

Bitting Actions and Reactions

Part 2 of a study on the science of biting

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IN MY PREVIOUS COLUMN (December 2005), I described the findings of a radiographic study of the position of four snaffle bits (jointed, Baucher, KK Ultra, and Myler Comfort) in the horse's oral cavity. In this article, I'll describe another facet of this study: the evaluation of movements of the horse's jaw and tongue in response to the presence of a bit.

Bitting Behaviors

The radiographic suite at the College of Veterinary Medicine at Michigan State University is equipped with a technique called fluoroscopy, which allows X-rays to be recorded on videotape. This is a wonderful technique for observing what happens inside the horse's mouth, where movements of the bit and tongue are usually invisible.

During our study, the horses wore a bridle that was adjusted so that the bit created a small wrinkle in each corner of the lips—just enough to fit the bit snugly, but not so tight that the bit caused a “smile.” The flash noseband was adjusted flush against each horse's face but not tight enough to indent the skin, so it did not prevent the horses from moving their jaws or opening their mouths.

I have posted video clips of the behaviors I'm about to discuss on the McPhail Chair Web site (www.cvm.msu.edu/dressage). Readers should not draw any conclusions from the bits chosen to show the various behaviors. The clips were selected because they show the specific behaviors clearly, not

because the behavior was typical of a particular bit. We have performed research on a wide variety of bits, and so some bits shown in the videos and in the still photographs that accompany this article may differ from those that I discussed in my previous article.

Behavior 1: Mouth Quiet

The horses' mouths were quiet for the majority of time they were observed. We defined “quiet” as the mouth's being closed, with the upper and lower cheek teeth in occlusal contact and the tongue showing minimal movement, so the bit did not move perceptibly within the oral cavity (Figure 1).

Behavior 2: Gentle Chewing

When horses chewed gently, there was a little movement between the upper and lower teeth, but without parting the lips. The tongue moved but remained under the bit, with the tip of



FIGURE 1: Mouth quiet. The horse's mouth is closed, as shown by the apposition of the upper and lower incisor teeth (IT) and cheek teeth (CT). The tongue (T), which appears gray in color, fills the oral cavity in front of the mouthpiece (M) of the bit. The horse is looking toward the right of the picture. The palate (P) and bit rings (R) are also labeled.



FIGURE 2: Chewing the bit. The dark space between the upper and lower incisor teeth (IT) indicates that the mouth is slightly open as the horse chews gently. The tongue (T) can be seen passing underneath the mouthpiece (M) and in the front of the oral cavity.

the tongue located in the front part of the oral cavity close to the incisor teeth (Figure 2). This type of chewing motion occurs when the horse is relaxed and accepting the bit. This action introduces small bubbles of air into the saliva, causing it to become foamy.

Behavior 3: Opening the Mouth

Horses would sometimes open and close their mouths repeatedly while keeping their tongues under the bit and the tips of the tongues close to the incisor teeth. This behavior produces a clacking noise as the upper and lower teeth meet when the mouth closes. The photo (Figure 3) shows the mouth being opened wider than when the horse chews the bit.

Behavior 4: Raising the Bit

A horse can use his tongue to raise the bit closer to his cheek teeth. At times he



FIGURE 3: Raising the bit. The tongue (T) is being used to lift the bit, so the mouthpiece (M) is closer to the cheek teeth (CT). The dark space between the incisor teeth indicates that the horse's mouth is open.

may actually grasp the bit between his upper and lower cheek teeth (Figure 4). On the video, the mouthpiece seems to catch between the teeth, then suddenly releases. Grasping the bit between the teeth was associated with the sound of enamel on metal. You will sometimes see evidence of this grasping action in the form of scratches on the mouthpiece.

Behavior 5: Drawing Back the Tongue

A horse's tongue is very mobile and has a lot of freedom to slide back and forth underneath the mouthpiece of



FIGURE 4: Grasping the bit between the teeth. This view is a close-up of the cheek teeth (CT), showing the mouthpiece (M) being held between the upper and lower cheek teeth. The horse's tongue is not visible on this picture. The left and right bit rings (R) appear offset because the view is slightly oblique.

the bit. Horses sometimes withdraw their tongues, pulling the front part of the tongue back toward the teeth. Retraction of the tip of the tongue under the mouthpiece of the bit is easily seen on the videos. The tongue can be withdrawn so far that it disappears entirely from the front part of the oral cavity (Figure 5), even without the horse opening his mouth.



FIGURE 5: Retracting the tongue. The tongue (T) has been retracted underneath the bit so only the tip is visible. The oral cavity looks dark because the tongue has been retracted.

The muscles that retract the tongue attach to the hyoid bones, which are stabilized by muscles on the underside of the neck that run from the hyoid bones to the sternum. Not surprisingly, tongue retraction may be associated with tension in the muscles on the underside of the neck.

Behavior 6: Tongue over the Bit

None of the horses in this study put his tongue all the way over the bit. On several occasions and in several horses, however, the body of the tongue bulged over the mouthpiece, forming a cushion between the mouthpiece and the palate (Figure 6). This behavior was observed quite frequently and may have been a way for the horses to protect their palates from painful bit pressure.

Swallowing While Bridled

There has been debate as to whether horses are able to swallow while bit-

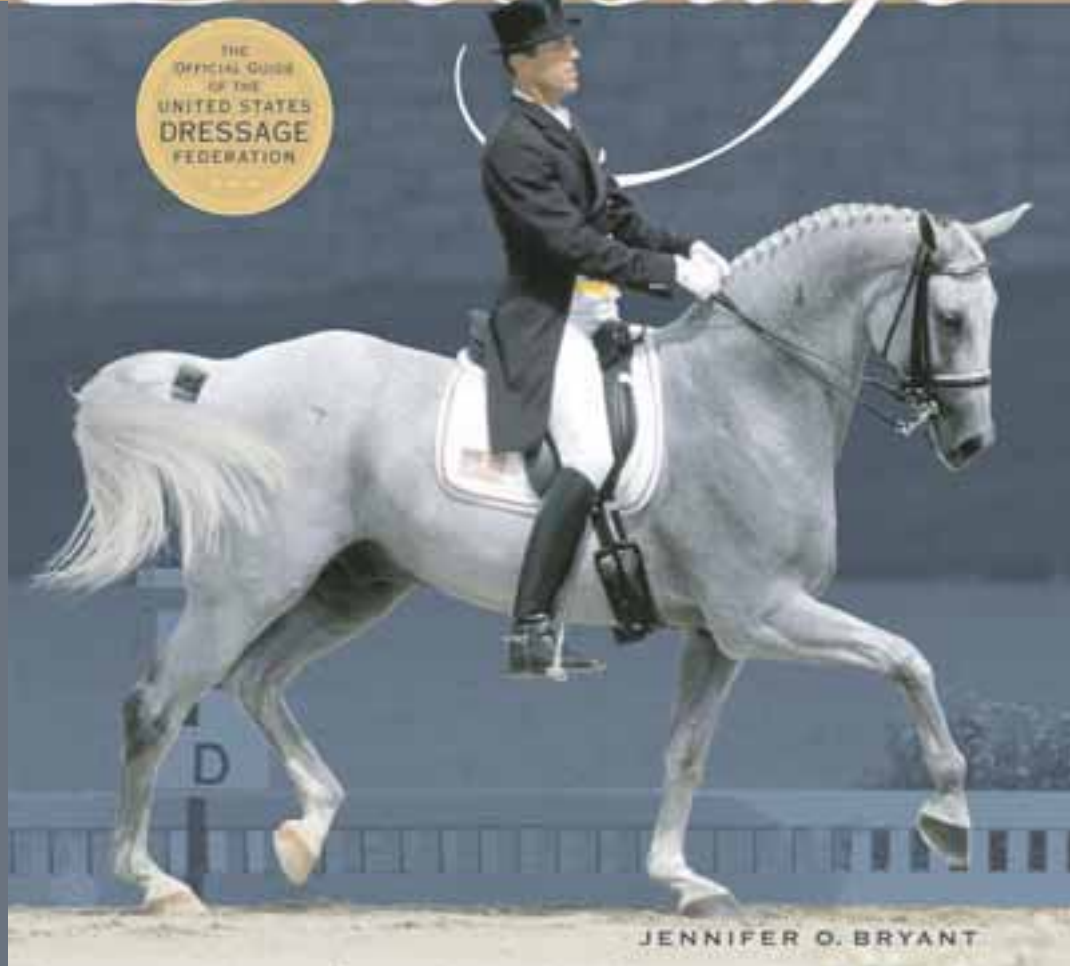
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FIGURE 6: Tongue over the bit. The middle part of the tongue (T) is ballooning over the mouthpiece (M) and forming a cushion between the mouthpiece and the palate (P). The tip of the tongue has not been displaced over the bit.

ted, and whether the type of bit used affects ease of swallowing.

In order to swallow, the horse must be able to move and retract his tongue. Researchers have questioned whether the presence of a bit interferes with tongue movements and prevents swallowing. In the McPhail study, we used an endoscope to record the movements of the larynx as the horses cantered on a treadmill while flexed at the poll. Analysis of the videotapes showed that there was a lot of variation among the twelve horses studied in terms of how frequently they swallowed. The frequency of swallowing by each individual horse, however, was the same while wearing a bit (jointed or Myler snaffle) as while wearing a halter or a bitless bridle. Therefore, we concluded that the presence of a bit does not interfere with a horse's ability to swallow.

Choosing a Suitable Bit

There is no simple way to select the "best" bit for an individual horse, but the results of our research have given some insights into reasons a horse may be uncomfortable or resist the action of a particular bit. When choosing a bit, consider the following factors:

Size. The width and thickness of the bit should fit the dimensions of the

horse's mouth. The width of the mouth is the distance between the corners of the lips. The corresponding bit-mouthpiece measurement is the distance between the insides of the rings or cheeks, and the mouthpiece should be up to half an inch wider than the horse's mouth to avoid the bit's pinching the lips. Some horses appear to dislike jointed bits that are much wider than this because they hang too low on the tongue.

The thickness of the bit is the diameter of the mouthpiece, usually measured an inch from the rings, in the area where the mouthpiece crosses the bars of the horse's mouth (the toothless spaces). Traditionally, a thicker bit was assumed to have a milder action than a thinner one, as the force is spread over a larger area and therefore produces less pressure. However, as I discussed in my previous article, our research suggests that many horses' oral cavities are too small to accommodate thick bits, and that such horses are more comfortable with thinner mouthpieces.

The space between the upper and lower bars when the mouth is closed gives an indication of the maximal bit thickness that a horse can accommodate. You can assess the size of this space by parting your horse's lips and inserting a finger between his gums in the area where the bit lies. The size of his tongue is another limiting factor, as the bit must compress the tongue in order to fit into the oral cavity. A horse with a large tongue has more trouble making room for the bit, especially if his palate is flat and not arched. However, the tongue is very malleable and can assume many different shapes, as shown in the photos.

Type. Biting is not a "one size fits all" proposition. Even after measuring the size and assessing the shape of a horse's oral cavity, there is still an element of trial and error in finding the

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most comfortable and appropriate bit for an individual horse. The horses in our studies appeared most comfortable in bits that did not put pressure on the palate. Many horses went well in the KK Ultra. Some horses that were uncomfortable in conventional snaffles appeared more content in Myler Comfort bits; this may be due to the different mechanics associated with the swiveling action of the Myler mouthpiece.

U.S. Equestrian Federation rules restrict the types of bits that are permitted in recognized national-level dressage competition, and these rules are subject to review and change. Check the current rules (available online at www.usef.org) before you go to a show or invest in a new bit.

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MEET THE EXPERT

Hilary Clayton, BVMS, PhD, MRCVS, is a world-renowned expert on equine biomechanics and conditioning. Since 1997, she has held the Mary Anne McPhail Dressage Chair in Equine Sports Medicine at Michigan State University's College of Veterinary Medicine, East Lansing. The position focuses on dressage- and sport-horse-focused research.



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Dr. Jane Manfredi when she worked in the McPhail Center through the Merck-Merial Veterinary Scholars Program. ▲

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