

Table S1: Inpatient Diet Composition

Diet Components (% of Energy)	Inpatient Period	
	Baseline	Intervention
Protein	15.1 ± 0.0	15.0 ± 0.1
Total fat	30.0 ± 0.0	30.0 ± 0.1
Saturated fat	8.6 ± 0.8	8.4 ± 0.9
Monounsaturated fat	8.7 ± 0.1	9.7 ± 0.5
Polyunsaturated fat	9.7 ± 0.5	8.7 ± 0.2
Total carbohydrate	55.0 ± 0.0	55.0 ± 0.1
Meal carbohydrate	55.0 ± 0.0	30.0 ± 0.1
Beverage sugar	0	25.0 ± 0.0
Meal sugar	5.3 ± 0.9	4.3 ± 0.4
Meal fructose (mono- & disaccharide)	1.5 ± 0.2	1.2 ± 0.2
Meal glucose (mono- & disaccharide)	2.9 ± 0.6	2.3 ± 0.2
Galactose	0.9 ± 0.2	0.8 ± 0.2
Total fiber (g/1000 kcals)	8.8 ± 1.2	6.7 ± 0.6
Cholesterol (mg/1000 kcals)	83.0 ± 29.5	99.4 ± 25.8

Mean ± SEM

Table S2: Outpatient energy, fat, added sugar and alcohol consumption based on 24-h food intake recalls

Variable	Glucose (n = 14)	Fructose (n = 14)	Factor	P value ^A
Outpatient energy intake (% difference compared with energy requirement)	+8.4 ± 2.5 ^C	+7.4 ± 3.2 ^B	Sugar	0.76
			Gender	0.26
			MSRF	0.80
Outpatient fat intake (% of energy consumed)	30.4 ± 1.2	28.4 ± 1.0	Sugar	0.31
			Gender	0.18
			MSRF	0.37
Outpatient added sugar intake--includes beverage (% of energy consumed)	28.5 ± 2.5	30.3 ± 1.0	Sugar	0.68
			Gender	0.70
			MSRF	0.80
Outpatient alcohol intake % of energy consumed	0.9 ± 0.5	1.3 ± 0.7	Sugar	0.61
			Gender	0.58
			MSRF	0.97

^AGLM 3-factor (sugar, gender, MSRF) ANOVA

^B $P < 0.05$, ^C $P < 0.01$, paired t test, outpatient energy intake vs calculated energy requirement.

Mean ± SEM

Table S3: Body weight and body composition before and after 10 weeks consumption of glucose- or fructose-sweetened beverages

Variable	Sugar (n)	0 wk (Baseline)	10 wk	Factor	P value ^A
Body Weight (kg)	Glucose (15)	85.9 ± 2.7	87.5 ± 2.9 ^C	Sugar	0.47
	Fructose (17)	85.7 ± 2.6	87.0 ± 2.6 ^D	Gender MSRF	0.068 0.76
Total Body Fat (kg)	Glucose (15)	30.7 ± 2.2	31.6 ± 2.2 ^D	Sugar	0.60
	Fructose (17)	28.9 ± 2.2	29.6 ± 2.1 ^C	Gender MSRF	0.020 0.93
Waist Circumference (cm)	Glucose (15)	94.6 ± 2.6	96.2 ± 2.7 ^B	Sugar	0.81
	Fructose (17)	94.7 ± 2.7	96.4 ± 2.6 ^D	Gender MSRF	0.25 0.12
Total Abdominal Fat (cc)	Glucose (14) ^G	765 ± 57	794 ± 53	Sugar	0.36
	Fructose (17)	683 ± 55	731 ± 51 ^B	Gender MSRF	0.11 0.61
Extra-Abdominal Fat (cc)	Glucose (14)	522 ± 59	544 ± 61 ^B	Sugar	0.64
	Fructose (17)	476 ± 43	495 ± 38	Gender MSRF	0.82 0.40
Intra-Abdominal Fat (cc)	Glucose (14)	243 ± 21	250 ± 23	Sugar	0.059
	Glucose/Men (7)	281 ± 38	291 ± 41	Gender	0.049
	Glucose/Women (7)	214 ± 18	219 ± 23	MSRF	0.21
	Fructose (17)	207 ± 21	235 ± 25 ^C		
	Fructose/Men (9)	195 ± 29	244 ± 36 ^{E,F}		
	Fructose/Women (8)	220 ± 33	226 ± 36		

^AGeneral linear model (GLM) 3-factor (sugar, gender, MSRF) ANOVA on 10 wk vs 0 wk %difference

^B $P < 0.05$, ^C $P < 0.01$, ^D $P < 0.001$ paired t test, 10 wk vs 0 wk.

^E $P = 0.048$ GLM gender-specific 2-factor (sugar, MSRF) ANOVA on 10 wk vs 0 wk %difference; Glucose/Men vs Fructose/Men.

^F $P = 0.019$ GLM sugar-specific 2-factor (gender, MSRF) ANOVA on 10 wk vs 0 wk %difference; Fructose/Women vs Fructose/Men.

Mean ± SEM

Table S4: Percent change of the natural log of gene expression in subcutaneous fat biopsied in the fasting state before and after 10 weeks of consuming glucose- or fructose-sweetened beverages.

Variable (n=glucose/fructose)	Glucose	Fructose	Factor	P value ^A
Fatty acid desaturase 1 (n=15/16)	65.3 ± 17.6	-0.7 ± 11.8	Sugar	0.0024
			Gender	0.14
			MSRF	0.27
Fatty acid desaturase 2 (n=15/16)	53.4 ± 17.9	9.6 ± 9.2	Sugar	0.025
			Gender	0.022
			MSRF	0.76
Stearoyl-CoA desaturase-1 (n=15/16)	54.0 ± 22.6	-2.1 ± 10.0	Sugar	0.017
			Gender	0.11
			MSRF	0.35
Fatty acid synthase (n=15/16)	23.9 ± 9.8	1.8 ± 7.0	Sugar	0.057
			Gender	0.29
			MSRF	0.54
SREBP1c (n=10/13)	1.5 ± 14.1	-6.1 ± 12.7	Sugar	0.36
			Gender	0.64
			MSRF	0.33
Acyl CoA:diacylglycerol acyltransferase 1 (n=10/13)	-8.6 ± 13.4	-3.6 ± 5.7	Sugar	0.96
			Gender	0.55
			MSRF	0.33
Acyl CoA:diacylglycerol acyltransferase 2 (n=10/13)	-9.9 ± 27.0	-0.3 ± 6.8	Sugar	0.92
			Gender	0.14
			MSRF	0.18
PPAR γ (n=10/13)	-15.3 ± 9.2	5.8 ± 5.3	Sugar	0.074
			Gender	0.55
			MSRF	0.16
Carbohydrate response element binding protein (n=10/13)	-14.1 ± 7.2	1.5 ± 6.1	Sugar	0.14
			Gender	0.30
			MSRF	0.35
Leptin (n=10/13)	-15.5 ± 11.9	9.4 ± 8.7	Sugar	0.2
			Gender	0.21
			MSRF	0.13
Adiponectin (n=10/13)	-13.4 ± 9.0	-1.7 ± 6.8	Sugar	0.39
			Gender	0.85
			MSRF	0.45
TNF- α (n=15/16)	0.3 ± 13.4	-12.8 ± 6.5	Sugar	0.42
			Gender	0.54
			MSRF	0.85

^AGLM 3-factor ANOVA on percent Δ of the natural log of the expression, 0 vs 10wk.

Table S5: Blood pressure before and after 2, 8, and 10 weeks consumption of glucose- or fructose-sweetened beverages

Variable	Sugar (n)	Complex Carb 0 wk	Sugar 2 wk	Sugar 8 wk	Sugar 10 wk	2-way Interactions	P value
Preceding diet		Energy balance	Ad libitum	Ad libitum	Energy balance		
Systolic BP mmHg	Glucose (n=15)	122 ± 2	124 ± 3	123 ± 2	121 ± 2	Sugar×t Gender×t MSRF×t	0.64 0.013 0.68
	Glucose/Men (7)	121 ± 2	129 ± 3	126 ± 2	121 ± 1		
	Glucose/Women (8)	123 ± 2	119 ± 3	120 ± 2	121 ± 3		
	Fructose (n=17)	120 ± 2	120 ± 2	119 ± 2	118 ± 2		
	Fructose/Men (9)	120 ± 2	122 ± 3	120 ± 3	120 ± 3		
	Fructose/Women (8)	120 ± 3	118 ± 3	118 ± 3	115 ± 3		
Diastolic BP mmHg	Glucose (n=15)	77 ± 1	79 ± 1	78 ± 1	79 ± 1	Sugar×t Gender×t MSRF×t	0.44 0.0013 0.27
	Glucose/Men (7)	76 ± 2	81 ± 2	79 ± 1	77 ± 1		
	Glucose/Women (8)	79 ± 2	78 ± 2	77 ± 2	80 ± 2		
	Fructose (n=17)	76 ± 1	76 ± 2	75 ± 1	75 ± 1		
	Fructose/Men (9)	76 ± 1	77 ± 2	77 ± 1	76 ± 2		
	Fructose/Women (8)	77 ± 3	76 ± 3	74 ± 2	73 ± 2		

Mixed Procedures (PROC MIXED) 4-factor (sugar, time, gender, MSRF) Repeated Measures (RM) ANOVA

Mean ± SEM

Table S6: Lipid & lipoprotein concentrations before and after 2, 8 & 10 weeks consumption of glucose- or fructose-sweetened beverages

Variable	Sugar (n)	Complex Carb 0 wk	Sugar 2 wk	Sugar 8 wk	Sugar 10 wk	2- and 3-way Interactions	P value
Fasting TG (mg/dl)	Glucose (n=15) Fructose (n=17)	146 ± 17 144 ± 18	163 ± 19 147 ± 20	149 ± 15 143 ± 18	157 ± 16 145 ± 17	Sugar×t Gender×t MSRF×t	0.44 ^B 0.23 ^B 0.030 ^B
23-h TG AUC (mg/dl•23h)	Glucose (n=14) ^C Fructose (n=17)	783 ± 118 808 ± 167	786 ± 160 1,530 ± 217 ^C	978 ± 151 1,541 ± 285 ^E	479 ± 150 1,241 ± 199 ^C	Sugar×t Gender×t MSRF×t	0.0011 ^B 0.0095 ^B 0.049 ^B
Mean 24-h [TG] (mg/dl)	Glucose (n=14) ^C Fructose (n=17)	171 ± 20 163 ± 21	179 ± 18 194 ± 24	178 ± 17 192 ± 24 ^F	170 ± 16 189 ± 21 ^D	Sugar×t Gender×t MSRF×t Sugar×Gender×t	0.0055 ^B 0.19 ^B 0.070 ^B 0.029 ^B
Postprandial TG Peak (mg/dl)	Glucose (n=15) Fructose (n=17)	202.4 ± 24.6 211.1 ± 28.3	234.7 ± 21.7 295.5 ± 36.7	227.2 ± 20.5 282.7 ± 35.4 ^D	214.2 ± 20.3 274.9 ± 31.1 ^F	Sugar×t Gender×t MSRF×t	0.0026 ^B 0.13 ^B 0.040 ^B
Fasting ApoB (mg/dl)	Glucose (n=15) Fructose (n=17)	86 ± 6 79 ± 6	92 ± 7 97 ± 8	90 ± 7 101 ± 9 ^F	87 ± 5 98 ± 6 ^F	Sugar×t Gender×t MSRF×t	<0.0001 ^B 0.54 ^A 0.83 ^B
Postprandial ApoB (mg/dl)	Glucose (n=15) Fructose (n=17)	81 ± 6 74 ± 6	88 ± 6 92 ± 7 ^C	87 ± 6 95 ± 8 ^D	86 ± 6 92 ± 7 ^F	Sugar×t Gender×t MSRF×t	0.043 ^B 0.31 ^B 0.34 ^B
ApoB/ApoA1	Glucose (n=15) Fructose (n=17)	0.75 ± 0.07 0.63 ± 0.06	0.70 ± 0.05 0.75 ± 0.07 ^C	0.72 ± 0.06 0.79 ± 0.07 ^D	0.75 ± 0.06 0.75 ± 0.06 ^D	Sugar×t Gender×t MSRF×t	0.0006 ^A 0.78 ^A 0.42 ^A
Fasting Cholesterol (mg/dl)	Glucose (n=15) Fructose (n=17)	186 ± 8 186 ± 8	198 ± 9 209 ± 10 ^D	191 ± 10 217 ± 13 ^C	193 ± 8 205 ± 9 ^F	Sugar×t Gender×t MSRF×t	0.036 ^A 0.45 ^A 0.89 ^A
Fasting LDL (mg/dl)	Glucose (n=15) Fructose (n=17)	123.4 ± 5.9 115.3 ± 8.0	133.7 ± 6.9 130.4 ± 9.8	129.8 ± 7.7 137.0 ± 10.1 ^D	127.2 ± 6.6 131.5 ± 9.6 ^E	Sugar×t Gender×t MSRF×t	0.023 ^A 0.90 ^A 0.97 ^A
Fasting HDL (mg/dl)	Glucose (n=15) Fructose (n=17)	39 ± 2 40 ± 3	41 ± 2 45 ± 3 ^C	42 ± 2 46 ± 3 ^D	38 ± 2 41 ± 2	Sugar×t Gender×t MSRF×t	0.085 ^A 0.25 ^A 0.21 ^A
Fasting ApoA1 (mg/dl)	Glucose (n=15) Fructose (n=17)	120 ± 6 133 ± 8	134 ± 6 135 ± 9	129 ± 5 135 ± 10	121 ± 6 138 ± 8	Sugar×t Gender×t MSRF×t	0.11 ^A 0.93 ^A 0.44 ^A
Fasting sdLDL (mg/dl)	Glucose (n=15) Fructose (n=17)	29.9 ± 3.5 24.7 ± 2.7	26.7 ± 3.0 28.0 ± 3.1	27.9 ± 3.5 30.5 ± 3.4	32.7 ± 3.3 34.8 ± 4.1 ^F	Sugar×t Gender×t MSRF×t Sugar×MSRF×t	0.022 ^A 0.87 ^A 0.031 ^A 0.076 ^A
Postprandial sdLDL (mg/dl)	Glucose (n=15) Fructose (n=17)	21.7 ± 2.3 19.1 ± 2.3	20.3 ± 2.5 20.4 ± 2.7	20.9 ± 4.1 21.8 ± 3.2	25.6 ± 2.4 ^C 24.0 ± 3.2 ^D	Sugar×t Gender×t MSRF×t Sugar×MSRF×t	0.34 ^A 0.80 ^A 0.45 ^A 0.082 ^A
Fasting oxidized LDL (U/L)	Glucose (n=15) Fructose (n=17)	53.3 ± 3.0 50.8 ± 3.9	56.2 ± 3.2 55.3 ± 5.2	53.8 ± 4.0 55.1 ± 4.2	53.0 ± 2.7 57.2 ± 4.3 ^D	Sugar×t Gender×t MSRF×t	0.022 ^A 0.93 ^A 0.97 ^A
Postprandial RLP-TG (mg/dl)	Glucose (n=15) Fructose (n=17)	70.7 ± 11.4 82.6 ± 16.5	81.7 ± 10.7 133.4 ± 24.0	82.0 ± 11.2 136.4 ± 26.2 ^D	77.9 ± 10.6 128.6 ± 19.2 ^F	Sugar×t Gender×t MSRF×t	0.0001 ^B 0.33 ^B 0.15 ^B
Postprandial RLP-C (mg/dl)	Glucose (n=15) Fructose (n=17)	10.1 ± 1.4 10.9 ± 1.6	11.0 ± 1.2 15.5 ± 2.5	11.5 ± 1.3 16.2 ± 2.5 ^D	10.3 ± 1.3 13.7 ± 1.7 ^F	Sugar×t Gender×t MSRF×t Sugar×Gender×t	0.0013 ^B 0.18 ^B 0.080 ^B 0.040 ^B
Mean 24-h [FFA] (mEq/l)	Glucose (n=14) ^G Fructose (n=17)	0.27 ± 0.01 0.28 ± 0.02	0.29 ± 0.01 0.26 ± 0.01	0.28 ± 0.01 0.28 ± 0.02	0.29 ± 0.01 0.28 ± 0.02	Sugar×t Gender×t MSRF×t	0.031 ^A 0.22 ^A 0.54 ^A

^APROC MIXED 4-factor (sugar, time, gender, MSRF) RM ANOVA

^BPROC MIXED 4-factor (sugar, time, gender, MSRF) RM ANOVA with previous day's energy intake (EI) as time-level covariable

^CP < 0.05, ^DP < 0.01, ^EP < 0.001, ^FP < 0.0001 vs 0 wk, Tukeys multiple comparison tests^A on LSmeans adjusted for previous day's EI^B.

Mean ± SEM

Table S7: Effects of MSRF on lipid and lipoprotein responses to fructose consumption

Variable	MSRF # n=male/ female	Complex Carb 0 wk	Fructose 2 wk	Fructose 8 wk	Fructose 10 wk	%Δ 10 wk vs 0 wk	Factor or Interaction	P value
Preceding diet		Energy balance	<i>Ad libitum</i>	<i>Ad libitum</i>	Energy balance			
Fasting TG (mg/dl)	0 (n=3/1)	78 ± 16	70 ± 15	74 ± 15	85 ± 16	10.3 ± 9.2	Time	0.84 ^B
	1 (n=2/1)	114 ± 19	110 ± 20	137 ± 27	133 ± 12	21.1 ± 12.1	MSRF	0.015 ^B
	2 (n=2/3)	135 ± 13	153 ± 22	135 ± 20	129 ± 24	-4.8 ± 14.0	MSRF×t	0.13 ^B
	3 (n=2/3)	224 ± 35	226 ± 41	210 ± 39	218 ± 32	-3.0 ± 6.3		
TG AUC (mg/dl•23h)	0 (n=3/1)	425 ± 110	1,005 ± 336	805 ± 163	716 ± 339	118.4 ± 102.5	Time	0.0023 ^B
	1 (n=2/1)	842 ± 376	1,597 ± 796	1,714 ± 786	1,610 ± 670	114.3 ± 54.5	MSRF	0.12 ^B
	2 (n=2/3)	551 ± 160	1,174 ± 125	1,170 ± 394	918 ± 252	75.5 ± 55.3	MSRF×t	0.36 ^B
	3 (n=2/3)	1,350 ± 431	2,267 ± 379	2,398 ± 646	1,764 ± 320	98.5 ± 55.1		
Mean 24-h [TG] (mg/dl)	0 (n=3/1)	82 ± 15	106 ± 25	101 ± 16	107 ± 24	30.6 ± 13.2	Time	<0.0001 ^B
	1 (n=2/1)	140 ± 32	171 ± 48	194 ± 41 ^C	191 ± 40 ^D	39.3 ± 11.1	MSRF	0.0099 ^B
	2 (n=2/3)	151 ± 14	176 ± 18	165 ± 20	159 ± 16	5.6 ± 4.4	MSRF×t	0.0081 ^B
	3 (n=2/3)	254 ± 41	297 ± 48	291 ± 48	283 ± 38 ^{D,F}	12.9 ± 4.4		
Postprandial TG Peak (mg/dl)	0 (n=3/1)	103 ± 21	173 ± 50	149 ± 34	153 ± 35	49.8 ± 16.7	Time	<0.0001 ^B
	1 (n=2/1)	190 ± 54	237 ± 70	309 ± 92	298 ± 62 ^D	69.8 ± 29.5	MSRF	0.0080 ^B
	2 (n=2/3)	177 ± 17	268 ± 13	251 ± 24	221 ± 21 ^C	26.3 ± 9.6	MSRF×t	0.012 ^B
	3 (n=2/3)	345 ± 48 ^F	456 ± 71	406 ± 74	413 ± 47 ^{D,F}	21.6 ± 6.8		
Fasting ApoB (mg/dl)	0 (n=3/1)	58 ± 4	78 ± 11	78 ± 12	79 ± 11	35.0 ± 10.7	Time	0.0001 ^B
	1 (n=2/1)	88 ± 10	106 ± 1	117 ± 1	117 ± 7	36.6 ± 17.0	MSRF	0.42 ^B
	2 (n=2/3)	80 ± 12	91 ± 16	92 ± 14	95 ± 9	22.7 ± 6.2	MSRF×t	0.50 ^B
	3 (n=2/3)	88 ± 15	113 ± 20	118 ± 22	104 ± 16	19.7 ± 4.2		
Fasting sdLDL (mg/dl)	0 (n=3/1)	13.5 ± 1.1	17.1 ± 3.9	20.5 ± 4.8	19.3 ± 3.6	40.4 ± 18.4	Time	0.0004 ^A
	1 (n=2/1)	22.1 ± 4.3	24.6 ± 4.6	25.6 ± 3.9	28.1 ± 6.8	29.7 ± 20.6	MSRF	0.013 ^A
	2 (n=2/3)	30.2 ± 7.2	32.6 ± 8.4	27.5 ± 7.6	32.0 ± 6.7	21.1 ± 17.1	MSRF×t	0.0018 ^A
	3 (n=2/3)	29.8 ± 1.4	34.3 ± 2.8	44.4 ± 3.3 ^C	54.1 ± 4.1 ^{E,F}	81.5 ± 11.7		
Postprandial sdLDL (mg/dl)	0 (n=3/1)	11.6 ± 2.7	10.6 ± 1.5	12.5 ± 2.5	12.7 ± 3.0	11.1 ± 13.0	Time	0.0057 ^A
	1 (n=2/1)	14.1 ± 1.9	17.4 ± 1.8	15.7 ± 1.8	14.7 ± 0.8	10.6 ± 23.4	MSRF	0.082 ^A
	2 (n=2/3)	22.3 ± 5.0	22.3 ± 5.4	19.5 ± 4.8	28.1 ± 7.2	21.6 ± 10.1	MSRF×t	0.029 ^A
	3 (n=2/3)	25.0 ± 4.2	28.2 ± 5.4	35.1 ± 6.8 ^C	34.5 ± 3.9 ^C	44.4 ± 10.9		
Fasting oxidized LDL (U/L)	0 (n=3/1)	39.3 ± 3.3	41.9 ± 8.6	44.6 ± 6.6	43.4 ± 6.0	8.9 ± 8.0	Time	0.0035 ^A
	1 (n=2/1)	43.3 ± 4.2	45.1 ± 4.8	47.2 ± 5.2	50.8 ± 6.1	16.9 ± 3.5	MSRF	0.33 ^A
	2 (n=2/3)	60.1 ± 9.8	63.1 ± 13.2	61.5 ± 11.0	66.4 ± 10.7	11.2 ± 3.9	MSRF×t	0.74 ^A
	3 (n=2/3)	55.3 ± 6.4	64.3 ± 7.5	61.8 ± 5.7	62.7 ± 5.1	15.0 ± 5.0		
Postprandial RLP-C (mg/dl)	0 (n=3/1)	6.3 ± 1.0	8.4 ± 1.9	9.2 ± 1.5	8.0 ± 1.6	26.5 ± 9.3	Time	<0.0001 ^B
	1 (n=2/1)	9.4 ± 2.2	12.7 ± 3.4	19.0 ± 6.5	15.7 ± 2.2 ^C	88.7 ± 57.6	MSRF	0.026 ^B
	2 (n=2/3)	9.2 ± 1.8	12.2 ± 1.1	12.2 ± 1.4	9.5 ± 0.7	13.0 ± 14.6	MSRF×t	0.012 ^B
	3 (n=2/3)	17.2 ± 3.5	26.2 ± 5.7	24.0 ± 5.9	21.3 ± 3.5 ^C	27.7 ± 7.3		
Postprandial RLP-TG (mg/dl)	0 (n=3/1)	35.2 ± 8.9	71.5 ± 29.4	65.9 ± 20.6	66.6 ± 24.3	73.9 ± 27.7	Time	<0.0001 ^B
	1 (n=2/1)	80.7 ± 39.0	100.6 ± 46.2	157.3 ± 74.8	147.6 ± 48.0	152.3 ± 98.4	MSRF	0.033 ^B
	2 (n=2/3)	53.8 ± 8.1	96.0 ± 10.0	100.4 ± 19.0	89.8 ± 17.2	70.6 ± 26.8	MSRF×t	0.16 ^B
	3 (n=2/3)	150.4 ± 36.1	240.1 ± 49.6	216.3 ± 64.0	205.5 ± 31.4 ^C	46.1 ± 11.9		

^APROC MIXED 3-factor (time, gender & MSRF) RM ANOVA

^BPROC MIXED 3-factor (time, gender & MSRF) RM ANOVA with previous day's energy intake (EI) as time-level covariable

^CP < 0.05, ^DP < 0.01, ^EP < 0.001 vs 0 wk, Tukeys multiple comparison tests^A on LSmeans adjusted for previous day's EI^B.

^FP < 0.05 vs MSRF 0 at corresponding wk, Tukeys multiple comparison tests^A on LSmeans adjusted for previous day's EI^B.

Mean ± SEM

Table S8: Glucose, insulin & indices of insulin sensitivity before and after consumption of glucose- or fructose-sweetened beverages

Variable	Sugar (n)	Complex Carb 0 wk	Sugar 2 wk	Sugar 8 wk	Sugar 10 wk	Factors and Interactions	P value
Preceding diet		Energy balance	<i>Ad libitum</i>	<i>Ad libitum</i>	Energy balance		
Fasting Glucose (mg/dl)	Glucose (n=15)	87.6 ± 1.5	88.0 ± 1.9	89.8 ± 2.1	86.4 ± 1.3	Sugar×t	<0.0001 ^A
	Fructose (n=17)	88.7 ± 1.0	95.7 ± 2.1 ^C	94.6 ± 2.1 ^C	93.6 ± 1.3 ^D	Gender×t	0.24 ^A
Fasting Insulin (μU/ml)	Glucose (n=15)	15.0 ± 1.9	15.8 ± 1.6	16.4 ± 1.9	15.0 ± 1.6	Sugar×t	0.27 ^A
	Fructose (n=17)	14.0 ± 1.5	17.1 ± 2.0	16.3 ± 2.1	15.4 ± 1.7	Gender×t	0.20 ^A
3h Oral Glucose Tolerance Test - Glucose AUC (mg/dl•3h)	Glucose (n=15)	129.4 ± 16.2			157.3 ± 19.6 ^G	Sugar	0.20 ^E
	Fructose (n=17)	107.7 ± 18.5			130.9 ± 17.0 ^H	Gender	0.87 ^E
3h Oral Glucose Tolerance Test - Insulin AUC (μU/ml•3h)	Glucose (n=15)	232.9 ± 33.0			241.7 ± 26.8	Sugar	0.026 ^F
	Fructose (n=17)	273.1 ± 44.4			353.4 ± 65.8 ^G	Gender	0.35 ^F
Insulin Sensitivity Index mmoles ² H ₂ O/Insulin AUC Insulin AUC: μU/ml•4h	Glucose (n=14) ^I	0.236 ± 0.036			0.210 ± 0.021	Sugar	0.030 ^E
	Fructose (n=17)	0.254 ± 0.049			0.208 ± 0.040 ^H	Gender	0.033 ^E
				MSRF	0.19 ^E		

^APROC MIXED 4-factor (sugar, time, gender, MSRF) RM ANOVA.

^B*P* < 0.05, ^C*P* < 0.01, ^D*P* < 0.0001 vs 0 wk, Tukeys multiple comparison tests.

^EGLM 3-factor (sugar, gender, MSRF) ANOVA on 10 wk vs 0 wk on %difference or ^F difference, 0 vs 10wk.

^G*P* < 0.05, ^H*P* < 0.01, paired *t* test, 10 wk vs 0 wk.

Mean ± SEM

Table S9: Effect of MSRF on indices of glucose tolerance/insulin sensitivity during fructose consumption

Variable	MSRF # n=male/ female	Complex Carb 0 wk	Sugar 2 wk	Sugar 8 wk	Sugar 10 wk	%Δ 10 wk vs 0 wk	Factor or Interaction	P value	
Preceding diet		Energy balance	<i>Ad libitum</i>	<i>Ad libitum</i>	Energy balance				
Fasting Glucose (mg/dl)	0 (n=3/1)	87.8 ± 0.7	90.0 ± 2.2	88.5 ± 3.3	89.8 ± 1.0	2.3 ± 0.8	Time	0.0003 ^A	
	1 (n=2/1)	87.3 ± 1.9	93.3 ± 5.2	92.6 ± 1.0	92.5 ± 0.2	6.1 ± 2.1	MSRF	0.51 ^A	
	2 (n=2/3)	89.6 ± 2.9	97.5 ± 4.9	98.3 ± 4.9	94.7 ± 3.5	5.7 ± 2.1	MSRF×t	0.56 ^A	
	3 (n=2/3)	89.2 ± 1.8	99.8 ± 3.8	97.1 ± 3.7	96.2 ± 1.8	7.9 ± 1.7 ^D			
Fasting Insulin (μU/ml)	0 (n=3/1)	7.3 ± 1.2	7.9 ± 0.6	6.6 ± 1.0	7.7 ± 1.2	8.8 ± 12.0	Time	0.0065 ^A	
	1 (n=2/1)	16.4 ± 3.3	22.4 ± 4.3	21.4 ± 6.1	20.6 ± 4.2	25.6 ± 8.6	MSRF	0.0090 ^A	
	2 (n=2/3)	13.1 ± 2.4	13.2 ± 1.5	15.4 ± 2.5	13.8 ± 2.5	5.4 ± 7.5	MSRF×t	0.063 ^A	
	3 (n=2/3)	18.8 ± 2.2	25.1 ± 2.7	22.0 ± 3.2	20.0 ± 2.2	6.8 ± 6.0			
HOMA-IR	0 (n=3/1)	1.6 ± 0.3	1.8 ± 0.1	1.4 ± 0.2	1.7 ± 0.2	11.4 ± 12.7	Time	0.0029 ^A	
	1 (n=2/1)	3.5 ± 0.6	5.2 ± 1.1	4.9 ± 1.4	4.7 ± 1.0	33.5 ± 10.7	MSRF	0.0042 ^A	
	2 (n=2/3)	2.9 ± 0.5	3.2 ± 0.4	3.7 ± 0.6	3.2 ± 0.5	11.7 ± 9.0	MSRF×t	0.11 ^A	
	3 (n=2/3)	4.1 ± 0.5	6.1 ± 0.5	5.2 ± 0.7	4.7 ± 0.5	15.3 ± 6.8			
3h OGTT Glucose AUC (mg/dl•3h)	0 (n=3/1)	35.1 ± 17.5				69.6 ± 21.1	148.6 ± 84.4	Time	0.0021 ^B
	1 (n=2/1)	71.4 ± 28.8				90.9 ± 23.3	42.0 ± 18.7	MSRF	0.35 ^C
	2 (n=2/3)	125.4 ± 38.6				138.2 ± 34.2	40.6 ± 32.9		
	3 (n=2/3)	170.0 ± 20.9				196.6 ± 15.2	20.2 ± 11.6		
3h OGTT Insulin AUC (μU/ml•3h)	0 (n=3/1)	83.4 ± 11.4				100.6 ± 12.4	21.6 ± 5.3	Time	0.014 ^B
	1 (n=2/1)	249.9 ± 73.4				371.2 ± 186.5	32.8 ± 28.1	MSRF	0.17 ^D
	2 (n=2/3)	275.4 ± 71.9				339.0 ± 88.8	26.5 ± 7.8		
	3 (n=2/3)	436.3 ± 77.5				559.5 ± 130.0	28.0 ± 12.3		
OGTDT ISI mmoles ² H ₂ O/ insulin AUC	0 (n=3/1)	0.523 ± 0.093				0.443 ± 0.065	-13.2 ± 6.1	Time	0.0029 ^B
	1 (n=2/1)	0.206 ± 0.065				0.174 ± 0.063	-20.2 ± 13.0	MSRF	0.58 ^C
	2 (n=2/3)	0.222 ± 0.069				0.170 ± 0.041	-16.0 ± 8.6		
	3 (n=2/3)	0.100 ± 0.018				0.080 ± 0.015	-20.2 ± 6.7		

^APROC MIXED 3-factor (time, gender & MSRF) RM ANOVA.

^BPaired *t* test, 10 wk vs 0 wk

^CGLM 2-factor (gender & MSRF) ANOVA on percent difference or ^Ddifference, 10 wk vs 0 wk.

^D*P* < 0.05 vs 0 wk, Tukeys multiple comparison tests on LS means.

Mean ± SEM

Table S10: Effects of gender on lipid and lipoprotein responses during fructose consumption

Variable	Sugar (n)	Complex Carb 0 wk	Sugar 2 wk	Sugar 8 wk	Sugar 10 wk	%Δ 10 wk vs 0 wk	Factor or Interaction	P value
Preceding diet		Energy balance	<i>Ad libitum</i>	<i>Ad libitum</i>	Energy balance			
Fasting TG (mg/dl)	Men (n=9) Women (n=8)	131 ± 21 159 ± 30	141 ± 26 154 ± 33	135 ± 20 152 ± 33	145 ± 22 145 ± 28	13.4 ± 7.3 -6.9 ± 7.0	Time Gender Genderxt	0.84 ^B 0.80 ^B 0.14 ^B
23-h TG AUC (mg/dl•23h)	Men (n=9) Women (n=8)	709 ± 197 919 ± 288	1,614 ± 291 ^C 1,436 ± 343	1,761 ± 401 ^E 1,294 ± 414	1,354 ± 280 ^D 1,115 ± 296	128.7 ± 45.0 66.0 ± 43.9	Time Gender Genderxt	0.0023 ^B 0.78 ^B 0.077 ^B
Mean 24-h [TG] (mg/dl)	Men (n=9) Women (n=8)	146 ± 23 182 ± 36	190 ± 28 198 ± 43	193 ± 28 ^D 191 ± 42	187 ± 25 ^F 191 ± 38	32.9 ± 5.5 4.7 ± 3.9	Time Gender Genderxt	<0.0001 ^B 0.83 ^B 0.0005 ^B
Postprandial TG Peak (mg/dl)	Men (n=9) Women (n=8)	190 ± 33 235 ± 48	289 ± 39 303 ± 68	282 ± 43 284 ± 61	282 ± 41 ^F 267 ± 50	58.6 ± 10.6 15.0 ± 3.9	Time Gender Genderxt	<0.0001 ^B 0.85 ^B 0.0008 ^B
Fasting ApoB (mg/dl)	Men (n=9) Women (n=8)	71 ± 4 87 ± 12	95 ± 5 ^C 99 ± 17	94 ± 7 ^C 108 ± 17 ^C	95 ± 6 ^D 101 ± 12 ^C	34.0 ± 6.6 19.5 ± 4.5	Time Gender Genderxt	0.0001 ^B 0.39 ^B 0.051 ^B
Postprandial ApoB (mg/dl)	Men (n=9) Women (n=8)	68 ± 4 81 ± 11	91 ± 6 ^C 94 ± 15	92 ± 7 ^C 99 ± 15 ^C	89 ± 7 ^E 95 ± 13 ^C	30.8 ± 7.8 18.4 ± 5.2	Time Gender Genderxt	0.0006 ^B 0.41 ^B 0.23 ^B
Fasting LDL (mg/dl)	Men (n=9) Women (n=8)	107.4 ± 7.5 124.1 ± 14.8	124.0 ± 6.7 137.6 ± 19.9	125.8 ± 7.3 149.6 ± 19.6	123.7 ± 7.8 140.3 ± 18.8	16.1 ± 3.3 11.5 ± 3.3	Time Gender Genderxt	0.0017 ^A 0.76 ^A 0.26 ^A
Fasting sdLDL (mg/dl)	Men (n=9) Women (n=8)	25.0 ± 3.5 24.4 ± 4.5	30.2 ± 4.6 25.6 ± 4.4	32.3 ± 4.3 28.4 ± 5.7	35.1 ± 5.5 ^C 34.6 ± 6.6	43.3 ± 15.1 46.8 ± 12.7	Time Gender Genderxt	0.0004 ^A 0.12 ^A 0.59 ^A
Postprandial sdLDL (mg/dl)	Men (n=9) Women (n=8)	17.9 ± 2.3 20.4 ± 4.4	17.3 ± 2.1 24.0 ± 5.1	18.4 ± 2.4 25.6 ± 6.3	22.0 ± 4.0 26.2 ± 5.4	20.5 ± 9.9 27.7 ± 10.2	Time Gender Genderxt	0.0057 ^A 0.85 ^A 0.10 ^A
Fasting oxidized LDL (U/L)	Men (n=9) Women (n=8)	48.1 ± 2.2 53.9 ± 8.2	52.1 ± 3.2 58.8 ± 10.7	52.6 ± 1.8 57.9 ± 8.9	54.5 ± 2.5 ^C 60.2 ± 8.8	13.6 ± 2.8 11.9 ± 4.7	Time Gender Genderxt	0.0035 ^A 0.97 ^A 0.99 ^A
Postprandial RLP-TG (mg/dl)	Men (n=9) Women (n=8)	77.1 ± 18.5 88.7 ± 29.4	135.1 ± 25.8 ^C 131.5 ± 44.1	143.0 ± 31.8 ^C 129.0 ± 45.1	135.6 ± 25.8 ^E 110.1 ± 30.8	106.8 ± 31.9 46.9 ± 18.0	Time Gender Genderxt	<0.0001 ^B 0.58 ^B 0.11 ^B
Postprandial RLP-C (mg/dl)	Men (n=9) Women (n=8)	9.2 ± 1.4 12.8 ± 2.9	14.6 ± 2.4 16.5 ± 4.7	15.9 ± 3.0 ^C 16.5 ± 4.2	13.9 ± 2.0 ^E 13.5 ± 3.1	57.6 ± 18.4 7.2 ± 7.1	Time Gender Genderxt	<0.0001 ^B 0.56 ^B 0.014 ^B

^APROC MIXED 3-factor (time, gender & MSRF) RM ANOVA

^BPROC MIXED 3-factor (time, gender & MSRF) RM ANOVA with previous day's energy intake (EI) as time-level covariable

^CP < 0.05, ^DP < 0.01, ^EP < 0.001, ^FP < 0.0001 vs 0 wk, Tukeys multiple comparison tests^A on LSmeans adjusted for previous day's EI^B.

Mean ± SEM

Table S11: Effect of gender on indices of glucose tolerance/insulin sensitivity during fructose consumption

Variable	Sugar (n)	Complex Carb 0 wk	Sugar 2 wk	Sugar 8 wk	Sugar 10 wk	%Δ 10 wk vs 0 wk	Factor or Interaction	P value
Preceding diet		Energy balance	Ad libitum	Ad libitum	Energy balance			
Fasting Glucose (mg/dl)	Men (n=9)	88 ± 1	94 ± 3	93 ± 3	92 ± 2 ^B	4.3 ± 1.3	Time	0.0003 ^A
	Women (n=8)	89 ± 1	98 ± 3	97 ± 3	95 ± 2 ^B	6.4 ± 1.6	Gender Genderxt	0.66 ^A 0.92 ^A
Fasting Insulin (μU/ml)	Men (n=9)	12.0 ± 1.6	16.4 ± 2.7 ^B	13.9 ± 2.1	14.3 ± 1.9 ^B	20.0 ± 4.4	Time	0.0065 ^A
	Women (n=8)	16.3 ± 2.5	17.8 ± 3.2	19.1 ± 3.7	16.6 ± 3.0	-0.8 ± 5.5	Gender Genderxt	0.56 ^A 0.16 ^A
3-h OGTT glucose AUC (mg/dl*3h)	Men (n=9)	106.5 ± 30.1			123.6 ± 29.1 ^F	60.6 ± 40.5	Time	0.0021 ^C
	Women (n=8)	109.1 ± 22.3			139.0 ± 17.1 ^F	59.8 ± 25.4	Gender	0.72 ^D
3-h OGTT insulin AUC (μU/ml*3h)	Men (n=9)	236.3 ± 58.8			303.6 ± 99.7	20.7 ± 6.9	Time	0.014 ^C
	Women (n=8)	314.4 ± 68.3	409.5 ± 85.9 ^F	33.8 ± 9.8	Gender	0.36 ^E		
OGTDT ISI mmoles ² H ₂ O/ Insulin AUC	Men (n=9)	0.301 ± 0.078			0.261 ± 0.063	-11.7 ± 5.6	Time	0.0029 ^C
	Women (n=8)	0.202 ± 0.055			0.150 ± 0.040 ^F	-23.6 ± 4.4	Gender	0.082 ^D

^APROC MIXED 3-factor (time, gender, MSRF) RM ANOVA.

^BP < 0.05 vs 0 wk, Tukeys multiple comparison tests.

^CPaired t test, 10 wk vs 0 wk.

^DGLM 2-factor (gender & MSRF) ANOVA on % difference or ^Edifference, 10 wk vs 0 wk.

^FP < 0.05, paired t test, 10 wk vs 0 wk.

Mean ± SEM

Table S12: Energy intake on days prior to 24-h blood collections

Sugar/Gender	n	0 wk & 10 wk energy requirement & intake (kcal)	2 wk: % of energy requirement consumed	8 wk: % of energy requirement consumed	RM ANOVA ^A	
					Factor & Interactions	P value
Glucose/Men	7	2,584 ± 52	132.7 ± 12.9	126.6 ± 6.1	Time (t)	<0.0001
Glucose/Women	8	2,194 ± 83	110.0 ± 3.3	109.0 ± 3.1 ^C	Sugar×t	0.16
Fructose/Men	9	2,711 ± 109	134.1 ± 7.0	123.3 ± 4.7	Gender×t ^B	0.039
Fructose/Women	8	2,197 ± 78	129.4 ± 9.9	105.7 ± 8.7	Sugar×Gender×t	0.22

^AGLM RM 4-factor (sugar, time, gender, MSRF) ANOVA on percent of energy consumed compared to calculated energy requirement.

^BGLM RM contrast comparison for effect of gender by wk: 2 wk $P = 0.082$; 8 wk $P = 0.0059$.

^C $P < 0.05$, unpaired t test, Glucose/Men vs Glucose/Women.

Mean ± SEM

Table S13: F statistic and P value on effects of previous day's energy intake -- time-level covariable within 3- & 4-factor RM PROC MIXED Models

Variable	Fructose & Glucose 4-factor RM ANOVA		Fructose 3-factor RM ANOVA		Glucose 3-factor RM ANOVA	
	F Statistic	P value	F Statistic	P value	F Statistic	P value
Fasting TG	0.61	0.44	1.1	0.33	3.5	0.090
TG AUC	3.0	0.095	4.7	0.051	0.7	0.11
Mean 24-h [TG]	7.7	0.010	8.3	0.014	0.6	0.46
Postprandial TG Peak	2.5	0.13	3.6	0.082	1.1	0.32
Fasting ApoB	4.6	0.041	6.4	0.027	1.6	0.23
Postprandial ApoB	3.6	0.069	9.9	0.008	23.2	0.0007
Postprandial RLP-C	3.2	0.084	5.5	0.037	6.9	0.025
Postprandial RLP-TG	2.0	0.17	0.7	0.43	6.5	0.029

Mean ± SEM

Table S14: Riboflavin levels in urine collected 2 times/wk during the 8 outpatient weeks as an index of sugar beverage consumption compliance

	Glucose	Fructose
Outpatient urine collections	Fold increase in flourescein counts compared with baseline period	
1	21.0 ± 8.6	12.2 ± 2.0
2	17.0 ± 3.7	14.3 ± 2.4
3	22.2 ± 6.2	18.7 ± 6.7
4	8.5 ± 2.0	14.0 ± 2.8
5	18.1 ± 4.8	12.4 ± 2.1
6	11.0 ± 3.1	13.1 ± 4.1
7	13.8 ± 4.7	13.1 ± 3.4
8	11.1 ± 3.6	12.9 ± 3.0
9	15.4 ± 4.9	10.2 ± 2.5
10	14.6 ± 5.3	11.7 ± 2.7
11	12.9 ± 4.2	12.4 ± 2.7
12	11.1 ± 4.5	11.9 ± 3.2
13	8.3 ± 2.5	8.5 ± 2.3
14	15.1 ± 4.5	14.7 ± 6.5
15	20.1 ± 13.2	9.9 ± 3.9
16	8.6 ± 2.2	10.1 ± 3.0
Mean of 8-wk period	14.6 ± 1.3	12.4 ± 0.8 ^A

^A*P* = 0.16 paired t test, fructose vs glucose

Mean ± SEM

Table S15: Effect of number of metabolic syndrome risk factors (MSRF) on baseline parameters in all subjects

Variable	MSRF=0	MSRF=1	MSRF=2	MSRF=3	P value
(n=Male/female)	(n=5/3)	(n=3/2)	(n=5/5)	(n=3/6)	
Fasting TG (mg/dl)	87 ± 11	107 ± 12	147 ± 14	216 ± 24	<0.0001 ^A 0.0001 ^B
TG AUC (mg/dl•23h)	568 ± 125	788 ± 213	604 ± 163	1,193 ± 237	0.12 ^A
Mean 24-h [TG] (mg/dl)	99 ± 18	134 ± 19	165 ± 18	239 ± 27	0.0013 ^A 0.0001 ^B
Postprandial TG Peak (mg/dl)	120 ± 48	173 ± 73	193 ± 66	319 ± 105	0.0002 ^A
Fasting LDL (mg/dl)	101 ± 9	129 ± 14	123 ± 9	125 ± 9	0.28 ^A
Fasting sdLDL (mg/dl)	19.0 ± 3.1	25.8 ± 3.9	31.3 ± 5.4	30.6 ± 2.7	0.07 ^A
Fasting oxidized LDL (U/L)	45.3 ± 4.3	52.5 ± 6.1	52.9 ± 5.6	56.5 ± 3.6	0.55 ^A
Postprandial RLP-C (mg/dl)	6.3 ± 0.7	8.8 ± 1.2	10.4 ± 1.6	15.3 ± 2.5	0.015 ^A 0.0051 ^B
Postprandial RLP-TG (mg/dl)	37.7 ± 4.6	64.8 ± 24.2	69.8 ± 12.4	126.8 ± 23.4	0.012 ^A 0.0053 ^B
Fasting HDL (mg/dl)	51 ± 3	38 ± 6	35 ± 1	36 ± 2	0.0001 ^A 0.028 ^C
Fasting Glucose (mg/dl)	87.1 ± 1.1	86.6 ± 1.3	88.0 ± 1.7	93.0 ± 2.2	0.071 ^A
Fasting Insulin (μU/ml)	10.0 ± 2.0	13.3 ± 2.7	13.7 ± 1.4	20.0 ± 2.4	0.019 ^A 0.75 ^B
HOMA-IR	2.2 ± 0.4	2.8 ± 0.6	2.9 ± 0.3	4.6 ± 0.6	0.018 ^A
3-h Glucose OGTT AUC (mg/dl•3h)	68.7 ± 17.7	87.8 ± 22.7	126.8 ± 23.5	168.4 ± 19.2	0.0094 ^A 0.0074 ^B
3-h Insulin OGTT AUC (μU/ml•3h)	120.1 ± 28.3	209.0 ± 47.4	250.8 ± 37.8	402.5 ± 53.6	0.0006 ^A 0.0002 ^B
OGTDT ISI mmoles ² H ₂ O/Insulin AUC	0.436 ± 0.066	0.219 ± 0.048	0.181 ± 0.037 ⁺	0.161 ± 0.037	0.0013 ^A 0.0062 ^C

^AGLM 2-factor (gender and MSRF) ANOVA with trend contrasts for number of MSRF

^BLinear trend

^CQuadratic trend

Mean ± SEM