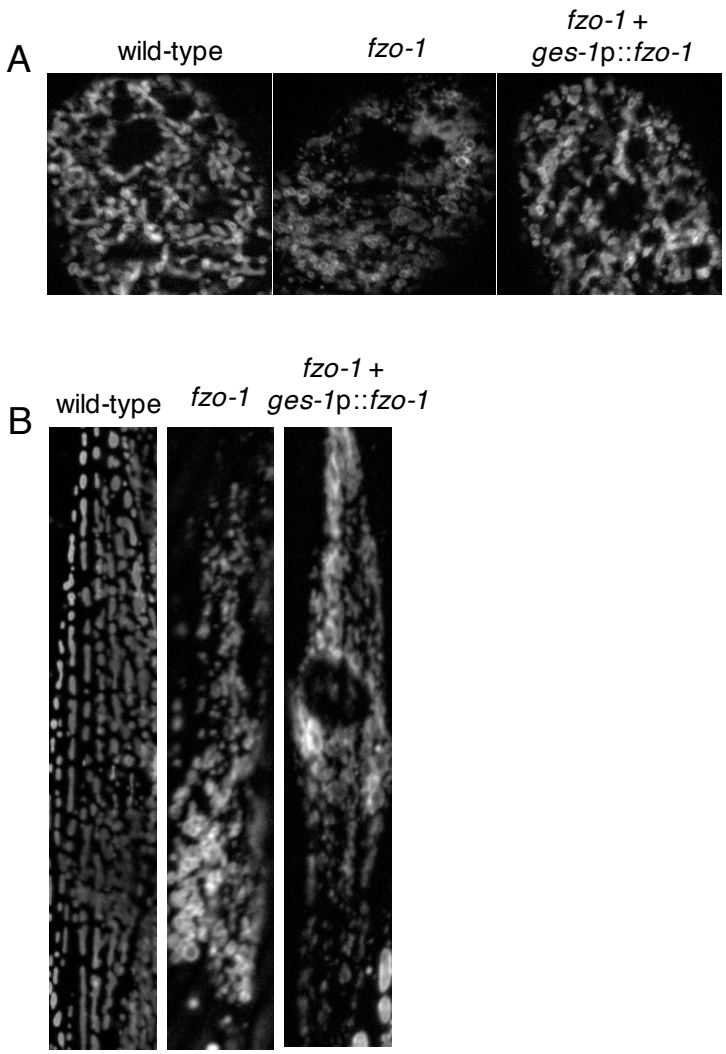

Figure S1. Intestinal-specific rescue of *fzo-1* rescues fragmented mitochondrial morphology in intestine but not muscle cells of *fzo-1* mutant worms. Related to Figure 3.

Mitochondrial networks in intestinal cells (**A**) and muscle cells (**B**) from wild-type, *fzo-1* mutant and *fzo-1* mutant with intestinal-specific *fzo-1* rescue (*ges1*p::*fzo-1*).

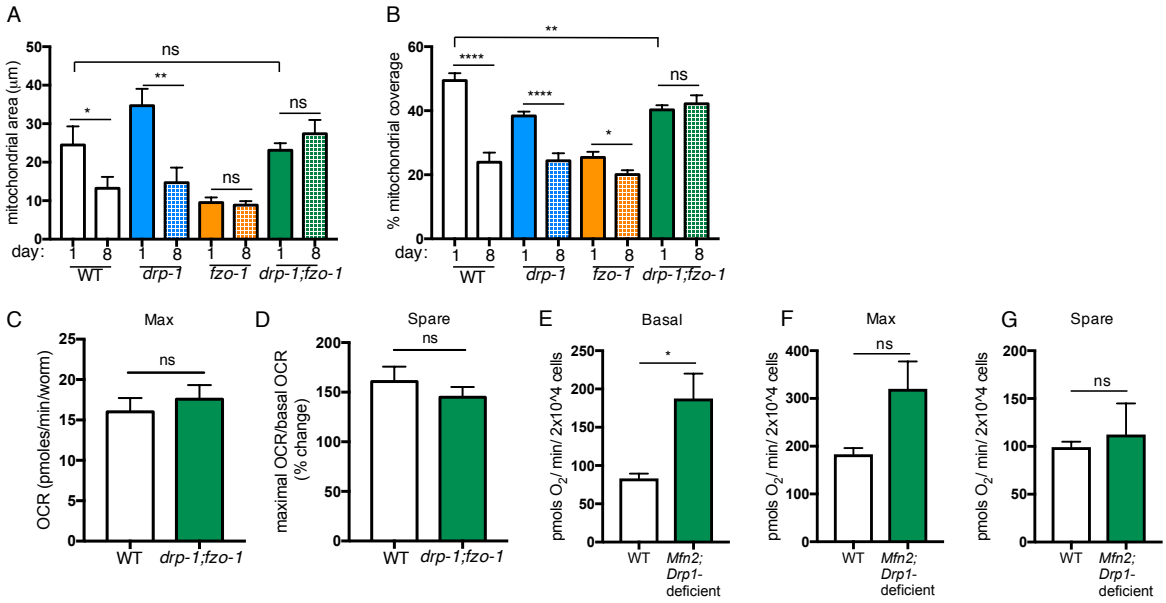

Figure S2. Mitochondrial content and size are maintained with age in *drp-1;fzo-1* double mutant animals. Related to Figure 5.

(**A**) and (**B**) Quantification of muscle cell mitochondrial networks from wild-type, *drp-1* mutant, *fzo-1* mutant, and *drp-1;fzo-1* double mutant worms on day 1 and day 8 of adulthood. Mitochondrial size (**A**) and mitochondrial content (**B**). Mean ± SEM of n=11-18 muscle cells from different worms. Maximal oxygen consumption rate (OCR, (**C**)) and spare respiratory capacity (**D**) of day 11 wild-type and *drp-1;fzo-1* double mutant worms are not significantly different. (**E**) - (**G**) Basal respiration (**E**), maximal respiration (**F**) and spare respiratory capacity in WT and *Mfn2;Drp1*-deficient MEFs in the presence of 20mM galactose, 4mM pyruvate and 2mM glutamine. Mean ± SEM of n=3-5 independent experiments. *p<0.05, **p<0.01, ****p<0.0001 by t test.

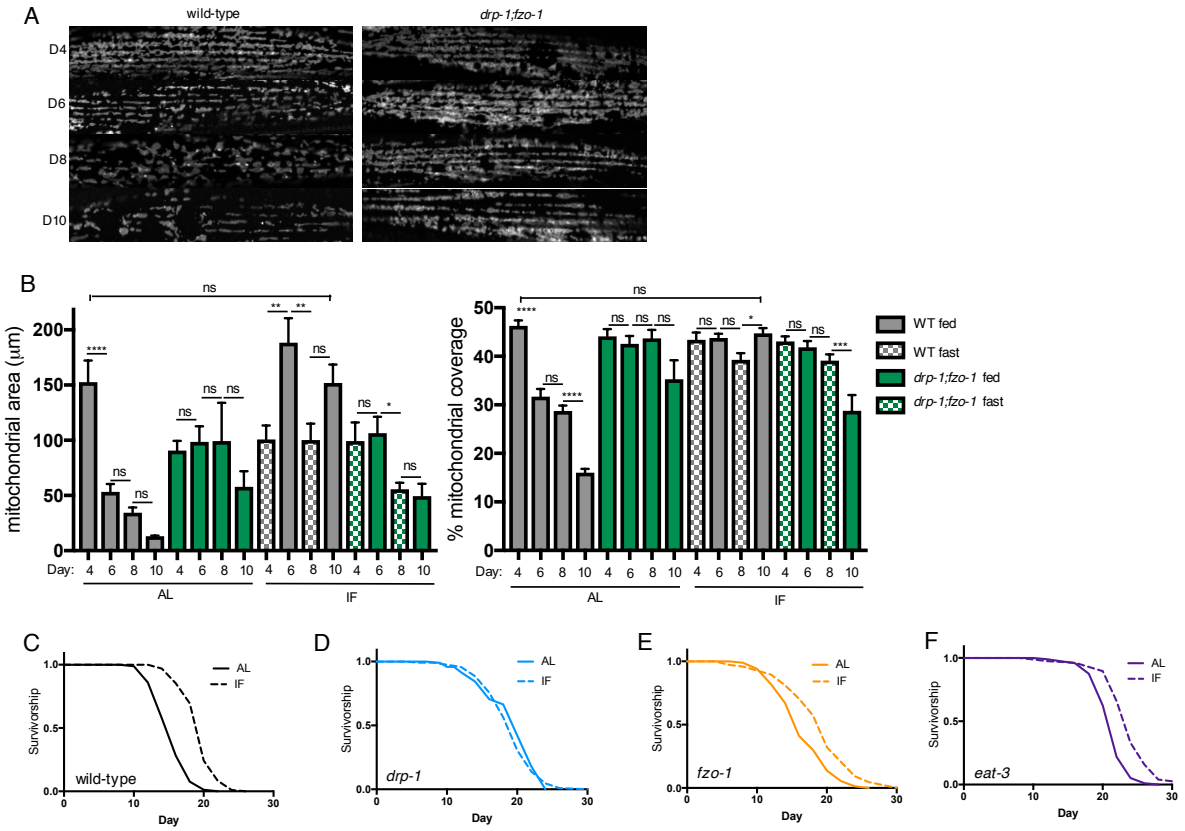

Figure S3. Mitochondrial plasticity and network remodeling is required for IF-mediated longevity. Related to Figure 5.

(**A**) Representative images of mitochondrial networks in wild-type and *drp-1;fzo-1* mutant worms fed *ad libitum* (AL) on day 4, 6, 8, and 10 (**B**) Mitochondrial area and content on day 4, 6, 8, and 10, from wild-type and *drp-1;fzo-1* mutant worms fed AL or with IF. Worms in the IF group were fasted from day 2-4 and day 6-8. Mean ± SEM of n=12-26 muscle cells from 2 independent experiments. *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001 by one-way ANOVA with Tukey's multiple comparisons test. (**C**)-(**F**) Survival curves for wild-type (**C**), *drp-1* (**D**), *fzo-1* (**E**) and *eat-3* (**F**) worms fed AL or with IF. See Table S1 for lifespan statistics.

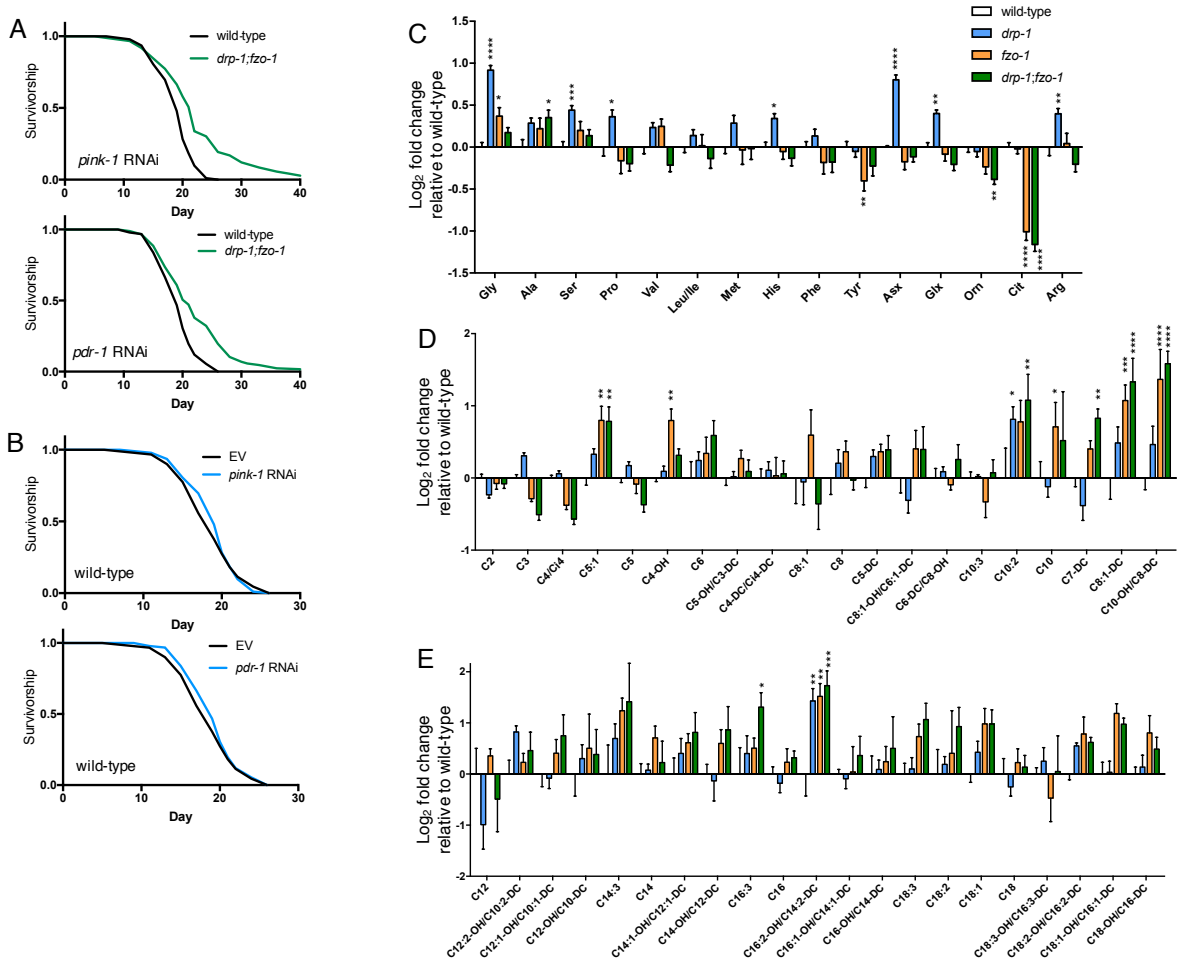

Figure S4. *drp-1;fzo-1* double mutants do not require mitophagy to increase lifespan but reprogram mitochondrial metabolism. Related to Figure 6.

(**A**) *drp-1;fzo-1* double mutant animals are long-lived with *pink-1* and *pdr-1* RNAi. (**B**) *pink-1* and *pdr-1* RNAi do not alter wild-type lifespan. See Table S1 for lifespan statistics. (**C**)-(**E**) Metabolomic analyses of wild-type, *drp-1* mutant, *fzo-1* mutant, and *drp-1;fzo-1* double mutant worms on day 1 of adulthood. Levels of amino acids (**C**), acylcarnitines C2-C10 (**D**) and C12-C18 (**E**) are expressed as $\log_2$ fold change relative to wild type levels. Mean ± SEM of 5-6 biological replicates. * $p<0.05$, ** $p<0.01$, *** $p<0.001$, **** $p<0.0001$ by two-way ANOVA with Tukey's multiple comparisons test. Statistics shown are relative to wild type levels.

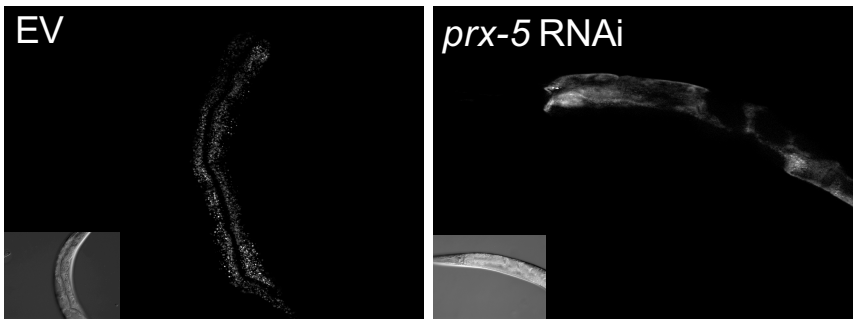

Figure S5. ***prx-5* RNAi inhibits peroxisomal protein import. Related to Figure 6.**

Fluorescence and DIC (inset) images of L4 wild-type worms expressing *vha-6*p::mRFP-PTS1. Fluorescence signal is punctate on empty vector control (EV, (**A**)), but diffuse on *prx-5* RNAi (**B**), indicating that mRFP fails to import into peroxisomes.

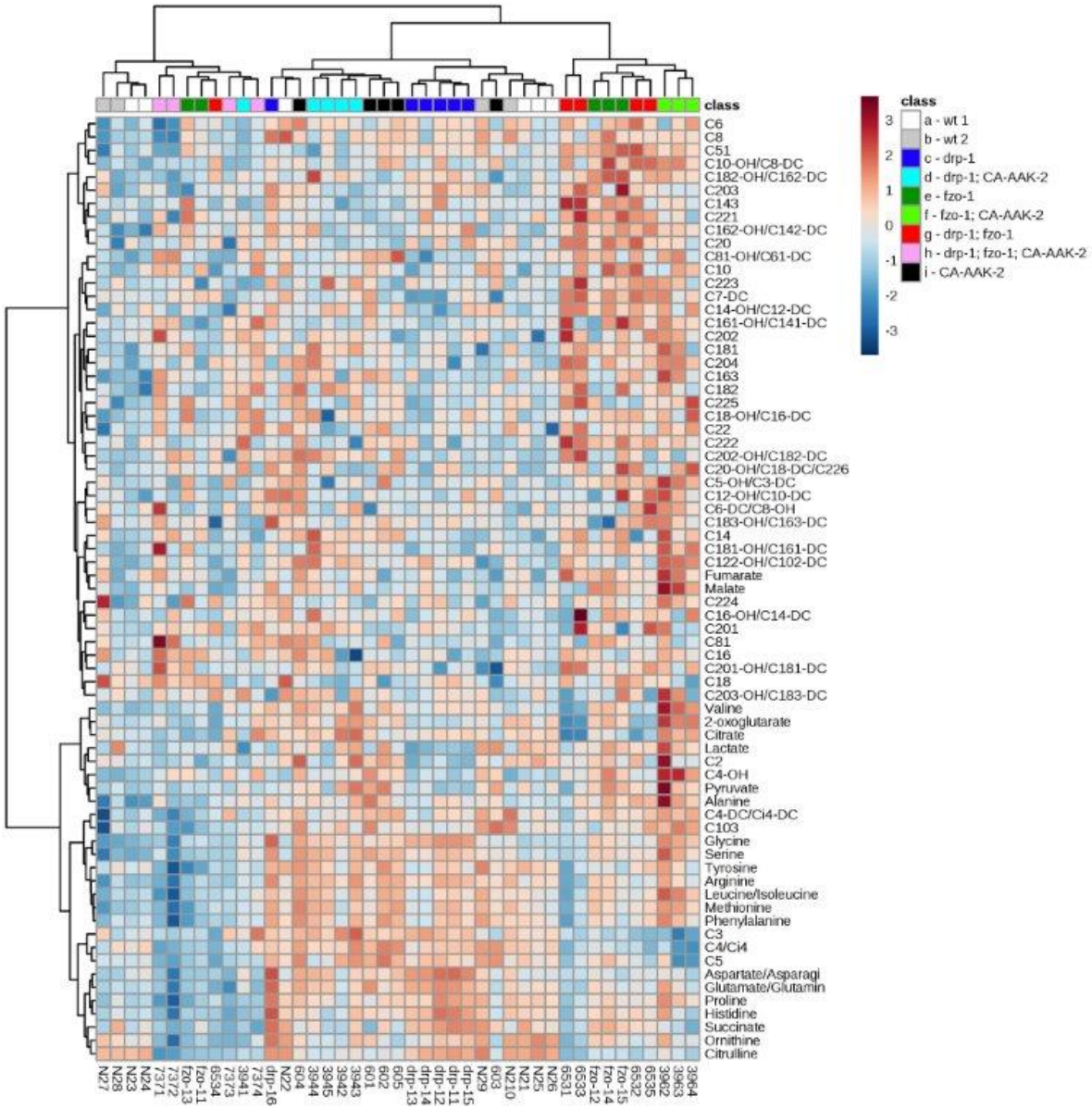

Figure S6. Metabolite profiles of *drp-1*, *fzo-1*, and *drp-1;fzo-1* mutants, with and without AMPK activation. Related to Figure 7.

Heatmap with hierarchical clustering of TCA intermediates, amino acids and acylcarnitines from wild-type, *drp-1*, *fzo-1*, and *drp-1;fzo-1* mutant worms, with and without CA-AAK-2.

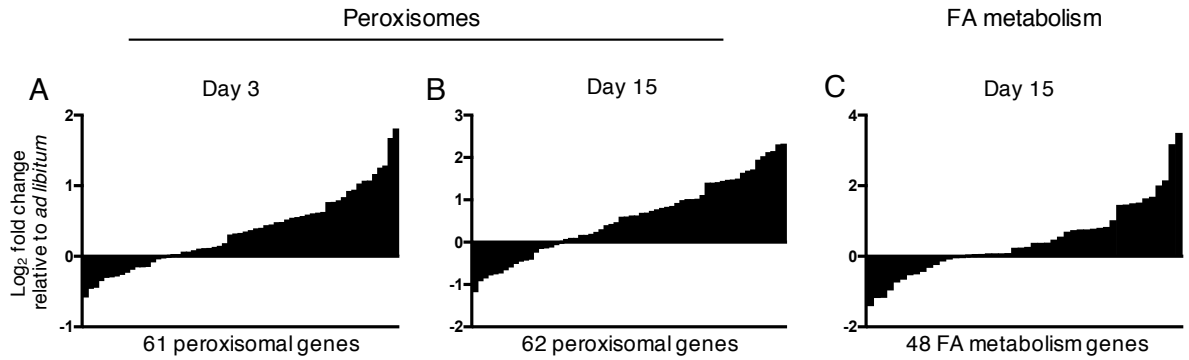

Figure S7. Peroxisome and FA metabolism genes are significantly enriched by DR. Related to Figure 7.

(**A**) and (**B**) Genes in the KEGG pathway 'Peroxisome' are upregulated in *eat-2(ad1116)* mutants (DR) vs wild-type animals (*ad libitum*) on day 3 (**A**) and day 15 (**B**). (**C**) Genes in the KEGG pathway 'Fatty acid metabolism' are upregulated in *eat-2(ad1116)* mutants vs wild-type animals on day 15. See also Tables S2-S4.