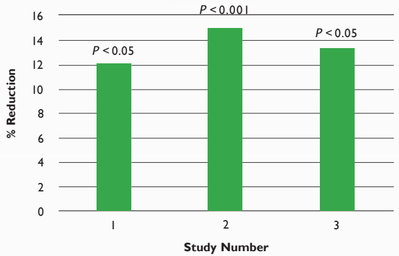
Rumen Fermentation Kinetics

Three *in vitro* rumen fermentation studies were conducted using rumen fluid collected from donor animals from different geographic regions. When **Securi** was added to the rumen and incubated, there was a significant reduction in methane emissions, which may lead to increased net energy from available feed for the animal.

Graph 1 shows the consistent data from each of the three studies, where there were significant reductions in methane emissions, averaging 13%.

Graph 1. Reduction in Methane Emissions (*in vitro*)

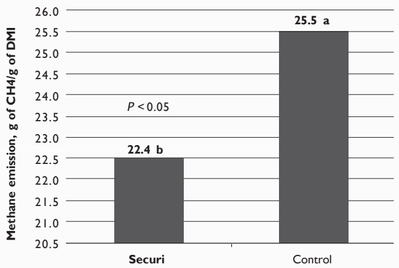


Study 1: Viegas, 2021; Study 2: Rossi et al., 2022; Study 3: CRC IVRF23, 2022

In vivo Rumen Fermentation in Sheep

Similar results were also observed in an *in vivo* study, where twenty-four adult non-pregnant sheep were fed a 70% hay and 30% concentrate diet as a TMR. After an adaptation phase of feeding, sheep were transferred to individual metabolic cages for measurement of methane emissions over 24 h using ventilated hoods. Animals fed **Securi** exhibited a 13% reduction ($P < 0.05$) in methane emissions[4].

Graph 2. Reduction in Methane Emissions (*in vivo*)



Study 4: Atzori, 2023

References

[1]Rossi et al., 2022. Animals.12(6) 728.
[2]Viegas J., 2021. Internal report GEAPA-UFSM.
[3]CRC IVRF23, not published, Phibro Animal Health 2022, available upon request.
[4]Atzori et al., 2023. Anim. Production Science. 63(15) 1483-1493.

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Securi nutritional specialty product is an innovative formulation that helps support rumen function which may lead to animal efficiency and the reduction of methane emissions

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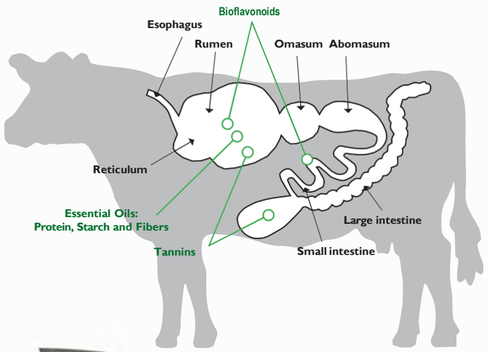


Apparent Total Tract Digestion

Research shows improvements in diet digestibility in dairy cattle fed **Securi**[1]. One hundred and forty lactating Holstein Friesian cows were divided into two groups and fed either a control diet or the control diet plus **Securi**. **Table 1.** shows the nutritional composition and values of the TMR fed. Dairy cattle fed **Securi** showed an increase in total tract digestibility of 23.57% and 1.8%, respectively, of cellulose ($P \leq 0.001$) and starch ($P = 0.0023$), as shown in **Table 2.**

Table 1. Nutritional composition and values of the total mixed ration (TMR) used for *in vivo* study (predicted by Plurimix[1], a ration balancing software package).

Feed	kg/head/day, as Fed
Corn silage	18.0
Alfalfa hay	3.0
Rye grass hay	1.6
Wheat silage	8.0
Corn meal	6.4
Soybean meal 44% CP[2]	4.6
Min vit supplement	0.5
	kg/head/d
As fed, kg	42.10
DM[3], kg	23.88
	Analysis, % of DM in the TMR
DM, %	43.30
Energy, Mcal/kg DM	1.61
UFL[4] /kg DM	0.95
CP	16.27
CF[5]	2.69
NDF[6]	33.27
ADF[7]	22.65
ADL[8]	4.51
Starch	27.56
Ca[9]	0.77
P[10]	0.34

[1]Plurimix = Fabermatica, Piazza Bruno Pari, 3 GPS: 45.22305 10.25275, 26032 Ostiano (CR); [2]CP = crude protein; [3]DM = dry matter; [4]UFL = feed units for lactation; [5]CF = crude fats; [6]NDF = neutral detergent fiber; [7]ADF = acid detergent fiber; [8]ADL = acid detergent lignin; [9]Ca = calcium; [10]P = phosphorus.

Table 2. Apparent total tract digestion of the diet in Control and Treatment groups.

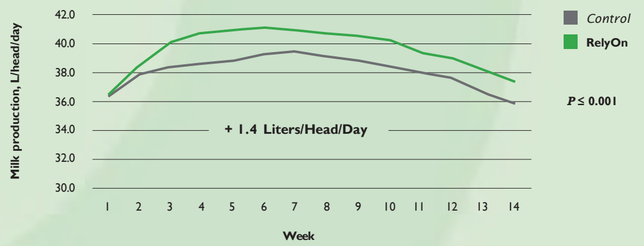
Month	August	September	October	Average	P (g) [1]	P (m) [1]	P (g*m) [1]
			Ash, %				
Control	61.63 ± 1.87	61.83 ± 1.87	63.27 ± 1.87	62.24 ± 1.53	0.612	0.654	0.5557
Treatment	61.73 ± 1.87	65.05 ± 1.87	62.41 ± 1.87	63.06 ± 1.53			
P-value	0.971	0.271	0.756	0.612			
			Crude Fats, %				
Control	69.15 ± 1.63	71.91 ± 1.63	72.44 ± 1.63	71.17 ± 0.94	0.818	0.059	0.672
Treatment	67.85 ± 1.63	72.50 ± 1.63	74.11 ± 1.63	71.49 ± 0.94			
P-value	0.593	0.807	0.496	0.818			
			Cellulose, %				
Control	43.14 ± 1.23	39.26 ± 1.23	43.24 ± 1.23	41.88 ± 0.71	≤ 0.001	0.031	0.469
Treatment	51.21 ± 1.23	49.57 ± 1.23	54.46 ± 1.23	51.74 ± 0.71			
P-value	0.003	0.001	0.0007	≤ 0.001			
			Hemicellulose, %				
Control	67.66 ± 2.12	67.56 ± 2.12	65.23 ± 2.12	66.81 ± 1.22	0.098	0.672	0.915
Treatment	70.19 ± 2.12	70.88 ± 2.12	69.55 ± 2.12	70.21 ± 1.22			
P-value	0.433	0.311	0.20	0.098			
			Starch, %				
Control	93.46 ± 0.41	93.09 ± 0.41	93.19 ± 0.41	93.25 ± 0.23	0.0023	0.770	0.397
Treatment	94.47 ± 0.41	95.02 ± 0.41	95.33 ± 0.41	94.94 ± 0.23			
P-value	0.13	0.015	0.010	0.0023			
			Sugars and Pectins, %				
Control	98.23 ± 0.44	97.92 ± 0.44	98.12 ± 0.44	98.09 ± 0.44	0.0926	0.138	0.314
Treatment	98.25 ± 0.44	96.49 ± 0.44	97.11 ± 0.44	97.28 ± 0.44			
P-value	0.981	0.062	0.159	0.092			

Data are presented as least squared means ± standard error of the means (SEM). [1]g = effect of the treatment; m = effect of the month; g*m = their interaction.

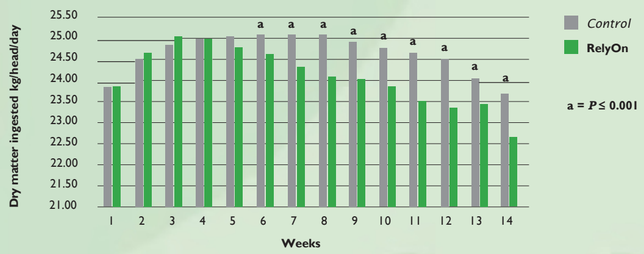
Performance Data

Rossi et al, 2022 showed that feeding **Securi** can improve rumen health which leads to significant measurable increases in performance parameters.

AVERAGE MILK PRODUCTION PER WEEK IN THE TWO TEST GROUPS



DRY MATTER INGESTED PER WEEK



DRY MATTER CONVERSION RATIO