

**Table S4. Yw Strain Males Diet Response Surfaces: ANOVA and Regression Analysis**

Response	Coefficient	Df	Estimate	Mean Square	F	P
log ( $\mu\text{gTAG}/\text{fly}$ )	(Intercept)		3.80			
	Sugar	1	-3.46	89.80	516.10	<0.0001
	Yeast	1	-0.28	10.45	60.01	<0.0001
	Sugar <sup>2</sup>	1	1.75	0.03	0.19	0.6800
	Yeast <sup>2</sup>	1	-0.06	0.94	5.39	0.0205
	Sugar <sup>3</sup>	1	-0.25	3.82	21.90	0.0002
	Sugar·Yeast	1	0.16	6.74	38.73	<0.0001
Residuals		234		0.17		
log ( $\mu\text{gProt.}/\text{fly}$ )	(Intercept)		4.52			
	Sugar	1	-0.57	0.88	68.84	<0.0001
	Yeast	1	-0.20	1.13	88.56	<0.0001
	Sugar <sup>2</sup>	1	0.07	0.19	15.13	0.0004
	Yeast <sup>2</sup>	1	0.02	0.05	3.72	0.07220
	Sugar·Yeast	1	0.15	0.42	33.17	<0.0001
	Sugar <sup>2</sup> ·Yeast <sup>2</sup>	1	-0.01	0.15	11.50	0.0009
Residuals		235		0.01		
log (TAG/Prot.)	(Intercept)		-1.74			
	Sugar	1	-2.70	108.46	581.81	<0.0001
	Yeast	1	0.29	18.33	98.32	<0.0001
	Sugar <sup>2</sup>	1	1.78	0.07	0.38	0.5550
	Yeast <sup>2</sup>	1	-0.16	0.58	3.12	0.0760
	Sugar <sup>3</sup>	1	-0.27	2.65	14.24	0.0018
	Sugar·Yeast	1	-0.14	3.83	20.53	<0.0001
Sugar <sup>2</sup> ·Yeast <sup>2</sup>	1	0.01	0.84	4.52	0.0372	
Residuals		233		0.19		
Sqrt (Food/fly/6h)	(Intercept)		9.74			
	Sugar	1	-0.93	199.12	352.57	<0.0001
	Yeast	1	-5.73	177.08	313.56	<0.0001
	Sugar <sup>2</sup>	1	0.20	0.11	0.20	0.6917
	Yeast <sup>2</sup>	1	0.86	63.01	111.57	<0.0001
	Sugar·Yeast	1	0.85	3.12	5.53	0.0190
	Sugar <sup>2</sup> ·Yeast <sup>2</sup>	1	-0.04	6.85	12.13	0.0005
Residuals		235		0.57		
Sqrt (cal/fly/6h)	(Intercept)		0.150			
	Sugar	1	-0.017	0.5983	1344.06	<0.0001
	Yeast	1	0.108	0.0015	3.38	0.0661
	Sugar <sup>2</sup>	1	0.014	0.0166	37.22	<0.0001
	Yeast <sup>2</sup>	1	0.023	0.0523	117.57	<0.0001
	Sugar·Yeast	1	0.010	0.0056	12.49	0.0009
	Sugar <sup>2</sup> ·Yeast <sup>2</sup>	1	-0.001	0.0031	6.87	0.0092
Residuals		235		0.0005		

Statistical analysis and best fit model for Diet Response Surface estimation (see Experimental procedures for details) presented in Figure S1A (log  $\mu\text{gTAG}/\text{fly}$ ), S1B (log  $\mu\text{gProt.}/\text{fly}$ ) S1C (logTAG/Prot) and S3A (sqrt ( $\mu\text{g Food}/\text{fly}/\text{day}$ )). Estimated regression coefficients are from a multiple regression analysis, while degrees of freedom (Df), sums of squares, and F values are obtained by ANOVA. P-values are obtained by randomization.