

Distribution and Clearance of Chopped Net Wrap in the Digestive Tract of Beef Cattle

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IMPACT STATEMENT

Beef cattle producers have adopted the practice of chopping forage without removing the plastic net wrap from the bale. However, results from the current study indicate that forage chopped with the plastic net wrap should not be offered for extended periods of time or over multiple seasons due to the large proportion of net wrap retained within the digestive tract and the risk of developing software disease.

SUMMARY

Commercial beef cattle producers have increased the frequency with which they feed chopped forage to winter cattle. As a result of economic and time constraints, a growing number of producers have chosen to chop forage without removing the indigestible plastic net wrap that can accumulate in the digestive tract over time. Therefore, the objective of this research was to determine 1) where the net wrap accumulates within the digestive tract and 2) the amount of net wrap the animal is able to clear from the digestive tract. To address these objectives, non-pregnant commercial beef cows were individually fed a ration that contained 0.07 % plastic net wrap for 7 months. The treatment did not result in digestive disturbances or loss of body weight. However, 47 % of the net wrap offered to the animals were collected from the digestive tracts and therefore this material was not digested, regurgitated, or passed by the digestive tract. The greatest proportion of net wrap was observed in the rostral (reticulum and rumen) region of the digestive tract that comprised 99.9 % of the total net wrap within the digestive tract. Long-term feeding of forage that contains net wrap has the potential to create large, impassable masses within the digestive tract that accumulate over the seasons and result in wasting, digestive tract blockage, and death.

INTRODUCTION

Chopped forage is widely utilized within the region to winter cattle. Due to the economic and time constraints of chopping forage, many producers chop forage without removing the plastic net wrap from the bale. As a result, a large proportion of the diet is littered with plastic debris that can lead to a syndrome known as software disease (Thomas, 2016). This syndrome is a result of indigestible plastic accumulating in the digestive tract that make the animal feel full and thus have reduced feed intake and body weight. Furthermore, net wrap can reduce the rate of passage of digesta while promoting the rate of water passage resulting in diarrhea and excessive thirst (Thomas, 2016). If the accumulation of plastic is excessive, it can result in wasting, digestive tract blockage, and death. It is currently unknown how this debris is distributed along the digestive tract and what proportion of the debris the animal is able to clear. Therefore, we sought to determine 1) where the net wrap accumulates within the digestive tract and 2) the amount of net wrap the animals are able to clear from the digestive tract.

PROCEDURES

Animal protocols were approved by the Montana State University Agricultural Animal Care and Use Committee.

Non-pregnant, commercial cows ($n = 4$; 3 years old; initial body weight 1273.8 ± 94.3 lbs; final body weight 1383.7 ± 82.5 lbs) were individually fed a total mixed ration (TMR) to meet or exceed dietary requirements (NRC, 2000) and formulated for 0.50 pounds of gain per day. The ration was composed of hay, straw, and a vitamin and mineral supplement. The hay and straw were chopped and processed without removing the plastic net wrap using a commercial large-scale bale processing unit with a 5 inch screen. The TMR was offered in a Calan gate feeding system to control the individual daily intake. Animals were fed the TMR for 7 months in order to mimic the interval chopped forage would be offered on a commercial operation over the winter. Samples of the TMR were collected at three time points during the experiment to assess the proportion of net wrap offered to the animals. Fasted body weights were recorded at the beginning and end of the feeding period and average daily gain (ADG) calculated. Animals were observed daily for signs of digestive disturbances. At the end of the 7 month feeding period, cows were euthanized at a commercial abattoir and digestive tracts harvested. The digestive tracts were divided into three regions: rostral (reticulum and rumen), medial (omasum and abomasum), and caudal (small and large intestines). Each region was weighed with digesta and then digesta was manually evacuated. Following evacuation, net wrap was manually sorted and total weight of tissue, digesta, and net wrap were recorded within each region.

RESULTS AND DISCUSSION

Animals did not exhibit any signs of digestive disturbances during the experimental period. Furthermore, animals gained an average of 0.53 pounds per day as estimated with the formulated TMR. Samples of the TMR were composed of 0.07 % net wrap (as fed basis) that over the course of 7 months were calculated to total 3.86 pounds of net wrap offered to each animal. As cattle are less selective foragers and have a greater prevalence to consume foreign bodies when compared to other ruminants (Sheferaw et al., 2014), it can be interpreted that a majority of

this net wrap was consumed. Furthermore, net wrap was rarely seen in the feed bunk or unconsumed portion of the daily ration.

Upon evaluation of the digestive contents, it was clearly evident by gross visualization that a large amount of the net wrap consumed in the diet was not cleared from the digestive tract by digestion, regurgitation, or passage (**Figure 1**). Previous reports have demonstrated that plastic net wrap is not digested within the rumen (Klein and Dahlen, 2014). Therefore, passage and regurgitation are the only means to clear net wrap from the digestive tract. The greatest proportion of net wrap was observed in the rostral (reticulum and rumen) region of the digestive tract that comprised 99.9223 % of the total net wrap within the digestive tract (**Table 1**). This observation is supported by previous data that observed the greatest occurrence of foreign bodies (plastic bags, cloth, ropes, etc.) ingested by cattle are located within the rumen (Mushonga et al., 2015). The digesta from the medial (omasum and abomasum) and caudal (small and large intestines) regions of the digestive tract had very little net wrap (medial 0.0746 %; caudal 0.0031 %; **Table 1**). Of the net wrap observed within the medial and caudal regions of the digestive tract, only small particles (less than 3 inches in length) were observed. This is in stark contrast to the large, ball-like masses of net wrap observed



Figure 1. Image of net wrap collected within the caudal (A), medial (B), and rostral (C) regions of the digestive tract of a single commercial beef cow offered a ration containing 0.07 % net wrap for 7 months.

Table 1. Average weight of net wrap within the rostral, medial, and caudal regions of the digestive tract of commercial beef cattle offered a ration containing 0.07 % net wrap for 7 months.

Net Wrap, lbs	Digestive Tract Region		
	Rostral	Medial	Caudal
	1.81780	0.00132	0.00006

within the rostral region of the digestive tract. These observations indicate that only small particles are able to pass from the rostral region to medial and caudal regions of the digestive tract. The remaining net wrap is retained within the rostral region where it is compressed into a tightly wound mass that either stays within the rostral region or is regurgitated during rumination (visual observation). Regurgitation appears to be a modestly effective means for the animal to clear the net wrap from the rostral digestive tract as only 47.2 % of the total offered net wrap was recovered from the rostral digesta. However, this also means that approximately half of the net wrap was retained within the digestive tract of the animal and may result in detrimental effects when plastic wrap is offered in the diet for extended periods of time.

In conclusion, it is not advised to feed chopped forage that contains net wrap for extended periods of time or over multiple seasons due to the large proportion of net wrap retained

within the digestive tract and the risk of developing software disease.

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