Table S1: Summary of ANOVA models in Strain Survey Database

Model	Tested Term	Data Set[a]	Tests[b]	Resulting Transcriptional Differences[c]
Overall[d]	GROUP	All data	1	Differences between any conditions
Model 1[e]	STRAIN	All data	1	Strain differences [sex, diet]
		F	1	Strain differences in females [diet]
		M	1	Strain differences in M [diet]
		LF	1	Strain differences when fed LF diet [sex]
		HF	1	Strain differences when fed HF diet [sex]
		F, LF	1	Strain differences in F fed LF diet
		F, HF	1	Strain differences in F fed HF diet
		M, LF	1	Strain differences in M fed LF diet
		M, HF	1	Strain differences in M fed HF diet
		strain pairs, All	66	Differences between 2 strains [sex, diet]
		data	66	Differences between 2 F strains fed LF diet
		F, LF, strain pairs	66	Differences between two F strains fed HF
		F, HF, strain pairs	66	diet

Model	Factor	Subset	Count	Description
		M, LF, strain pairs	66	Differences between two M strains fed LF diet
		M, HF, strain pairs		Differences between two M strains fed HF diet
	SEX		1	
		All data	12	
		LF, strain	12	Sex differences [strain, diet]
		HF, strain		Sex differences in one strain when fed LF diet
	DIET		1	
		All data	12	Sex differences in one strain when fed HF diet
		F, strain	12	
		M, strain		
				Diet differences [sex, strain]
				Diet differences in F of one strain
				Diet differences in M of one strain
Model 2[f]	SEX	All data	1	General sex differences [diet, ~strain]
		LF	1	General sex differences when fed LF

		HF	1	[~strain]
				General sex differences when fed HF
	DIET	All data	1	[~strain]
		F	1	
		M	1	General diet differences [sex, ~strain]
				General diet differences in females [~strain]
				General diet differences in males [~strain]
Model 3[g]	DIET:STRAIN	All data	1	Diet-by-strain interactions [sex]
		F	1	Diet-by-strain interactions in females
		M	1	Diet-by-strain interactions in males
		F, strain pairs	66	Diet-by-strain interactions in F for two
		M, strain pairs	66	strains
				Diet-by-strain interactions in M for two
				strains
Model 4[h]	SEX:DIET:STRAIN	All data	1	Sex specific Diet-by-strain interactions
		Total	**532**	

[a]The data was subset before conducting the statistical test as indicated; [b]Total number of statistical tests

associated with modeling scheme; [c]terms in the bracket are treated as covariates in the given ANOVA model.

A "~" indicates a term treated as a random effect. F – females; M – males; LF – low fat; HF – high fat

[d]**Overall Model:** $Y = \mu + GROUP + \varepsilon$;

[e]**Model 1:** $Y = \mu + SEX + DIET + STRAIN + \varepsilon$;

[f]**Model 2:** $Y = \mu + SEX + DIET + {\sim}STRAIN + \varepsilon$;

[g]**Model 3:** $Y = \mu + SEX + DIET + STRAIN + DIET{:}STRAIN + \varepsilon$;

[h]**Model 4:** $Y = \mu + SEX + DIET + STRAIN + DIET{:}STRAIN + SEX{:}DIET + SEX{:}STRAIN +$

$SEX{:}DIET{:}STRAIN + \varepsilon$;