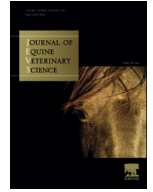




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## Original Research

## Effects of Bit Chewing on Right Upper Quadrant Intestinal Sound Frequency in Adult Horses



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## ABSTRACT

Many therapies have been proposed to prevent and treat postoperative ileus (POI) in horses, but to date none is considered fully effective. Various methods have been considered in the prevention of POI in humans too, and among these, gum chewing is gaining a role, reducing time from surgery to first fecal passage and hospitalization time. The aim of the present study is to produce a method to consistently induce horses at chewing without ingesting food and to evaluate its effects on gut sounds in healthy horses. Animals used in this study were 10 adult horses of both genders. A digital phonendoscope was positioned on the right upper flank. A first registration was started and lasted for five consecutive minutes. Then a snaffle bit with toggles was applied to the horse, and a second registration was obtained in the following 15 minutes. Recording sessions were cut into 5-minute subsessions and blindly assessed by two operators that calculated the number of borborygmi per minute in each session. Application of a bit produced consistent mastication and swallowing in all horses for a period of 20 minutes or more. There was a significantly different increase in short (<3 seconds) gut sounds in the first 5 minutes after application of the bit. In conclusion, mastication of a bit consistently caused an increase in gut sounds on the right upper quadrant. Bit chewing can be easily obtained in horses at rest, and further evaluation as an adjunctive element in the management of POI is warranted.

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## 1. Introduction

Postoperative ileus (POI) is a recognized complication of abdominal surgery [1,2]. The reported incidence of ileus in horses ranges from 14% to as high as 47% [1,3,4] and greater if only small intestinal diseases are considered. Postoperative ileus carries also a high mortality rate, which can be up to 86% [1–5].

Although other causes have been proposed [1], POI is supposedly caused by surgical manipulation and inflammation [6–8]. Many therapies have been proposed to

prevent and treat POI in horses [9], but to date none is considered fully effective.

For this reason probably, POI management requires a multidisciplinary approach that comprises drugs, nasogastric (NG) intubation, fluid therapy, and all other measures that could possibly help in its prevention and treatment.

In horses, like humans, POI may involve the entire gastrointestinal (GI) tract [10–13], and prevention and treatment are based on the same principles. Management strategies for POI can be divided into prevention and supportive care. In human medicine, the choice of anesthesia, the surgical technique, and the means of providing pain relief, such as thoracic epidural analgesia [14], can play an important role in prevention. For supportive care, considerable research has looked into avoiding the use of routine

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NG intubation, early ambulation, early oral feeding, and prokinetic agents [14]. These strategies have been incorporated into fast-track protocols designed to shorten POI and to hasten discharge [15].

Aside of pharmacological treatment that does not differ substantially between horses and humans, other factors have been considered in the prevention of POI in humans [11]. Among these, early feeding and gum chewing are the most recent, yet promising. Although there is no confirmed evidence of the effectiveness of gum chewing, it seems to have some success in reducing time from surgery to first fecal passage and hospitalization time [11,16,17].

Early feeding can rarely be encouraged in equine patients suffering from POI and gastric reflux. Our hypothesis is that gum chewing or, better said, some sort of sham feeding that cause horses to chew without loading the GI tract with food could be beneficial in improving GI motility, thus preventing or treating POI.

The aim of the present study is to produce a method to consistently induce horses at chewing without ingesting food and to evaluate its effects on gut sounds in healthy horses.

## 2. Materials and Methods

The study received the approval of the Ethical and Animal Welfare Committee of the Department of Veterinary Sciences of the University of Turin, and an information sheet was signed by owners. Ten healthy horses (six standardbred and four warmblood) of both genders (two intact males, four geldings, and four mares) with ages ranging from 3 to 6 years and mean weight  $500 \pm 34$  kg were included in the study. All subjects underwent a clinical examination to exclude intestinal or other pathologies. A history of normal feeding behavior was obtained for each horse. The study has been conducted in an environment familiar to the animal to avoid external confounding factors. To avoid the influence of feeding times, all horses were subjected to the experiments after a fasting time of at least 4 hours.

Each subject underwent three sessions one week apart with different order to reduce individual variability or variability because of fasting time.

Horses were cross-tied in the stable, and an area approximately 10-cm diameter was clipped on the right upper flank between the tuber coxae and the last rib, dorsal to the crus of the oblique external abdominal muscle. As previously described [18], a digital phonendoscope connected to a laptop and held by an operator was positioned in this area, and the site was marked with a permanent marker to ensure correct positioning at each examination.

A first registration was started and lasted for five consecutive minutes. Then, a snaffle bit with toggles was applied to the horse, and a second registration started soon after and lasted for 18 minutes.

Because we found that a consistent increase in gut sounds started from approximately 3 minutes after bit application in a preliminary study, the first 3 minutes of each registration was discarded. The remaining 5-minute recording sessions were randomly numerated and assessed blindly by two operators that counted the total number of borborygmi for each session with a sound analysis software (Audacity 2.0.3) (Fig. 1).

Borborygmi were divided into two categories: one lasting less and the other lasting  $>3$  seconds.

For each period of 5 minutes in each session, the number of borborygmi per minute was then obtained and compared using commercially available statistical software (GraphPad InStat version 3.00 for Windows 95).

A repeated measures analysis of variance Friedman test with Dunn posttest was performed to compare the number of borborygmi per minute between 5-minute prechewing and 5-, 10-, and 15-minute postchewing sessions.

## 3. Results

All horses tolerated the procedure. Application of a bit produced consistent mastication and swallowing in all horses that started soon after and lasted for a period of approximately 20 minutes. An increase in frequency of short sounds was evident from  $3 \pm 0.7$  minutes after starting chewing.

We noted a significant increase in short ( $<3$  seconds) gut sounds in the first 5 minutes of registration (Table 1).

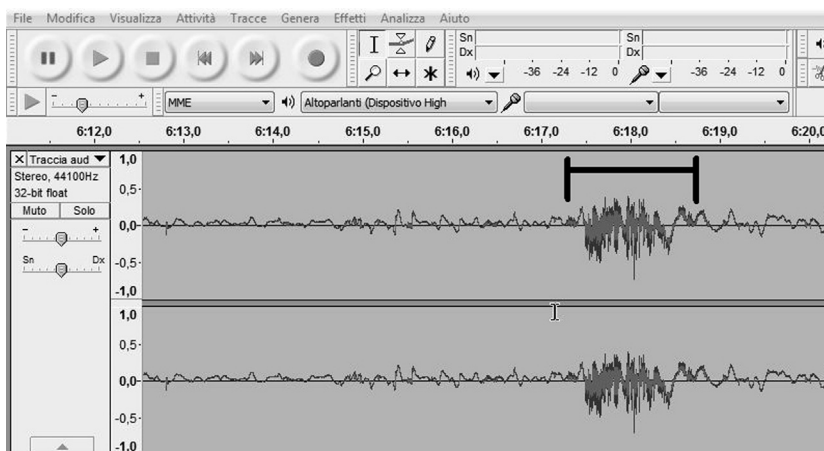


Fig. 1. Print screen of the Audacity software. Black bar indicates a gut sound  $<3$  sec.

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