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A2 Milk Research

The Move To A2

The issue of A2 milk has garnered considerable attention from both consumers and producers in recent years, including National All-Jersey Inc. (NAJ). Three factors served as catalysts for NAJ's interest. First, among the members of National All-Jersey Inc. (NAJ) are producers who are marketing Jersey milk direct to the public. These producers have ample anecdotal evidence from customers that say they have less digestive problems with Jersey milk than conventional milk. Second, social media abounds with claims from some consumers that A2 milk does not cause them the digestive stress they experience with conventional milk. Third, one significant difference known to exist between the two milks is that Jersey genetics have a higher frequency of A2 betacasein than the general dairy cattle population. Therefore, NAJ decided to pursue A2 research with two primary goals:

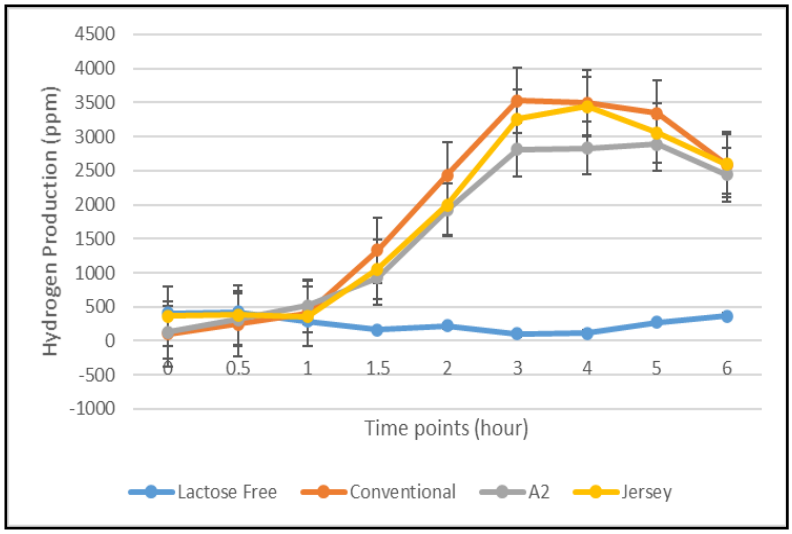
1. To determine if there is a quantifiable benefit to consumers from A2 and/or Jersey milks.

2. If so, to determine the threshold of A2 at which the benefit can be realized. In other words, does milk need to be 100% A2, or will milks of lesser amounts of A2 also provide benefits.

The research project was led by Dr. Dennis Savaiano and involved clinical trials with persons known to be lactose maldigesters due to problematic digestive symptoms experienced after ingesting lactose. The A2 Milk Company was also interested in this research which led to NAJ and the A2 Milk Company jointly funding the research project, "Comparing the digestion of milk with different beta-casein protein content in lactose maldigesters." The research at Purdue University has been completed and the results were submitted to the scientific journal, Nutrients, and was accepted for publication.

The hypothesis of the research project was that there would be a graded relationship between the content of A2 beta-casein and symptoms of lactose intolerance.

Beginning with 853 people who expressed interest to participate in the study, the screening process constricted eligible participants down to 36 subjects who completed the trial. The test subjects underwent a double-blinded, randomized crossover trial with four study visits and a washout period of at least six days between two consecutive visits. Participants received four randomized treatments of milk:



1. Commercial milk (25% A2)
2. Jersey milk (75% A2)
3. a2 milk (100% A2)
4. Commercial lactose-free milk (control)

Participants would then be monitored for breath hydrogen levels and intolerance symptoms for six hours after consuming a single meal of milk after an overnight fast. Hydrogen in breath samples were measured and self-reported physical symptoms were recorded at 0, 0.5, 1, 1.5, 2, 3, 4, 5 and 6 hours of the study.

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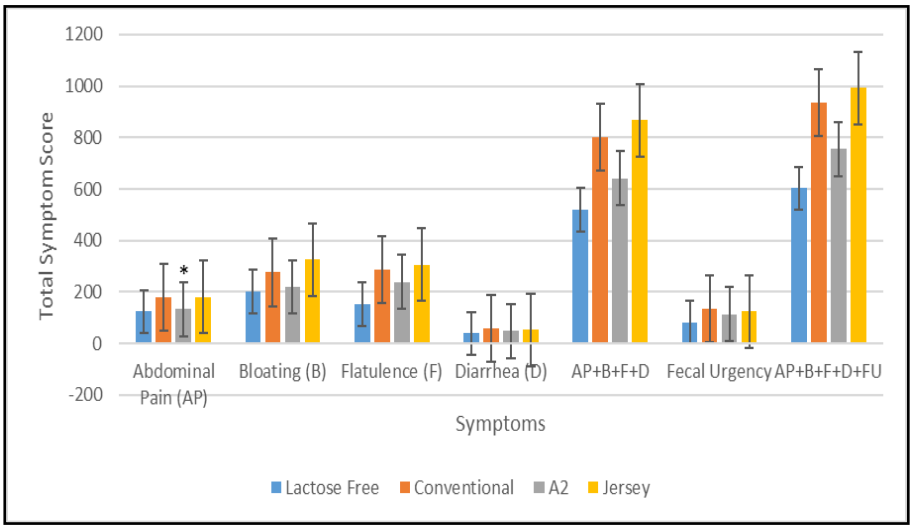
Hydrogen Test Results

The total hydrogen produced by the 36 maldigesters following consumption of A2 milk was significantly lower than hydrogen produced by subjects following consumption of conventional milk. However, hydrogen production following consumption of Jersey milk (75%A2) was not significantly different from that following consumption of conventional milk.

Symptom Test Results

The total symptom score for abdominal pain after the consumption of A2 milk in all maldigesters was significantly lower than that following consumption of conventional milk; however, the total score for abdominal pain after the consumption of Jersey milk was not significantly different from conventional milk. The total symptom score for bloating was lower when consuming A2 milk compared with conventional milk; bloating was not different between commercial and Jersey milk. Total symptom scores for flatulence, diarrhea, and fecal urgency were similar in subjects consuming A2 milk, Jersey milk, and conventional milk. The combined total symptom scores for abdominal pain, bloating, flatulence, and diarrhea showed there were fewer symptoms with A2 milk compared with conventional milk, whereas consumption of Jersey milk or conventional milk produced similar symptom scores. The combined total symptom scores for abdominal pain, bloating, flatulence, diarrhea, and fecal urgency showed there were fewer symptoms with A2 milk compared with conventional milk, whereas consumption of Jersey milk or conventional milk produced similar symptom scores.



The best possible outcome of this research would have been if Jersey milk had been found to perform similarly to A2 milk. Even though the results did not reach that conclusion, the good news is that A2 milk does provide advantages over conventional milk to consumers who are lactose maldigesters. Given the Jersey breed's overall frequency of the A2 gene, producers wanting to market to those consumers can utilize genotyping to gauge the makeup of their herd and potentially segregate A2 cows for the A2 milk market. Genomic results can also be used to cull or otherwise market A1/A1 cows given that none of their progeny and only one-half of their grand-progeny will be A2 even if A2 bulls are used for two generations.

To summarize, the two main takeaways from the research are:

1. Given the low frequency of the A1 gene in the Jersey bred there is no reason not to breed away from it.
2. The number of consumers actually affected by lactose maldigestion is relatively small as evidenced by 36 subjects completing the trial compared to 853 people that initially expressed interest in participating in the trial. However, the number of consumers who believe they are affected is significantly higher, presenting a marketing opportunity for A2 milk.

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NAJ Milk & Component Outlook - *January 2021 Jersey Price Comparisons*

JAN'21 STATISTICAL BLEND PRICE

Northeast (Boston)	$15.91
Appalachian (Charlotte)	$17.42
Southeast (Atlanta)	$17.59
Florida (Tampa)	$19.26
Mideast (Cleveland)	$14.96
Upper Midwest (Chicago)	$15.12
Central (Kansas City)	$14.44
California (Los Angeles)	$14.24
Southwest (Dallas)	$14.90
Arizona (Phoenix)	$14.98
Pacific Northwest (Seattle)	$14.68
ALL FMMO MARKET AVERAGE	**$15.77**

Prices reflect Federal Order minimum blend prices for city shown.

JAN'21 MONTHLY MILK VOLUME (Million #)

Northeast (Boston)	2,318
Appalachian (Charlotte)	462
Southeast (Atlanta)	396
Florida (Tampa)	223
Mideast (Cleveland)	1,406
Upper Midwest (Chicago)	1,036
Central (Kansas City)	959
California (Los Angeles)	2,014
Southwest (Dallas)	1,052
Arizona (Phoenix)	352
Pacific Northwest (Seattle)	620
ALL FMMO MARKET TOTAL	**10,837**

Total Grade A milk volume sold under FMMO during month.

JAN'21 JERSEY REGULATED BLEND PRICE

Northeast (Boston)	$19.76
Appalachian (Charlotte)	$19.38
Southeast (Atlanta)	$21.59
Florida (Tampa)	$21.62
Mideast (Cleveland)	$18.19
Upper Midwest (Chicago)	$18.95
Central (Kansas City)	$18.04
California (Los Angeles)	$16.73
Southwest (Dallas)	$18.01
Arizona (Phoenix)	$17.24
Pacific Northwest (Seattle)	$18.09
ALL FMMO MARKET AVERAGE	**$18.87**

Prices reflect FMMO minimum prices at Jersey component values.

JAN '21 JERSEY BLEND WITH ESTIMATED PROTEIN OR CHEESE YIELD PREMIUMS

Northeast (Boston)	$20.06
Appalachian (Charlotte) (includes protein prem.)	$19.78
Southeast (Atlanta)	$21.59
Florida (Tampa)	$21.62
Mideast (Cleveland) (includes protein premium)	$18.93
Upper Midwest (Chicago) (includes cy premium)	$19.25
Central (Kansas City)	$18.04
California (Los Angeles)	$16.73
Southwest (Dallas)	$18.01
Arizona (Phoenix) (includes protein)	$17.64
Pacific Northwest (Seattle)	$18.09
ALL FMMO MARKET AVERAGE	**$19.07**

Includes a protein premium of $0.05 for every 0.01% increase in protein over the market average.

JAN'21 DOLLAR DIFFERENCE: JERSEY MILK WITH PREMIUMS VS. STATISTICAL BLEND PRICE

Northeast (Boston)	$4.15
Appalachian (Charlotte)	$2.36
Southeast (Atlanta)	$2.33
Florida (Tampa)	$2.36
Mideast (Cleveland)	$3.97
Upper Midwest (Chicago)	$4.13
Central (Kansas City)	$3.60
California (Los Angeles)	$2.49
Southwest (Dallas)	$3.11
Arizona (Phoenix)	$2.66
Pacific Northwest (Seattle)	$3.41
ALL FMMO MARKET AVERAGE	**$3.14**

Prices reflect difference between Jersey price with premiums, and the statistical blend price.

JAN'21 PERCENT DIFFERENCE: JERSEY MILK WITH PREMIUMS VS. STATISTICAL BLEND PRICE

Northeast (Boston)	26.1%
Appalachian (Charlotte)	13.5%
Southeast (Atlanta)	12.1%
Florida (Tampa)	12.2%
Mideast (Cleveland)	26.5%
Upper Midwest (Chicago)	27.3%
Central (Kansas City)	24.9%
California (Los Angeles)	17.5%
Southwest (Dallas)	20.9%
Arizona (Phoenix)	17.8%
Pacific Northwest (Seattle)	23.2%
ALL FMMO MARKET AVERAGE	**20.2%**

Percent difference in Jersey price with premiums, over the statistical blend price.

ESTIMATED JERSEY MILK COMPOSITION

	Jan-21
Butterfat	5.23
TRUE Protein	3.90
Other Solids	5.73
Solids Not Fat (SNF)	9.63
Cheese Yield (90% Fat Recovery, 38% Moisture)	13.50
CME Block Cheese Price	$ 1.75

REGULATED MILK PRICES

	Jan-21
FMMO Milkfat	$ 1.5541
FMMO True Protein	$ 3.0355
FMMO Other Solids	$ 0.2682

AVERAGE JERSEY PRICE ADJUSTMENT PER CWT:

	Jan-21
FMMO Milkfat Adjustment	$1.87
FMMO True Protein Adjustment	$1.89
FMMO Other Solids Adjustment	$0.18