

FITTING THE CROSSUNDER BITLESS BRIDLE

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“There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.”

- Niccolo Machiavelli (1469-1527)

INTRODUCTION

The correct fitting of the crossunder bitless bridle is quite simple. There are only two things to remember; the noseband should be fitted low and snug. Numerical guidelines are provided in the manual that comes with the bridle and if these are followed there should be no problem (see also Fig 1).

However, whenever there is only one way to do something correctly, there are always many ways to do it incorrectly. As this applies to the crossunder bitless bridle, some understanding of the anatomy of the horse's head, will avoid disappointment. When fitted correctly, it is the experience of hundreds of users that the new bridle provides the safest and most effective method of communication that has yet been devised (see the Users' Comments online at www.bitlessbridle.com). It is also the only bridle that is painless, compatible with the physiology of the exercising horse, and universally suited to all disciplines (notwithstanding the current regulations of the Federation Equestre Internationale and other organizations that do not yet permit its use for competition purposes). But when fitted incorrectly, some of its effectiveness may be lost and riders then criticize the method unfairly.

After 6000 years of bitted bridles, a painless and comprehensive method of bitless communication has finally been developed. The new method represents a landmark advance in equine welfare and the art of equitation. Care must now be taken that the benefits of this advance are not lost as a result of reports from people who have fitted the bridle incorrectly.

Just as the most important features to remember are that the noseband should be fitted low and snug, the most common mistakes in fitting arise from a failure to observe these two criteria. Human nature being what it is, this can come about in at least three ways. Simple failure to read the manual is the first way. We

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have all experienced a reluctance to read the instructions that accompany a new device. A second way arises from the force of tradition. For generations we have been taught that a plain cavesson noseband should be placed two fingers below the projecting cheek bones (facial crest). So recommendations that defy this tradition must surely be wrong and can be ignored. Thirdly, there is a mistaken belief that a low noseband obstructs breathing. This belief arises, however, from a misunderstanding of anatomy. It is falsely assumed that a low noseband is necessarily lying on cartilage rather than bone, and that, as pressure on cartilage would tend to suffocate a horse, this should be avoided at all costs. The last part of this argument is correct but not the first.

This article has three objectives. First, to explain where bone stops and cartilage begins (see legend # 3 on Fig. 2). Secondly, to show that the crossunder bitless bridle is uniquely compatible with the physiology of the horse at exercise. Thirdly, to provide an introduction to some of the form and function reasons (anatomical and physiological reasons) why the bit method of communication is contraindicated and counterproductive (Cook 1999a, 1999b, 2000, 2002, 2003a & b, and Cook & Strasser 2003). The objectives can be most conveniently achieved by a study of Figures 1 to 3.



Figure 1: Showing the correct fitting for the crossunder bitless bridle on an adult Tennessee Walking Horse, with the noseband low and snug.

CORRECT FITTING FOR THE CROSSUNDER BITLESS BRIDLE

The noseband is placed much lower on the horse's head than the plain cavesson of a bitted bridle. In an average-sized horse the bottom edge of the noseband should lie between 3.8 and 5.0 cm (one-and-a-half to two inches, or about two

fingers) above the corner of the mouth (Fig. 1). At this height there is no danger of the noseband obstructing the airway. If the noseband is placed higher than recommended, the sensitivity of the signal is lessened because the sensory nerve endings in this region are less concentrated and some leverage advantage is also forfeited. With a compliant horse this may not be of any great consequence but with an eager horse the rider may have to work too hard and could finish the ride with sore shoulders.

Once the height of the noseband is correctly adjusted, the chinstrap is buckled-up so that it is snug but not tight. One should be able to get just one flat forefinger between the chinstrap and the bottom edge of the jawbone. By 'flat' it is meant that the fingernail should touch the bone and the pad of the finger should touch the chinstrap. Note that this check takes place under the bone and not under the soft tissues at the center of the jaw. Care must be taken that the crossunder straps are not trapped under the chinstrap. Failure to buckle-up the chinstrap sufficiently results in the noseband riding up the head too far at each application of rein pressure. This can result in a cosmetic loss of hair but it can also result in some loss of control. A snug noseband can cause no discomfort as long as the horse's cheek teeth have no sharp edges. A noseband that is tight rather than snug will cause the same sort of intense pain that we experience if goggles or spectacles are fitted incorrectly. In addition, the rider cannot provide any 'release' for the horse.

As with all bridles, one should check that the browband fits comfortably around the base of the ears. A browband that is too tight may cause headshaking.

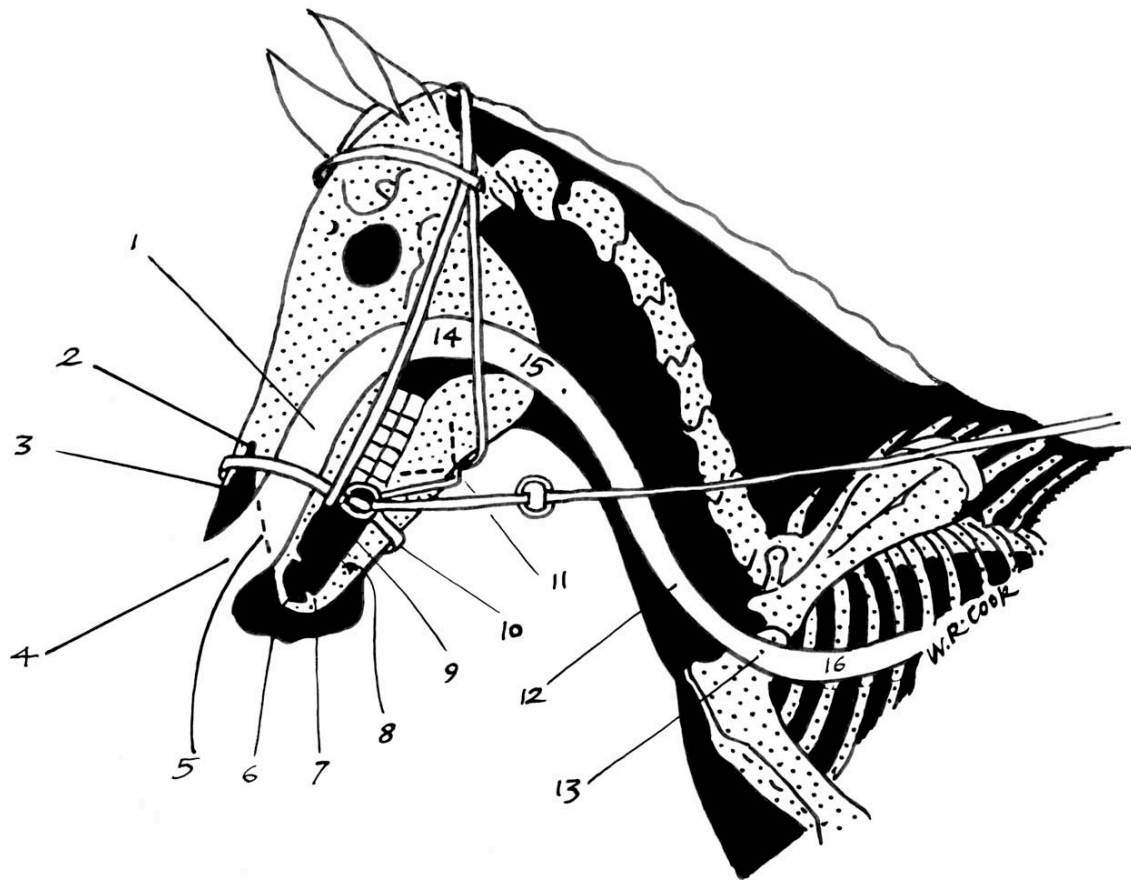


Figure 2. A diagrammatic version of Figure 1, showing how the correctly fitted noseband relates to the anatomy of the region.
Key: white = airway; black = soft tissue (including cartilage); dotted areas = bone. The numbered legends in the diagram correspond to the numbered paragraphs in the text below.

FORM AND FUNCTION

Figure 2 shows the nostril dilated as for exercise. But remember that the diagram is based on the photograph of a horse at rest, so the position of the head is not really appropriate for fast exercise as the airway is too bent. If the crossunder bitless bridle is fitted correctly, it should be possible to palpate the premaxillary notch lying just above the top edge of the noseband (see legend #2). This is a landmark that can be used to check the fit of the bridle on horses of all sizes from draft to miniature. Obviously, the recommendation with regard to the distance of the noseband above the corner of the mouth will vary slightly with the size of the horse, but the premaxillary notch provides an invariable landmark.

1. **Nasal cavity.** The two scrolls of delicate bone in the nasal cavity (the turbinate bones) create three longitudinal channels (upper, middle, and lower). The upper and middle channels function as dust filters and serve the sense of smell in the resting horse. Much the largest channel and the one that provides a direct pathway from nostril to throat is the lower channel. This is the main airway for the horse both at rest and at exercise. Accordingly, this is the one depicted in the diagram. Notice how this lower channel, at the level of the noseband, is shielded by a wall of bone (the incisive bone and the maxilla). Even if the noseband was tight, rather than snug, it could not interfere with the airway.
2. **Premaxillary notch.** The ability to palpate the top of this notch provides the final check that the noseband is at the correct height. In the resting horse, the nostril is relaxed and the false nostril (nasal diverticulum) occupies the large black triangle above and below the noseband. In the resting horse, the false nostrils are two dead-end pouches that lie on the outside of each nostril (see Fig. 3). In the exercising horse, however, the nostrils are dilated. This has the effect of obliterating the false nostrils. The space that they used to occupy now supplements the true airway. Flaring of the nostril provides a funnel-like entrance to the airway that, in the running horse, facilitates the rapid and smooth flow of huge volumes of air. The presence of the noseband, bridging the gap between two bones at the level of the notch, cannot interfere with the passage of air. First, the noseband is supported by bone on each boundary of the notch and, secondly, the main airflow does not involve this region anyway.

[Incidentally, these anatomical and physiological facts are relevant to the debate over whether nasal strips enlarge the airway in racehorses. The facts are such that the use of nasal strips cannot possibly be of any benefit. First, unless a horse has a facial paralysis (extremely rare), its nostrils do not collapse during a race. Secondly, even if the nostrils did collapse, nasal strips would not be of any help because they have no influence over the size of the airway. The situation in man is different but then our anatomy is different. We do not have the false nostrils of the horse. If trainers wish to improve the airway of their horses they can do this by removing the bit (see below)]

3. **Peak of the nasal bone.** Note that this is bone, not cartilage. It is not liable to be bent or compressed as the result of the relatively trivial downward pressure exerted by the noseband of the crossunder bitless bridle. It has been incorrectly suggested, but not by an anatomist, that the peak of the nasal bone is fragile and easily damaged. In a dried skull, this bone is sometimes damaged by the skull being dropped but in the live horse such damage does not occur. Cartilage that extends forward from the peak of the nasal bone provides the support for two comma-shaped cartilages (the alar cartilages) that form the wings of the nostril. All these cartilaginous structures are represented by the black area between the tip of the nasal bone and the nostril.

4. **Nostril (anterior nares).** Note the funnel shape of this entrance to the airway during fast exercise and remember that there are two of them. The nasal airway is a dual carriageway, separated by a sturdy sheet of cartilage, the nasal septum (see also Fig 3). This septum, incidentally, adds significant support and rigidity to the peak of the nasal bone. As implied by the anatomical name for the nostrils there are also posterior nares. In Fig. 2 the posterior nares are sited at the black dot that separates the nasal cavity (#1) from the throat (#14). Their existence is worth noting because the posterior nares are a potential site of serious airway obstruction. Any elevation of the soft palate (the floor of the throat) constricts the posterior nares. The soft palate is attached to the hard palate (the roof of the mouth and floor of the nasal cavity) and hinges at this critical point where the nasal cavity joins the throat. In my opinion, the most common cause of elevation of the soft palate is the presence of a bit in the horse's mouth (see paragraph # 14 and Cook 2002).
5. **Front edge of the premaxilla or incisive bone** (the bone that houses the incisor teeth or nippers). Note that the noseband is firmly supported on each side by this bone that forms the outside wall of the nasal cavity.
6. **Point of contact between upper and lower lip.** In this representation of a relatively normal airway at exercise, the mouth is closed, the lips are sealed, and no air is permitted to enter the oral cavity. An open mouth at exercise is not normal (physiological) as air gets into the back of the mouth and is one cause of elevation or dorsal displacement of the soft palate (DDSP). DDSP constricts the airway at the throat (see legend #14). The word 'relatively' is used above because if this particular horse were performing maximally its head and neck would have to be extended to straighten out the airway. In the position depicted, the airway is obstructed by virtue of poll flexion and high head carriage. This produces two sharp bends in the airway, one at the throat and the other at the entrance to the chest. Unfortunately, with the bit method of communication, it is only too easy for the rider to cause both poll flexion and a high head carriage (false collection).
7. **Canine tooth in the lower jaw.** The root of this tooth occupies most of the space in the jawbone, as far back as the mental foramen (#8). The tooth's presence in the male horse probably accounts for the higher incidence in male horses of bit-induced facial neuralgia (the headshaking syndrome). Mares do not generally have canine teeth and when they do the teeth are much smaller (vestigial).
8. **Mental foramen.** This is the point of emergence of the mandibular nerve, which supplies sensation to the gums (including the bars of the mouth), incisor teeth, lower lip and chin. In a bitted horse, the bit lies on the bars immediately above this highly sensitive region. Pressure from the bit on the gum at the bars of the mouth causes periostitis, which commonly results in bone spur formation (Cook 2002). Gum is a specialized form of periosteum (skin of the bone).

Superficial inflammation of the gum is called gingivitis but deep-seated inflammation is called periostitis (bone spur formation). Bone spurs, in turn, are a common cause of headshaking.

9. **Oral cavity.** Actually, the legend points to the bars of the mouth but it is the black region above the bars that represents the front half of the oral cavity (mouth). The back half of the mouth lies between the first five cheek teeth. At the level of the fifth cheek tooth, the oral cavity continues as the oral part of the throat (in the diagram, the black region behind the last cheek teeth). Compared with man, the horse has an unusually long and narrow oral cavity and throat. But the word 'cavity' as applied to the oral cavity is somewhat misleading because, when exercising rather than eating, both the oral cavity and the oral part of the throat are potential cavities only. In a horse at liberty (or in a horse ridden in the crossunder bitless bridle) both the oral cavity and the oral part of the throat are entirely occupied by the tongue. There is no 'cavity' as such, as all air is excluded. The oral cavity is filled with the tip and body of the tongue, and the oral part of the throat is filled with the root of the tongue.
10. **Chinstrap.** This is a continuation of the noseband. In the diagram it might appear to be attached to the 'O' ring, but the 'O' ring is itself attached to the noseband. The scale of the diagram is not large enough to show this clearly. Notice that the chinstrap lies outside the cheek at the level of the first cheek tooth in the upper jaw. A snug chinstrap could press the cheek against a sharp enamel edge on this tooth, so any such defects should be corrected when using the crossunder bitless bridle.²
11. **Crossunder straps,** each continuing in the direction indicated by the broken line. Notice that the gentle pressure applied by the straps lies away from the teeth and over relatively insensitive tissues such as the side of the jaw and the muscle of the cheek. Pressure elsewhere is also well-distributed and applied to relatively insensitive tissue. Compare this with the focused pressure of a bit on the highly sensitive tissues of the mouth.
12. **Windpipe (trachea).** A high head carriage causes the windpipe to be compressed at the entrance to the chest. Any obstruction of the nasal cavity, throat or voice box will tend to cause a collapse of the windpipe and further obstruction (Cook & Strasser 2003)
13. **Entrance to chest at the level of the first rib.** This is the dividing point between the upper and lower airways (see also Fig 3).
14. **Respiratory part of the throat (nasopharynx).** The throat has an upper (respiratory) and a lower (digestive) part. The two regions are separated by the

² 'The Bitless Bridle.' Manufacturer's address: The Bitless Bridle Inc., 2020 South Queen Street. York, PA 17403-4829. Telephone toll free 866 235 0938 and online at www.bitlessbridle.com

long soft palate of the horse, which forms the floor of the respiratory part of the throat (the nasopharynx) and the roof of the oral part of the throat (the oropharynx). When a horse is eating, the oral part of the throat takes precedence over the respiratory part and enlarges at its expense. Conversely, when a horse is galloping, the respiratory part of the throat enlarges at the expense of the oral part. But note that this is only the situation in the horse at liberty or in a horse that is galloping in a crossunder bitless bridle. This is not the situation when a horse is galloped in a bitted bridle (Cook and Strasser 2003). As the horse depicted in this diagram is exercising, the respiratory part of the throat is open and the digestive part of the throat is closed. During deep breathing as for exercise, the oral part of the throat (oropharynx) is, in normality, a potential space only as it is entirely occupied by the root of the tongue. Unfortunately, because a bit breaks the normal seal of the lips at exercise, air often creeps back into the oral part of the throat and causes the soft palate to billow upwards. As already mentioned, this is one cause of DDSP. A second cause is retraction of the tongue behind the bit, as this results in elevation of the soft palate on the bunched-up root of tongue. These and other causes of DDSP are described more fully in previous publications (see bibliography).

15. **Voice box (larynx).** The common name for this structure incorrectly suggests that voice production is its most important function. In fact, the larynx is a valve in the floor of the throat, at the entrance to the windpipe. The most important function of the larynx is to open to facilitate the flow of air during exercise, and to close to prevent food or water from inundating the lungs during swallowing. Unfortunately, the presence of a bit in the oral cavity of a horse at exercise sends inappropriate messages to the brain and the horse is physiologically confused as to whether it should be breathing or swallowing. This confusion explains why many a racehorse chokes at exercise.
16. **Lower airway.** This section of the airway comprises the windpipe within the chest, the two bronchi and the small airways of the lung (see also Fig 3). Like every other mammal, a horse inhales by expanding the chest and flattening the diaphragm. This creates a negative atmospheric pressure in the air sacs of the lungs and air rushes in to fill the vacuum. The mechanism works well as long the upper airway is not obstructed. Unfortunately, the bit method of communication is, for a variety of different reasons, a frequent source of upper airway obstruction (Cook & Strasser 2003). The abnormally intense negative pressure that results from any upper airway obstruction easily damages the delicate air sacs of the lung and the small airways. The damage is inflicted twice a second in a cantering horse and more frequently in a galloping horse. The end result of this barometric bruising is bronchiolitis, pulmonary congestion, and edema of the lung ('waterlogging'). It is edema of the lung that is the basic pathology behind what is commonly referred to as 'bleeding' in the racehorse (so-called exercise-induced pulmonary hemorrhage or EIPH). A more accurate name for 'bleeding' is asphyxia-induced pulmonary edema or AIPE (Cook

1999b). An even better name would be the name adopted in human medicine for this type of damage to the lungs, negative pressure pulmonary edema (NPPE).

Another common cause of upper airway obstruction is hereditary recurrent laryngeal neuropathy (laryngeal hemiplegia). As this is a disease that is impossible to treat and difficult to prevent, it is all the more important to eliminate those causes of upper airway obstruction that are avoidable. Removal of the bit would do much to reduce the prevalence of pulmonary disease in the horse.

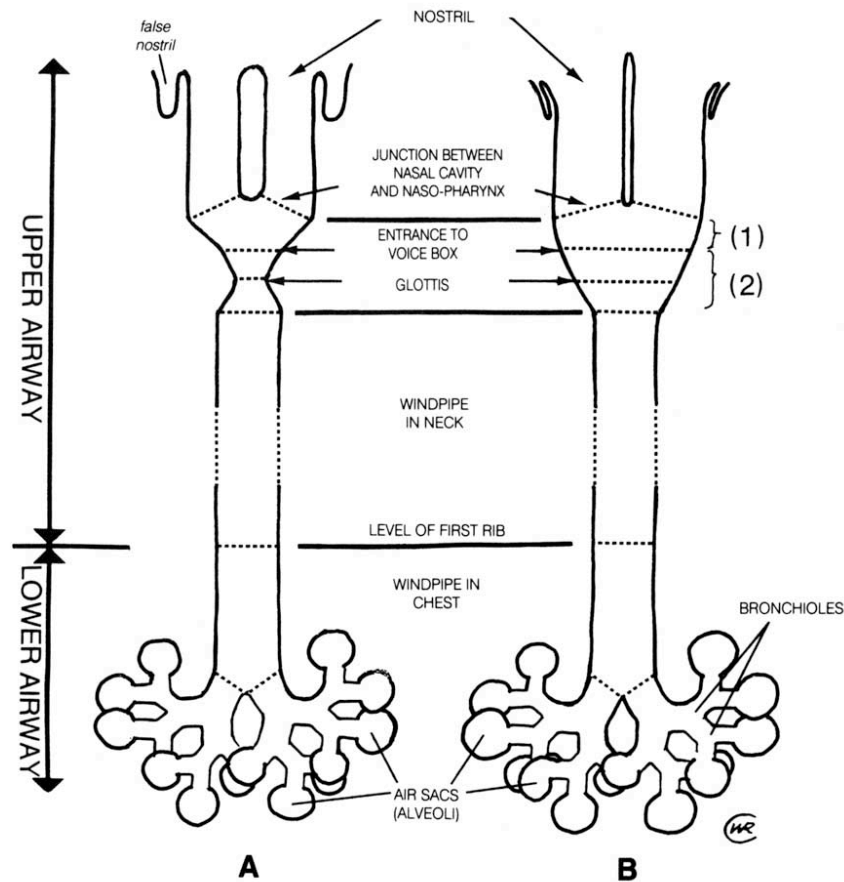


Fig. 3. A bird's eye view of the respiratory tract of a horse at rest and at exercise. Key: 1 = throat (nasopharynx); 2 = voice box (larynx)

Figure 3 illustrates many of the ways in which the healthy airway is enlarged to facilitate the huge increase in airflow that occurs at exercise. At rest (A), a horse may breathe at the rate of 8/minute but at the gallop (B) the rate may be as high as 150/minute. Of particular relevance to this article, is the elimination of the false nostril in the exercising horse, as illustrated (Fig. 3). The nasal airway is further enlarged at exercise by a shrinkage of the vascular erectile tissue in the nose. But the throat and voice box also expand considerably in the healthy horse at liberty. For reasons already given, the expansion of the throat and voice box

in the bitted horse may not take place. On the contrary, the size of the airway at these sections may be reduced.

CONCLUSION

The above explanations of form and function are all relevant to comparing the merits of the crossunder bitless bridle and the bitted bridle. However, one important aspect of physiology has not been addressed ... bit-induced pain. This is something that cannot be illustrated. It requires a study of behavior to demonstrate that the most important (and dangerous) effect of the bit is to hurt and frighten the horse. For further information about bit-induced pain see Cook (2003b).

What is Fitting - Bit or Bitless?

1. From the horse's point of view, the bit is contraindicated because it is painful and mentally stressful. It is also difficult to breathe deeply and stride rhythmically during athletic work with one or more foreign bodies in the mouth.
2. From the rider's point of view, the bit is counterproductive because it has too many side effects. For example, it frightens a horse, causes pain, impedes breathing, interferes with the stride, and lowers performance.
3. From an ethical, welfare and legal point of view, the bit is cruel because it *inflicts avoidable pain* - the definition of cruelty.

Of the three viewpoints, the last is the most difficult for a horse lover and long time bit user to accept. It requires some explanation in order to avoid misunderstandings and a backlash of righteous indignation that such a statement should be made, albeit that the statement is logical and based on facts. I preface the following explanation with the confession that for 99.9% of my riding life I have ridden in a bitted bridle; mostly in a double bridle.

During the five millennium history of the domesticated horse there has, until very recently, been no universally acceptable alternative to the bit method of communication. While this situation pertained, though it had to be conceded that a metal rod in a sensitive body cavity was a potential source of pain, the pain was unavoidable and, therefore, by definition, not cruel. **IF** good horsemanship was practiced, bit pressure was minimal, and it was discontinued the instant that the horse complied with the rein aid, we were able - at the previous state of knowledge - to comfort ourselves with the thought that perhaps no harm was done and the method was justifiable.

But three things are now wrong with that dream. First, it was heavily dependent on the 'if;' secondly, new evidence has become available in the last ten years showing that the bit is the cause of pain, serious physical trauma and mental distress that imperils the safety of both horse and rider; and thirdly, the pain and

stress can now be avoided because of the availability of a more humane, more effective and painless alternative.

As bit-induced pain can be avoided, this changes the classification of the bit from an ethical point of view. Continued use of the bit means that riders are now inflicting avoidable pain. Such riders may protest that they are simply abiding by competition rules but, from an ethical point of view, such a defense carries no weight, and only leads to a justifiable questioning of the ethics of the organization's administrators who mandate such rules. Just as ignorance of the law is not a defense, neither is it a defense for a rider to say that they have not read the evidence, nor that they question its scientific validity, nor that they simply don't believe it, nor that this is merely the biased opinion of a charlatan selling bitless bridles, and nor that the bitless alternative doesn't 'work' for every horse, every rider and every discipline - because the evidence is against them.

As a consequence of being able to ride a horse in a bitted bridle and then, without any longer interval of time than it takes to switch bridles, ride him again in a bitless bridle, it has been possible to amass a whole new body of evidence about what a bit does to a horse. Over the last decade it has become evident that the bit is no longer the relatively innocent intra-oral device that it was previously considered to be. The days have past when we thought there were no more than half a dozen signs of aversion to the bit, and that most of these could be blamed on the horse.

Instead the bit now stands indicted as the direct cause of over 200 signs of unacceptable behavior. These cannot be referred to as signs of 'abnormal behavior' because, from the horse's point of view, they are perfectly normal physiological responses to pain or dis-ease, albeit inconvenient, disturbing or dangerous for the rider. Let's call them side-effects of the bit method and note that, in spite of their quantity and severity, the bit still gets FEI approval. If the bit was a medication for human use, it would never get FDA approval. The bit is also the indirect cause of a great deal of poor performance, both competitive and non-competitive, and many accidents (Cook 2009a). It is the most common cause of bolting, bucking or rearing, three occurrences that are potentially fatal to both horse and rider. It is also the most common cause of career-ending trigeminal neuralgia (the headshaking syndrome). In a survey of 66 non-feral horse skulls from two Natural History Museums, 58 exhibited evidence of bit-induced erosion of the first lower cheek tooth or bit-induced periostitis (bone spurs) on the bars of the mouth, a prevalence of 88% (Cook 2009b).

It is common for a horse to exhibit 50 side effects and for 90% of these to be resolved within two weeks of using the crossunder bitless bridle. In a controlled experiment with four horses that had never previously been ridden in a crossunder bitless bridle, the riders improved their scores in a four minute dressage test from an average of 37% when bitted, to 64% when bitless (Cook and Mills 2009).

The new knowledge gained in the last decade has moved the ethical goal posts for horse welfare. As a result, administrators of horse sports find themselves wrong-footed by an advance in equitation science. Organization's rules need to be constantly updated when circumstances change or when new information becomes available. Otherwise, the rules no longer match the organization's stated objectives. For example, until such time as the FEI approve a humane option to the bit, they are no longer able to claim that their organization regards the welfare of the horse as paramount. The crossover bitless bridle is in compliance with all 10 of the requirements listed in the FEI Code of Conduct . But until the crossover bitless bridle is permitted, the FEI is non-compliant with nine of its own requirements. The only one with which they currently remain compliant is #5 ... *Adequate provision must be made for ventilation, watering and maintaining a healthy environment during transportation.*

As I understand the FEI protocol, one way (and possibly the only way) to persuade the FEI to update its rules, is for national federations to file recommendations. For the welfare of the horse and the safety of the rider it is to be hoped that such recommendations will be filed without delay. Perhaps the Royal Dutch Equestrian Federation, as the first national federation to approve bitless dressage will, once again, be the first to set a good example.

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