J. Dairy Sci.
https://doi.org/10.3168/jds.2022-22376
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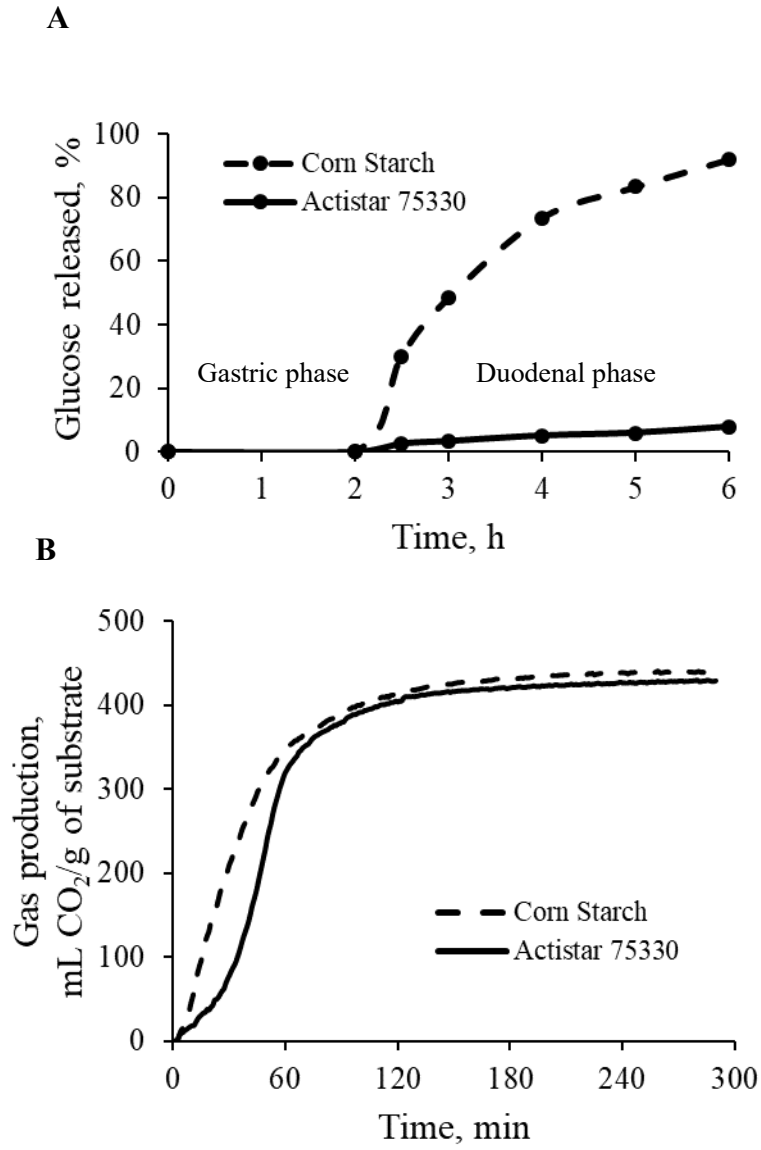

Supplemental Figure S1. In vitro evaluation of the resistant starch used during challenge periods: A. Degradation of corn starch (dashed line) and resistant starch (Actistar 75330; solid line) expressed as total glucose released overtime, which indicates potential enzymatic degradation in small intestine determined using a method described by Garcia-Campayo et al. (2018). Approximately 90% of glucose from the corn starch was released at 6 h of incubation, indicating high expected digestibility in small intestine. In contrast, less than 10% of glucose from the resistant starch was released over 6 h of incubation, indicating low expected digestibility; B. Fermentation of corn starch (dashed line) and resistant starch (Actistar 75330; solid line) using the ANKOM RF gas production system (Macedon, NY) and rumen fluid as inoculum over time, which indicates potential for hindgut fermentation when abomasally infused. Corn starch increased gas production more quickly compared with resistant starch during the first 60 min, and starch sources were likely not different after 60 min of incubation.

Supplemental Table S1. Carryover assessment that evaluates the difference between Model A (no carryover effects added) and Model B (with carryover effects). A Chi-square *P*-value < 0.05 indicates models are significantly different, and therefore, carryover effects were present.

	-2 Res Log Likelihood			Chi-square Square test
Variables	Model A	Model B	Difference	*P*-value
Performance parameters				
DMI, kg/d	160	157	3.58	0.17
Yields, kg/d				
Milk	240	234	6.56	0.04
Milk fat	4.66	10.8	6.14	0.05
Milk protein	-32.9	-25.6	7.30	0.03
Milk lactose	6.41	11.9	5.52	0.06
3.5% FCM	247	241	6.66	0.04
Milk variables				
Fat, %	53.8	52.8	0.981	0.61
Protein, %	-69.9	-61.6	8.37	0.02
Lactose, %	-62.8	-52.0	10.8	<0.01
SCC, x 1,000/mL	11.9	17.7	5.79	0.06
MUN, mg/dL	155	153	2.14	0.34
3.5% FCM/DMI	27.7	32.9	5.18	0.08
BW,[1] kg	107	96.0	10.9	<0.01
BW change,[2] kg	92.2	80.0	12.3	<0.01
BCS[3]	18.3	23.6	5.33	0.07
BCS change[4]	13.3	17.1	3.77	0.15
Fecal parameters				
Fecal pH				
4 h after morning feeding	7.93	9.70	1.77	0.41
8 h after morning feeding	-2.50	4.29	6.79	0.03
8 – 4 h after morning feeding	12.1	14.1	2.06	0.36
Fecal starch				
4 h after morning feeding	51.9	44.9	6.94	0.03
8 h after morning feeding	65.1	59.6	5.48	0.06
8 – 4 h after morning feeding	65.9	60.8	5.11	0.08
Inflammatory markers[5]				
LBP, µg/mL	-47.9	-40.7	7.15	0.03
Endotoxin, pg/ml	53.9	50.1	3.74	0.15
Haptoglobin, µg/mL	82.7	83.8	1.06	0.59
Serum amyloid A, µg/mL	38.8	42.5	3.73	0.16
IL1β, pg/mL	101	91.2	10.2	<0.01
Metabolic parameters				
NEFA, µEq/L	21.2	25.0	3.73	0.15
BHB, mg/dL	-52.4	-48.3	4.09	0.13
Glucose, mg/dL	-113	-102	10.2	<0.01

[1]Measured on d 14 of the wash-out period.

[2]Change measured between d 5 of the challenge and 14 of wash-out period.

[3]Measured on d 5 of the challenge period.
[4]Change in a 21-d period.
[5]Abbreviations: LBP (LPS binding protein), IL1β (interleukin 1 beta), NEFA = nonesterified fatty acids, BHB = beta-hydroxybutyrate, NA = not applicable.

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Supplemental Table S2. Performance, fecal, metabolic, hepatic, and inflammatory parameters of cows subjected to different treatments during challenge periods. Results were adjusted for carry-over effects.

	Treatment[1]				*P*-values	
Variables[2]	CTR	FR	RS	SEM	Trt	Trt ×Day
Performance parameters						
DMI, kg/d	24.1[a]	12.4[b]	22.3[a]	0.9	<0.01	0.59
Yields, kg/d						
Milk	32.4	26.0	30.3	2.0	0.11	<0.01
Milk fat	1.12	1.01	1.14	0.08	0.45	0.33
Milk protein	0.98	0.79	0.93	0.06	0.09	0.01
Milk lactose	1.56	1.24	1.47	0.10	0.09	<0.01
3.5% FCM	32.2	27.7	31.6	2.1	0.24	0.13
Milk composition						
Fat, %	3.46[b]	3.92[a]	3.76[ab]	0.11	0.05	0.39
Protein, %	3.09	3.07	3.11	0.04	0.67	0.06
Lactose, %	4.82	4.73	4.81	0.04	0.14	0.58
SCC,[3] x1,000/mL	72	116	75		0.19	0.15
MUN, mg/dL	14.6	14.0	13.8	0.5	0.44	0.28
3.5% FCM/DMI	1.32[b]	2.28[a]	1.40[b]	0.08	<0.01	0.04
BW,[4] kg	704	703	711	20	0.54	NA
BW change,[5] kg	7.5[a]	-59.5[b]	-2.71[a]	5.2	<0.01	NA
BCS[6]	2.86	2.71	2.88	0.30	0.49	NA
BCS change[7]	0.136	-0.085	-0.032	0.155	0.56	NA
Fecal parameters						
Fecal pH						
4 h after morning feeding	6.84	6.81	6.58	0.13	0.42	NA
8 h after morning feeding	6.92[a]	6.68[a]	6.27[b]	0.08	<0.01	NA
8 – 4 h after morning feeding	0.091	-0.161	-0.259	0.156	0.34	NA
Fecal starch						
4 h after morning feeding	2.77	1.08	2.35	0.73	0.28	NA
8 h after morning feeding	2.96	2.45	6.88	1.75	0.23	NA
8 – 4 h after morning feeding	0.18	1.37	4.67	1.82	0.25	NA
Inflammatory markers[8]						
LBP,[3] µg/mL	3.03	3.02	3.75		0.18	0.03
Endotoxin,[3] pg/ml	402	362	411		0.36	NA
Haptoglobin,[3] µg/mL	0.66	0.65	1.54		0.30	0.05
Serum amyloid A,[3] µg/mL	29.7	30.5	36.3		0.93	0.31
IL1β,[3] pg/mL	1,096	1,404	1,338		0.81	NA
Metabolic parameters						
NEFA,[3] µEq/L	75[c]	162[a]	97[b]		<0.01	0.41
BHB, mg/dL	11.4[a]	7.9[b]	11.1[a]	0.6	<0.01	0.45
Glucose, mg/dL	62.6	62.6	61.3	3.4	0.85	0.99

[1]Treatments (Trt) were: control (CTR; fed ad libitum), 50% feed restriction (FR), and TMR fed ad libitum plus 500 g DM resistant starch (RS; abomasally infused as a pulse-dose once daily 30 min before am feeding).

[2]Different letters within a row indicate $P \leq 0.05$.

[3]Data were transformed for analysis and LSM were back-transformed and included in the table for interpretational purposes. Transformed values and SEM were not included for simplicity purposes, and *P*-value are those of the transformed data.
[4]Measured on d 14 of the wash-out period.
[5]Change measured between d 5 of the challenge and 14 of wash-out period.
[6]Measured on d 5 of the challenge period.
[7]Change in a 21-d period.
[8]Abbreviations: LBP (LPS binding protein), IL1β (interleukin 1 beta), NEFA = nonesterified fatty acids, BHB = beta-hydroxybutyrate, NA = not applicable.