**Supplemental Figure 1: Density assays for genetic background controls.**

Two-way ANOVA compares Spen-KD and CTRL-KD MYD to cg-Gal-4/w1118 MYD background control. Yellow asterisks are significant differences between CTRL-KD and cg-Gal4/w1118, blue asterisks are significant differences between Spen-KD and cg-Gal4/w1118. \*p<0.05, \*\*p<0.01, \*\*\*p<0.001, \*\*\*\*p<0.0001, ns not significant. Medium-Yeast Diet (MYD), High-Yeast Diet (HYD), High-Sugar Diet (HSD), High-Fat Diet (HFD).

**Supplemental Figure 2: Carnitine and citric acid-cycle metabolite abundance between diets.**

Violin plots showing distribution of individual larvae metabolite abundance from the heat map in Figure 4A. Student T-test, \*p<0.05. Medium-Yeast Diet (MYD), High-Yeast Diet (HYD), High-Sugar Diet (HSD), High-Fat Diet (HFD). Each violin plot represents data from 30 larvae, representing 3 biological replicates with 10 larvae per replicate.

**Supplemental Figure 3: Glycolytic metabolite abundance between diets.**

Violin plots showing distribution of individual larvae metabolite abundance from the heat map in Figure 4A. Student T-test, \*p<0.05. Medium-Yeast Diet (MYD), High-Yeast Diet (HYD), High-Sugar Diet (HSD), High-Fat Diet (HFD). Each violin plot represents data from 30 larvae, representing 3 biological replicates with 10 larvae per replicate.