

SarTec®

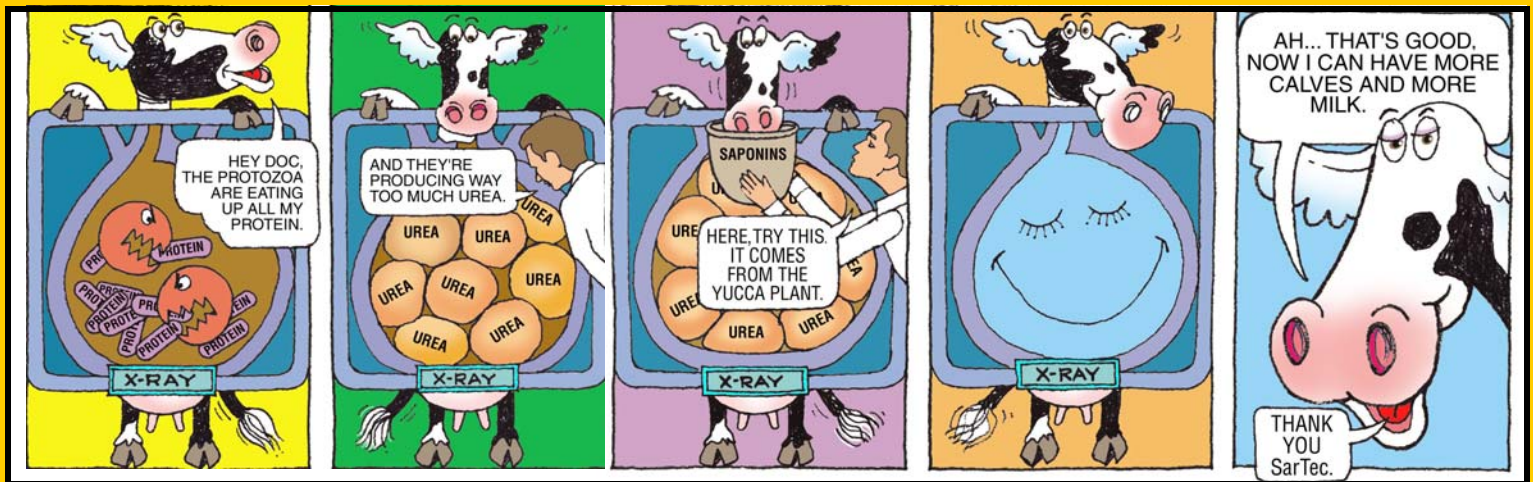
www.sartec.com 1-800-472-7832

SarTec Anti-Protozoa Treatment (APT)*

Step 1: Initial 100 cc/head application of SarStart® in ration.

Step 2: SarStart® Plus - 100 cc/head drench at freshening time.

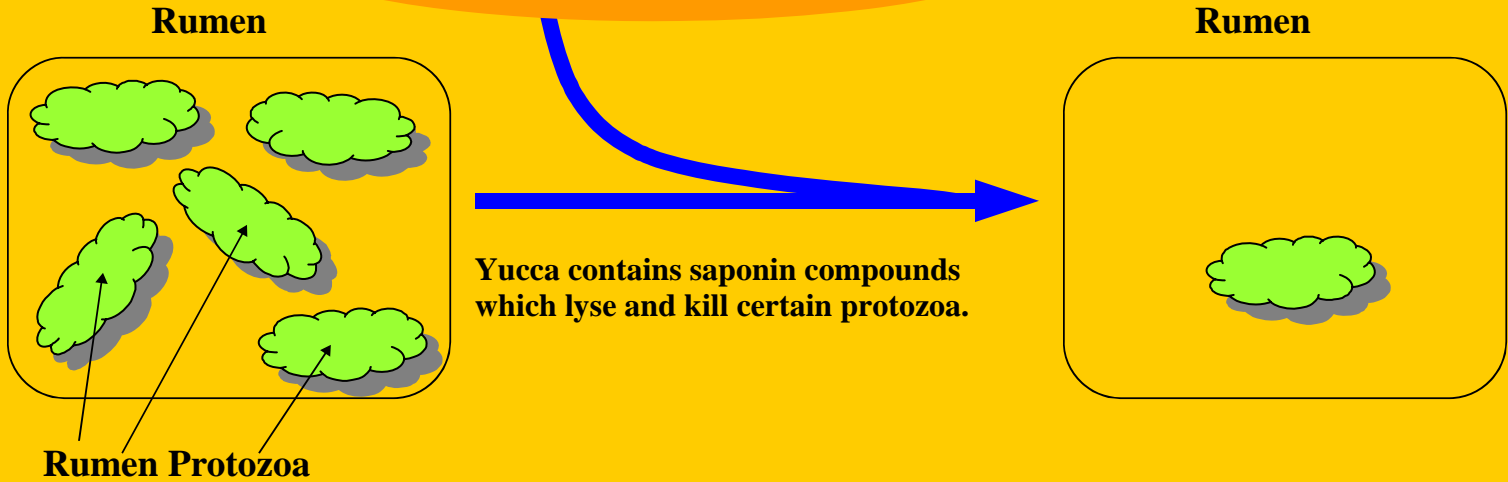
Step 3: SarStart® LSC - Feed 4 cc/head/day in total mixed ration (TMR) during milk production.



* Patent Pending.

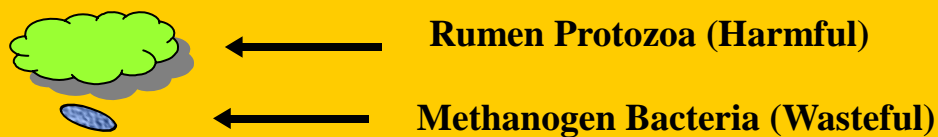
♦ Yucca in the Ration Can Decrease the Number of Rumen Protozoa in the Animal

Yucca Saponins

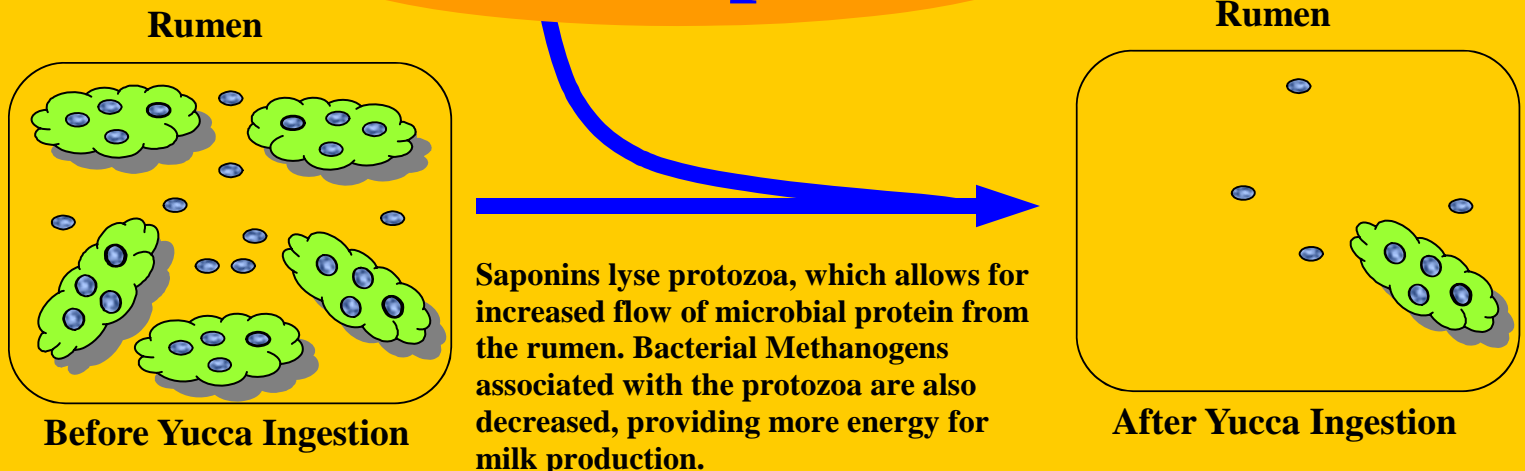


♦ Why is this Important?

This is important because rumen protozoa are harmful in that they ingest and digest beneficial bacteria in the rumen. Protozoa are also associated with bacteria called methanogens that rob energy available to the cow for milk production. Protozoa also consume (and waste) dietary protein, which lowers the protein available to the animal for growth or milk production. This is very important in a starting calf and a fresh dairy cow.



Yucca Saponins



Rumen Protozoa

What are Protozoa?



- Protozoa are defined as single-celled organisms whose cells characteristically contain a cell-bound nucleus or nuclei.
- Protozoa are the most abundant animals in the world in terms of numbers and biomass.

What are Methanogens?



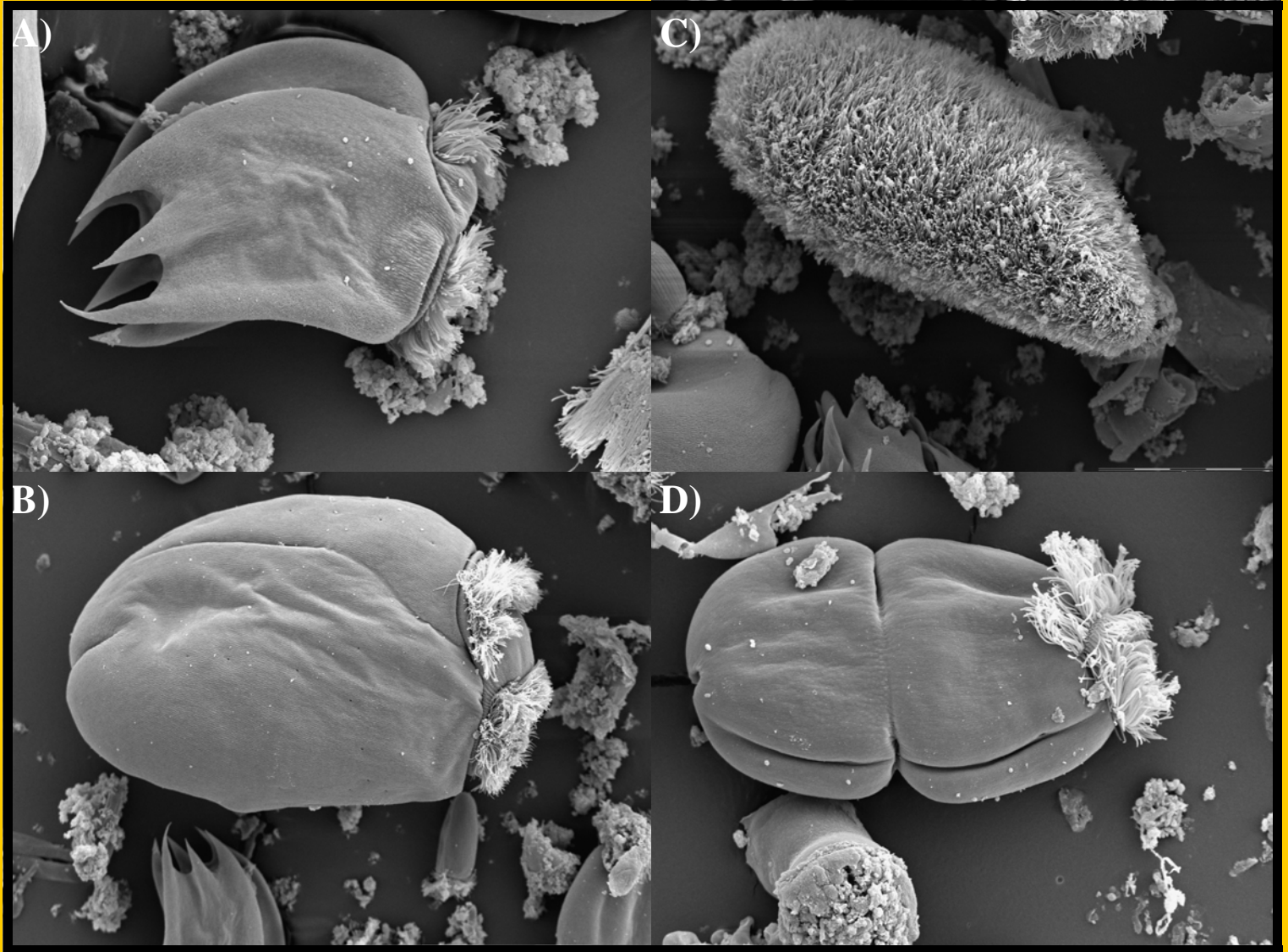
- ♦ Methanogens are bacteria in the rumen that produce methane through a symbiotic association with protozoa.
- ♦ Livestock (methanogens) are thought to produce around 17% of the methane in the atmosphere which is a greenhouse gas thought to be associated with global warming.

Effects of Rumen Protozoa and Methanogens

- Protozoa ingest and digest bacteria in the rumen, decreasing the flow of microbial protein from the rumen, and inserting an energy wasting step in the net synthesis of bacterial protein in the rumen. (Williams and Coleman, 1992)
- Rumen protozoa reduce the efficiency of fermentation in the rumen. (Peter R. Cheeke, Ph.D.)
- Animal performance can be increased by decreasing rumen protozoa. (Peter R. Cheeke, Ph.D.)
- Ruminal methane production causes a loss of 2-12% of feed gross energy during digestion. Methane is a greenhouse gas and livestock account for 17% of total methane emissions. Inhibition of ruminal methanogenesis could both increase feed efficiency and mitigate global warming. (B.A. Montigny et al., J. Animal. Sci. Vol. 80, Suppl. 1)

- ▶ **Yucca saponins suppress rumen protozoa and methanogens.**
- ▶ **SarTec[®] products contain yucca saponins.**

What Do Rumen Protozoa Look Like?



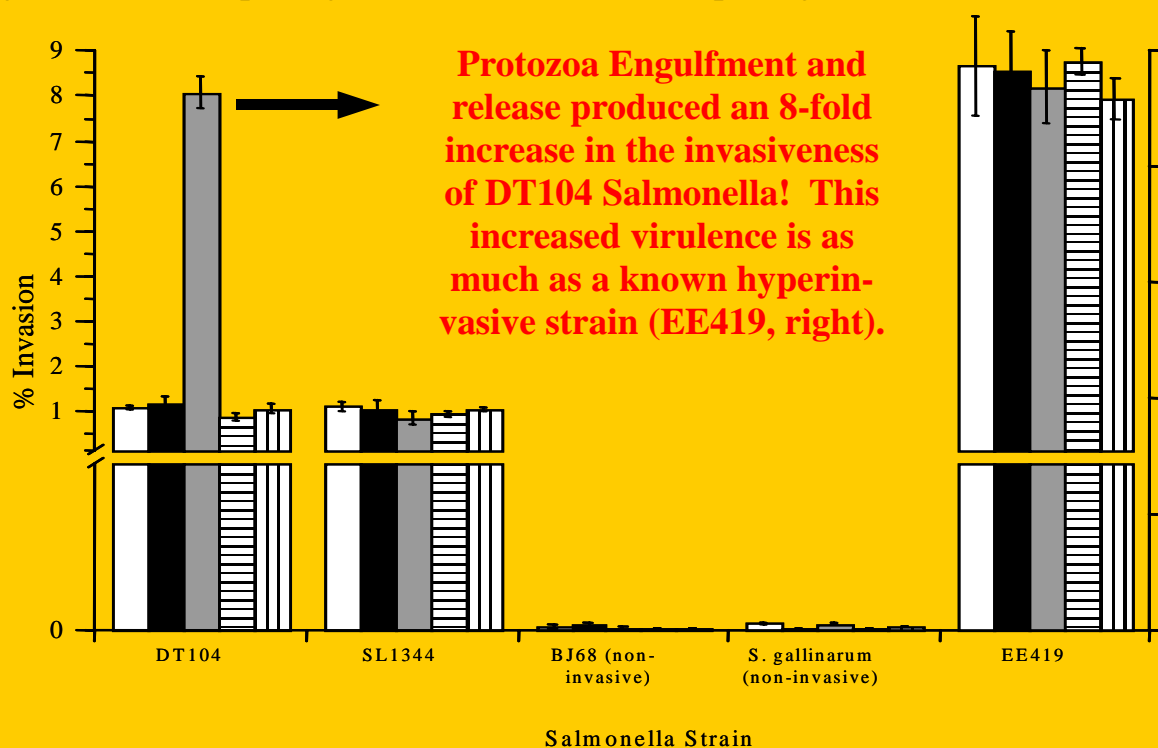
Figures above: SEM of Protozoa: A) *Diplodinium* spp., 1,500x magnification, B) *Polyplastron* spp., 900x magnification, C) Protozoan *Isotricha* spp. 900x magnification, and D) Protozoan *Entodinium* spp., 1,600x magnification. Pictures courtesy of Dr. Mark Rasmussen and Sharon Franklin of the National Animal Disease Center, ARS/USDA, Ames, IA.

- ▶ *Rumen protozoa are found in large numbers in the bovine rumen. They typically make up 50% of the biomass of the rumen and persist in high numbers throughout the feeding period even during the feeding of high concentrate diets.*
- ▶ *Saponins found in Yucca Extract have been shown to be very effective all-natural agents for eliminating protozoa in rumen fluid.*

Protozoa as a Trojan Horse

New research by USDA researchers the NADC in Ames, IA has led to a deeper understand of the surprising ability of pathogenic bacteria to thrive within protozoa and through adaptation, become more virulent and invasive. This has led to the view that *protozoa are like a Trojan Horse*, wherein pathogens can lie in wait to attack higher mammals. The following is reprinted (with permission from the author) from a paper presented in St. Louis at the 2004 Joint Meeting of ADSA, ASAS, and PSA by Dr. Mark Rasmussen et al.

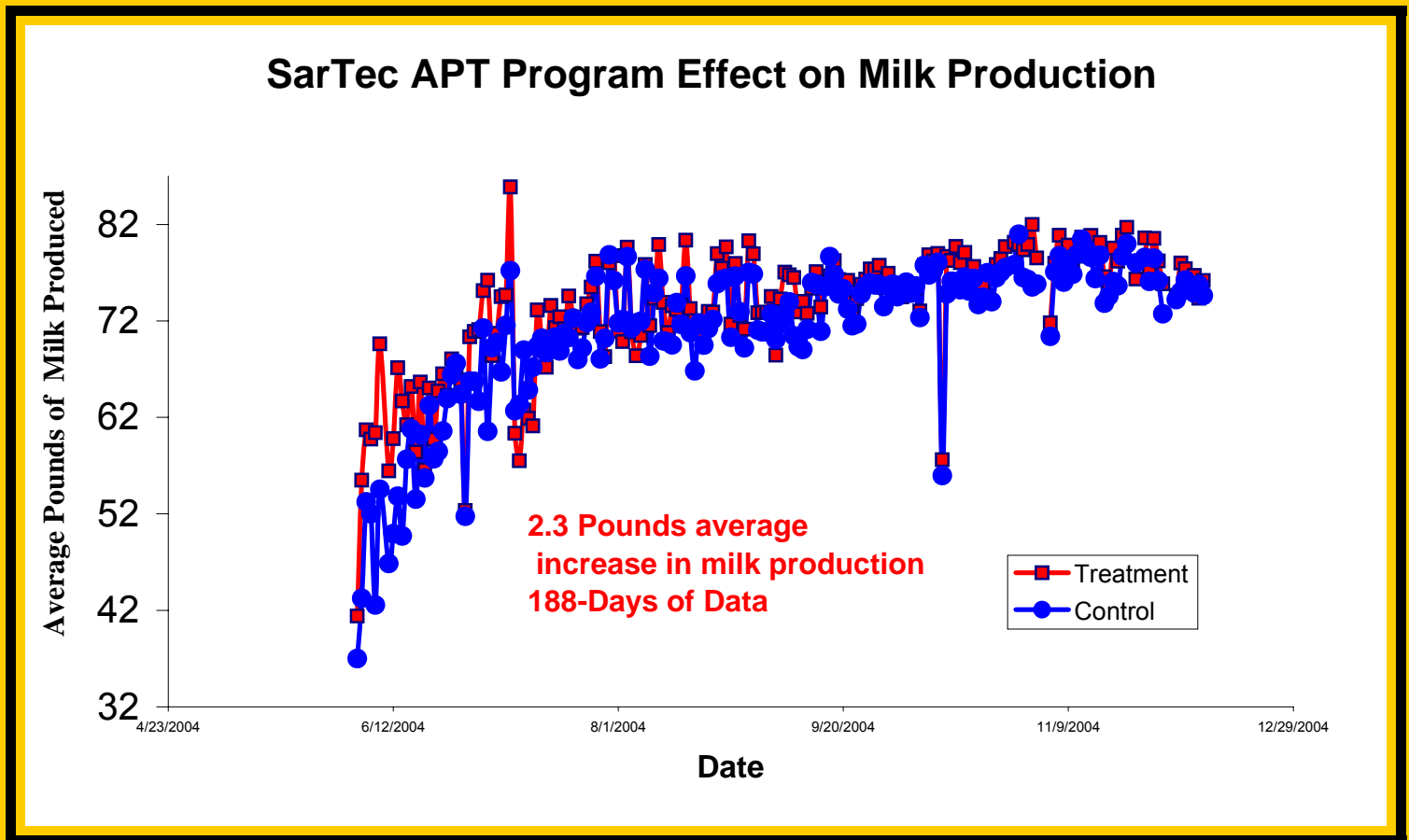
“The objective of this study was to determine if there is a relationship between predation by rumen protozoa and the enhancement of virulence in *Salmonella*. Previous research indicates that intracellular bacterial pathogens can become more pathogenic after engulfment, survival and release from free-living eukaryotic micro-organisms such as amoeba. In order to investigate if such relationships exist within the rumen microbiota, we determined the virulence of *Salmonella* strains after recovery from lysed preparations of mixed rumen protozoa. When inoculated into calves, *S. typhimurium* DT104 recovered from rumen protozoa caused a more rapid disease progression, including pyrexia (increased body temperature spikes), greater recovery of the bacteria from lymph nodes and spleen, and a more unfavorable prognosis resulting in earlier euthanasia. We conclude that intracellular bacterial/protozoal interactions in the rumen can enhance *Salmonella* virulence. The molecular mechanisms (and their relationship to antibiotic resistance) which contribute to intracellular survival and subsequent bacterial release from protozoa merit further investigation. These observations have implications for mechanisms of disease pathogenesis, rumen microbial ecology, fecal shedding of food borne pathogens from ruminants, and pathogen reservoir status of the rumen.”



How Do SarTec Products Work in Ruminants?

- ▶ Methane is natural gas obtained from deep wells and is used as an energy source for heating and manufacturing.
 - ▶ Methane is also produced by certain bacteria (called **methanogens**) in the rumen of ruminant animals.
 - ▶ Some of the energy from the feed consumed is siphoned off by methanogens and converted to methane which is burped out of the animal.
 - ▶ 5-15% of the feed energy is lost in the ruminant animal due to methane production.
 - ▶ The energy loss is manifested as lower feed efficiency; more feed is required per pound of gain, thereby increasing the cost of gain.
 - ▶ Protozoa found in the rumen produce hydrogen from feed which is excreted in the rumen and used by methanogen bacteria to produce methane. Therefore **protozoa and methanogens are symbiotic**.
 - ▶ Rumen methane production is a result of the combination of rumen protozoa and methanogen bacteria which robs energy from the animal.
- ▶ **Yucca saponins found in SarTec products have been shown to kill protozoa and reduce the amount of methane produced in the rumen.**

Dairy Study I Shows an Average 2.3 Pounds Per Head Per Day Increased Milk Production



Study Design

- Performed at a commercial dairy, which milks 1,900 cows. At day 188 there were 395 and 410 cows in the control and treatment groups, respectively.
- Treatment – All animals receive a one-time application of 50 cc of SarStart Plus as soon as possible post-calving during days 1-60 and 100 cc from days 61-188. They also received 2 cc/hd/day of SarStart LSC feed additive in the TMR once daily for days 1-60 and 4 cc/hd/day of SarStart LSC feed additive for days 61-188.
- Control - All animals in this treatment group will receive no post-calving drench, or feed additive in the TRM.

Economic Considerations

Milk Cost Per Pounds	\$0.14
Number of Cows	1,900
Milking Days/Year	365
Economic Value	\$219,601

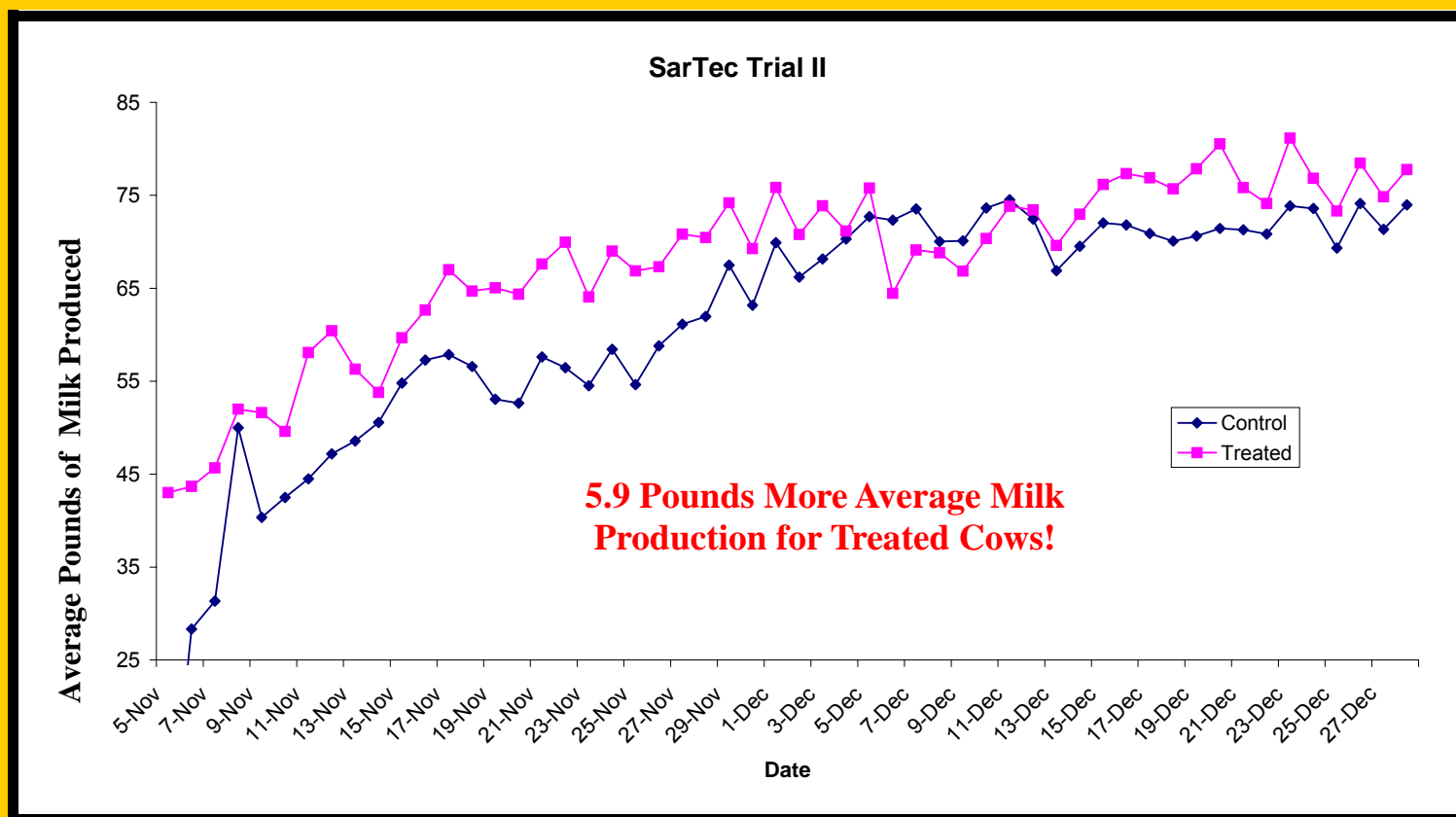
Cost of SarStart Plus	\$7,077
Cost of SarStart LSC	\$23,313
Cost per animal per year	\$16.00

Return on Investment = 7.2

Conclusion:

Treated cows produced an average of 2.3 pounds (P < 0.004) more milk per head per day.

Dairy Study II Shows an Average 5.9 Pounds Per Head Per Day Increased Milk Production



Study Design

- Performed at a commercial dairy which milks 3,000 cows. At day 52 there were 124 and 129 cows in the control and treatment groups, respectively.
- Treatment 1 – All animals receive 100cc of SarStart Plus as soon as possible post-calving. They will then also receive 4 cc/hd/day of SarStart LSC feed additive in the TMR once daily for the duration of the trial.
- Treatment 2 - All animals in this treatment group will receive no post-calving drench or feed additive in the TRM.

Economic Considerations

Milk Cost Per Pounds	\$0.14
Number of Cows	3,000
Milking Days/Year	365
Economic Value	\$904,217
Cost of SarStart Plus	\$15,000
Cost of SarStart LSC	\$43,800
Cost per animal per year	\$19.60

Conclusion:

Treated cows produced an average of 5.9 pounds (P < 0.002) more milk per head per day.

Return on Investment = 15.4