

Sarford's News

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Methanogenic bacteria in ruminants cost U.S. beef and Dairy producers Billions

By Dr. Clayton McNeff

Methane production in the rumen of cattle (methanogenesis) is a nutritionally wasteful process that is implicated in global warming (1). Methane production in the rumen results in a costly loss of 3-12% of gross feed energy (2). *This energy loss translates to a total cost of about 0.4-1.5 billion dollars a year at today's ration prices for dairy and beef producers in feed cost alone.* When the loss in value of decreased gain and milk production and potentially detrimental environmental effects are factored into this estimate, the total cost becomes truly astronomical. Thus, there is a clear need for new technologies and feeding practices to reduce ruminant methane production. *In a new prelimi-*

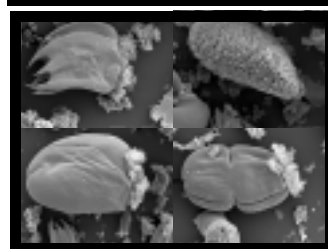
nary study (2005), methane production was reduced by nearly 60% (see Graph 1 next page) using Sar-sasaponin containing Yucca Schidigera extract.

Methanogens are an ancient form of bacteria that metabolize hydrogen to produce methane. The hydrogen that methanogens use to produce methane in the anaerobic (absence of oxygen) environment of the rumen, is primarily supplied by rumen protozoa. Protozoa themselves have been shown to be reservoirs for pathogenic bacteria (such as Salmonella and E. Coli: 0157) and in general are now believed to be parasitic to the animal. Figure 1 (right) shows scanning electron micrographs of a few selected rumen protozoa. Ultimately, methane production is energetically inefficient for animal agriculture. However, there is

a new light at the end of the tunnel in the potential use of Yucca Schidigera saponins for reducing methane production and protozoa populations in cattle and thereby improving feed efficiency for both dairy and beef production. The biochemistry of the methanogens firstly involves the use of feedstuffs by the protozoa to produce hydrogen, which in turn is combined with carbon dioxide by the methanogens to produce methane gas.

Methanogens are closely associated with protozoa in the rumen as the protozoa produce some of the hydrogen that the methanogens use as an energy source (3). Defaunation (removal of protozoa) of the rumen has repeatedly demonstrated a reduction in ruminal methanogenesis (1). Virtually all of the hydrogen produced in the rumen is converted to methane by the methanogens. Methanogens compete versus other rumen bacteria that use hydrogen

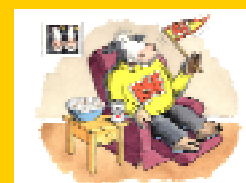
Rumen Protozoa (Fig. 1):



Pictures courtesy of Dr. Mark Rasmussen and Sharon Franklin of the National Animal Disease Center, ARS/USDA, Ames, IA.

Special Points of Interest:

- SarTec Products Reduce Methane Production in Rumen Fluid.
- SarFord's Kitchen - Beef Tenderloin with Blackberry Port Wine Sauce.
- Employee Feature: Jarrod Taylor.



SarFord's kitchen

Beef Tenderloin with Blackberry Port Wine Sauce:

This is a delicious beef recipe that we found on the web (www.txbeef.org).
Prep Time: approx. 10 Minutes. Cook Time: approx. 30 minutes. It makes approximately 4 servings.

Ingredients:

4 beef tenderloin steaks, 6 ounces each
1 small onion, finely diced

1 cup fresh or frozen blackberries
2 cups port wine
1 tsp. sugar
2 cups beef stock
1 Tbsp. butter, softened

Preparation:

- In a saucepan bring diced onions, 3/4-cup blackberries, wine and sugar to a boil. Boil gently to reduce wine to 1/2-cup. Strain and set liquid aside.
- Boil beef stock in a separate pan to reduce by half. This will take approximately 15 minutes.

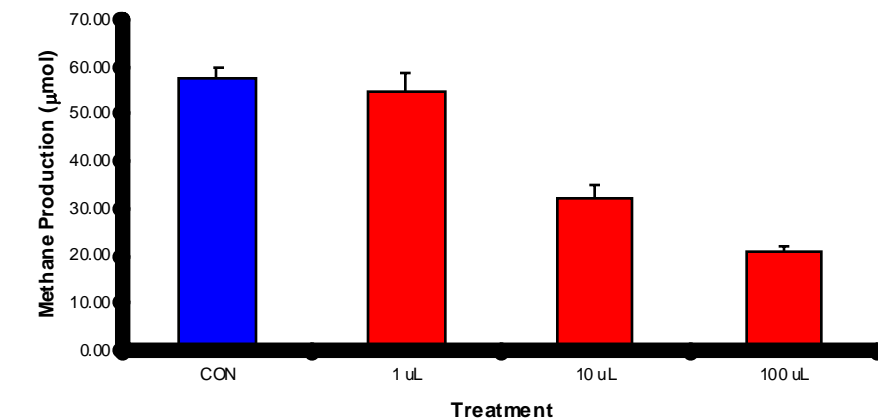
- Grill steaks or pan broil in skillet 6 minutes per side.
- Whisk blackberry and port wine reduction into reduced beef stock. If sauce is too thin, dissolve 1 tsp. cornstarch in water, then stir into sauce and bring to a boil.
- Whisk in 1 Tbsp. softened butter.
- Serve steaks with sauce and garnish with remaining blackberries.

*Hope you enjoy it.. We sure did!
- thanks, SarFord.*

Methanogenic bacteria in ruminants cost U.S. beef and Dairy producers Billions (continued)

(such as acetogens, and sulfate-reducing bacteria). It is therefore arguable that it would be advantageous to reduce methane production in the rumen and shift the hydrogen usage to other bacteria such as acetogens, which produce acetate and which can be used nutritionally by cattle.

Nutritionists have long recognized the energetic inefficiency of rumen methanogenesis and have attempted to devise management systems that would shift fermentation away from it. Such attempts have included feeding supplemental combinations of grain and/or protein. These attempts have met with limited success because they have inhibited fiber digestion and/or had little to no net effect on the energy status of the animal (4). Because a treatment that would kill protozoa, and thereby inhibit methanogenesis is desirable, there has been a lot of research into compounds that might be suitable for this purpose. For instance, feeding fats has been shown to be an effective means of defaunation; however, supplemental fat



Graph 1. Data courtesy of Professor Jess Miner and Eric J. Behlke, Department of Animal Science, University of Lincoln, Nebraska. In-vitro study using a 4mL sample of rumen fluid treated with different amounts (see graph) of Yucca Schidigera extract supplied by SarTec Corporation.

depresses fiber digestion. Alternatively, the use of detergents for both protozoal and methanogen inhibition has been investigated (5). In this report, detergents proved successful in defaunating the rumen and reducing methane, but they also suppressed appetite, and in one instance proved lethal. Many compounds have been investigated and have been successful in defaunating the rumen; however, most have deleterious effects on the host animal and none are currently approved for feeding to animals (6-7).

Most interestingly, multiple

studies do exist which document the antiprotozoal effect of saponins (8, 9). Furthermore, SarTec saponin-containing products have been shown to reduce the number of protozoa as a function of the dosage applied to the rumen (10). Most recently, a direct effect of saponins on methanogens has been shown (11-12). Figure 1 shows the effect of adding Yucca Schidigera extract on methane production of methanogens in fresh rumen fluid in-vitro. These data indicate the dramatic potential for saponins to provide potent inhibition of methanogenesis and will be the topic of future studies.

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SARTEC Employee highlight: Jarrod Taylor

This issue's employee highlight is Jarrod Taylor from St. John, Kansas. Jarrod brings a great enthusiasm to the SarTec team along with the “can do” attitude that is a strong tradition among SarTec people. Before joining SarTec, Jarrod taught computer science classes and was in charge of the computer lab at the Stafford High School, in Stafford, KS. Jarrod also coached middle School boy's basketball and taught forensics. Jarrod decided to join SarTec last year, “because of the exciting opportunities that exist within SarTec. I think it will be great for me and for my family. I will miss teaching, but we have so much new

research going on at SarTec that I will still be able to share information with people, which I think is a real strong suit of mine. I have been around feedlots all my life and I really look forward to working with people in the industry.” Jarrod has two small kids, Jordan and Julia, who are 2 and 5 years old, respectively. Jarrod and his wife, Michelle, have been married now for 8 years. Jarrod is an avid hunter and especially enjoys hunting for elk, deer, turkeys, quail, and pheasant. Jarrod enjoys hunting so much that he often guides hunts in his spare time. So, if you want to talk turkey, Jarrod is your man!



Jarrod Taylor and His New Dyna Superglide Harley Davidson Motorcycle Enjoying a Sunny Day in Kansas .

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at www.sartec.com


God Bless America

See inside:

**How Yucca Saponins Can Help Reduce
Costly Methane Production in
Ruminants and a Great New SarFord
Beef Tenderloin Recipe!**

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