, W.R. (2019b): Bleeding, breakdowns and sudden death: An interim solution for Californian horseracing? <https://www.horsetalk.co.nz/2019/08/23/bleeding-breakdowns-sudden-death-an-solution-california-horseracing/>

Cook, W.R., Williams, R.M., Kirker-Head, C.A. and Verbridge, D.J. (1988): Upper airway obstruction (partial asphyxia) as the possible cause of exercise induced pulmonary hemorrhage in the horse: a hypothesis. *Journal of Equine Veterinary Science*, 8:11-26

Cook, W.R. and Strasser, H. (2003): *Metal in the Mouth; The abusive effects of bitted bridles*. Sabine Kells, Qualicum Beach, BC, Canada

Field, J. (2014): *The Art of Liberty Training for Horses*. Trafalgar Square Books, Vermont, USA

Cook, W.R. and Mills, D.S. (2009): Preliminary Study of Jointed Snaffle vs. Crossunder bitless bridles in four horses. *Equine Veterinary Journal*. 41, 827-830

Cook, W.R. and Kibler, M. (2018): Behavioural assessment of pain in 66 horses, with and without a bit. *Equine Veterinary Education*, 31, (10) 551-560 <https://doi.org/10.1111/eve.12916>

Grandin, T. and Johnson, C. (2005): *Animals in Translation: Using the mysteries of autism to decode animal behavior*. Simon and Schuster, New York

Guillot, M. (2016): *Western Dressage: Straight from the horse's mouth*. North American Western Dressage, Parker, Colorado

Hanson, F.J. and Cook, W.R. (2015): The rediscovery of the Bedouin Bridle: A welfare and safety enhancer. *The Horse's Hoof*, Issue 60 <http://salon-philosophique.de/2017/03/18/the-bedouin-bridle/>

Hawson, L.A., McLean, A.N., McGreevy, P.D., 2010. The roles of equine ethology and applied learning theory in horse-related human injuries. *Journal of Veterinary Behavior: Clinical Applications and Research* 5, 324–338.

Hunt, R. and Hunt, M. (1978): *Think Harmony with Horses: An In-depth Study of Horse/man Relationship*. Pioneer Pub. Co., Fresno, California

ISES (2018): Position Statement on Aversive Stimuli in Horse Training <https://equitation-science.com/equitation/position-statement-on-aversive-stimuli-in-horse-training>

Lyons, S. (2012): Medication and Performance-enhancing Drugs in Horse Racing: Hearing before the Committee on Commerce, Science, and Transportation US Senate <https://www.govinfo.gov/content/pkg/CHRG-112shrg76248/pdf/CHRG-112shrg76248.pdf>

Lyons, S. (2019a): Racing's legislation set-up USADA to fail. <https://www.horseraceinsider.com/racings-legislation-setup-usada-to-fail/>

Lyons, S. (2019b): New York State Senate. Public Hearing: To Examine the Health of Racehorses while Training and Racing, and Resources for Aftercare. June 2019. <https://www.nysenate.gov/calendar/public-hearings/june-05-2019/public-hearing-examine-health-racehorses-while-training-and-0>

Mairinger, F. (1983): *Horses are made to be Horses: A philosophy of Horsemanship*. Adelaide, Australia

Mayhew, E. (1890): *The illustrated Horse Doctor*, 17th Edition, 1890, p60. W.H. Allen, London

McGreevy, P.D. and McLean, A.N., 2007. Roles of learning theory and ethology in equitation. *Journal of Veterinary Behavior: Clinical Applications and Research* 2, 108–118.

McGreevy P.D. and McLean, A.N., 2010. *Equitation Science*. Wiley-Blackwell, Oxon, UK. McLean, A.N. and McGreevy, P.D., 2010. Ethical equitation: Capping the price horses pay for human glory. *Journal of Veterinary Behavior: Clinical Applications and Research* 5, 203–209.

Mellor, D.J. and Beausoleil, N, J. (2017): Equine Welfare during Exercise: An Evaluation of Breathing, Breathlessness and Bridles. *Animals* 2017, 7(6), 41; <https://doi.org/10.3390/ani7060041>

Miles, S, Shaw, D, and Pearson, G (2018): Approach to the gate: examining conflict behaviour in thoroughbred racehorses. *Proceedings of the International Society for Equestrian Science*, 2018.

Tuomola, K, Mäki-Kihniä, N, Kujala-Wirth, M, Mykkänen, A, Valros, A (2019): Oral mucosal lesions in the bit area in Finnish trotters after a race: lesion evaluation, scoring and occurrence. *Frontiers of Veterinary Science*. doi:10.3389/fvets.2019.00206

## ONLINE OPTIONS

Clarkson, N. (2018): Horses in study showed dramatic fall in pain-related behaviors after going Bitless. *Horsetalk*, New Zealand. <https://www.horsetalk.co.nz/2018/05/13/horses-dramatic-fall-pain-behaviors-going-bitless/>

Cook, W.R. (2016): Metal, Myth and Equine Misery <https://en.weltexpress.info/2016/02/08/metal-myth-and-equine-misery/>

Cook, W.R (2019): Horsemanship's elephant-in-the-room; the bit as a cause of unsolved problems affecting both horse and rider <https://en.weltexpress.info/2019/02/15/horsemanships-elephant-in-the-room-the-bit-as-a-cause-of-unsolved-problems-affecting-both-horse-and-rider/>

Cook, W.R. (2019): Man Bites Horse. Berlin, Germany (Weltexpress) <https://en.weltexpress.info/2019/09/08/man-bites-horse/>

Jahiel, J. (2015): Increase Comfort, Reduce Risk: A review of the harmful effects of bits. *Equine Medical Safety Association Newsletter*. Check the URL [www.bitlessbridle.com/articles/2015](http://www.bitlessbridle.com/articles/2015)

Mellor, D. (2018): Equine welfare during exercise #2. Do we have a bit of a problem? <https://www.youtube.com/watch?v=rY4yEC7lhco>