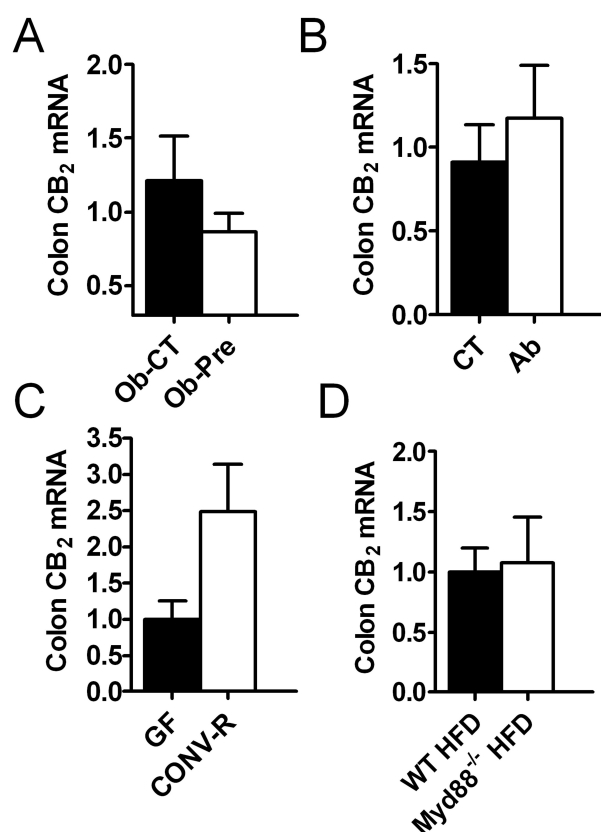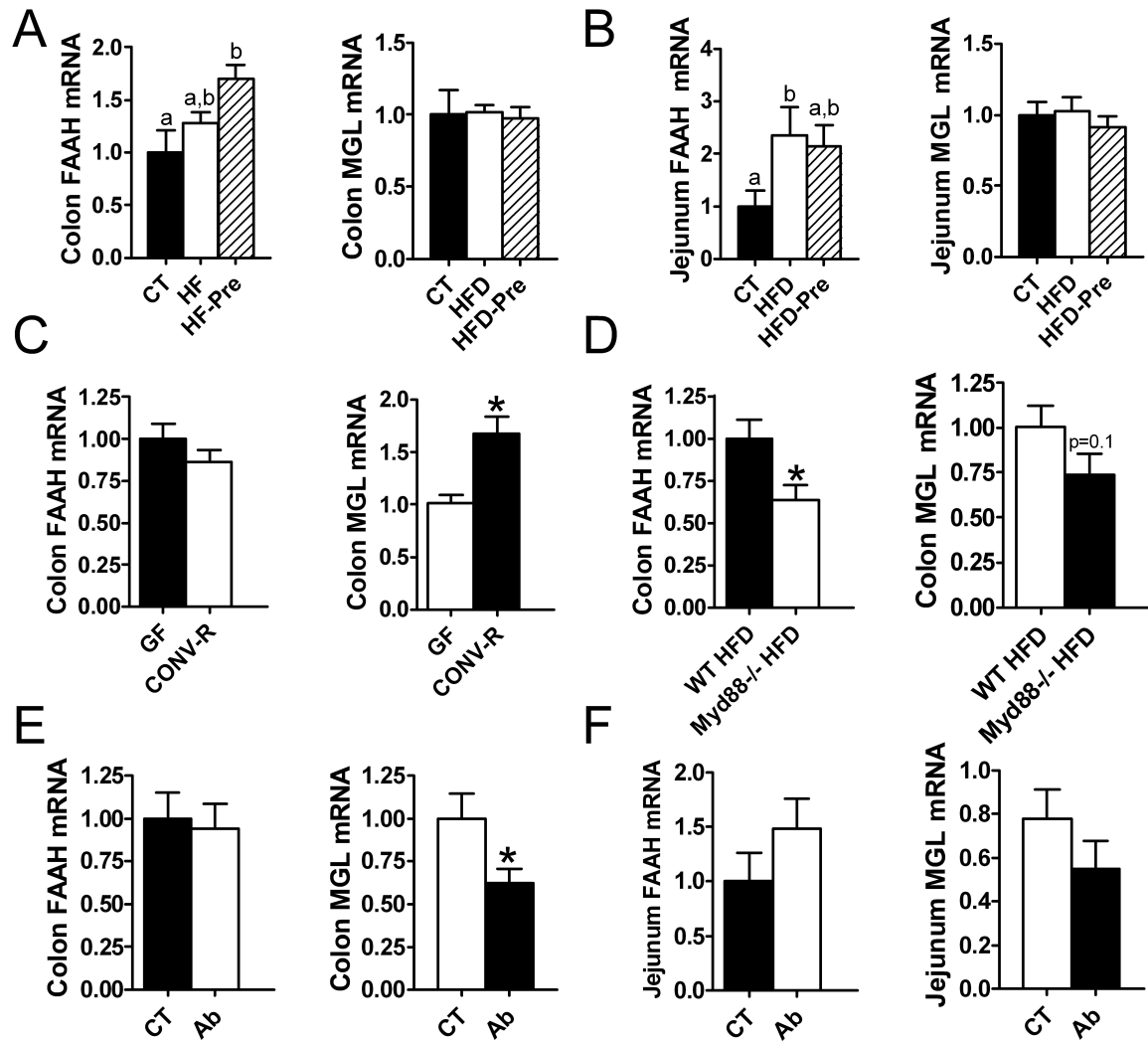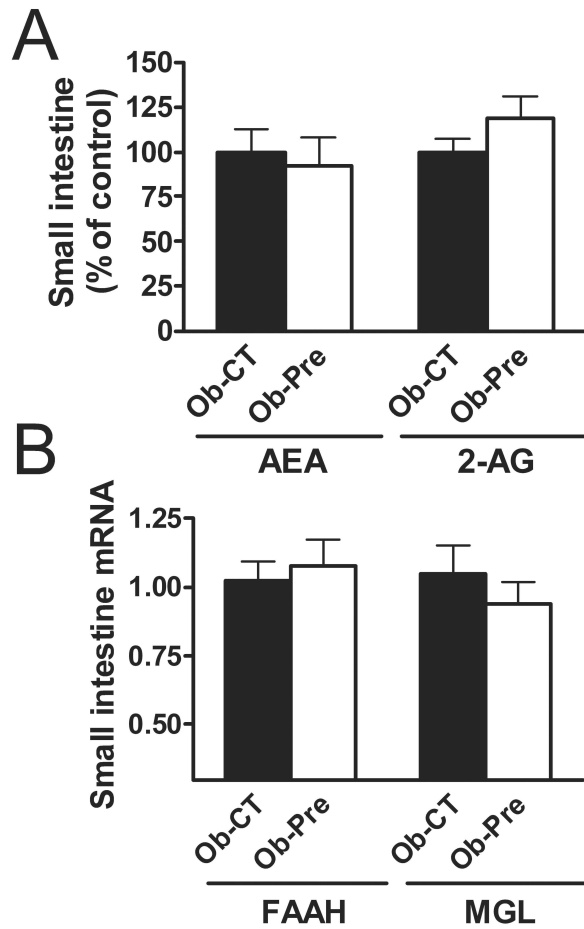**Supplementary Figures**

Supplementary Figure S1 Gut microbiota does not significantly change CB$_2$ mRNA expression.

CB$_2$ mRNA levels in the colon of mice models of gut microbiota-host interaction. (**A**) Colon CB$_2$ mRNA levels in *ob/ob* mice fed a normal chow diet (Ob-CT) or treated with prebiotics (Ob-Pre) for 5-weeks ($n = 10$). (**B**) Colon CB$_2$ mRNA levels in control mice (CT) following antibiotics treatment (Ab) for 2-weeks ($n = 8$-9). (**C**) Colon CB$_2$ mRNA levels in germ-free (GF) mice versus conventionally raised (CONV-R) ($n = 5$). (**D**) Colon CB$_2$ mRNA levels in wild-type or in *Myd88$^{-/-}$* mice fed a high-fat diet (HFD) for 8-weeks ($n = 5$).

Supplementary Figure S2 Gut microbiota modulates intestinal FAAH and MGL mRNA levels.

(**A**) Colon FAAH mRNA and MGL mRNA levels in mice fed a normal chow diet (CT) or in high-fat (HFD) treated mice fed a prebiotics (HFD-Pre) for 14-weeks (n = 7-8). (**B**) Jejunum FAAH mRNA and MGL mRNA levels in mice fed a normal chow diet (CT) or in high-fat (HFD) treated mice fed a prebiotics (HFD-Pre) for 14-weeks (n = 7-8). (**C**) Colon FAAH mRNA and MGL mRNA levels in germ-free (GF) mice versus conventionally raised (CONV-R) (n = 5). (**D**) Colon FAAH mRNA and MGL mRNA levels in wild-type or in $Myd88^{-/-}$ mice fed a HFD for 8-weeks (n = 5). (**E**) Colon FAAH mRNA and MGL mRNA expression levels in wild-type lean mice (CT) or following antibiotics treatment (Ab) for 2-weeks (n = 8-9). (**F**) Jejunum FAAH mRNA and MGL mRNA levels in wild-type lean mice (CT) or following antibiotics treatment (Ab) for 2-weeks (n = 8-9). *$P<0.05$ as determined by a two-tailed Student's t-test. Data with different superscript letters were significantly different according to post-hoc ANOVA one-way statistical analysis

Supplementary Figure S3 Gut microbiota modulation does not change small intestine eCB system tone.

(**A**) Jejunum AEA and 2-AG levels (percent of control values) (**B**) Jejunum FAAH mRNA and MGL mRNA levels in *ob/ob* mice fed a normal chow diet (Ob-CT) or treated with prebiotics (Ob-Pre) for 5-weeks ($n = 10$). *$P<0.05$ as determined by a two-tailed Student's *t*-test.
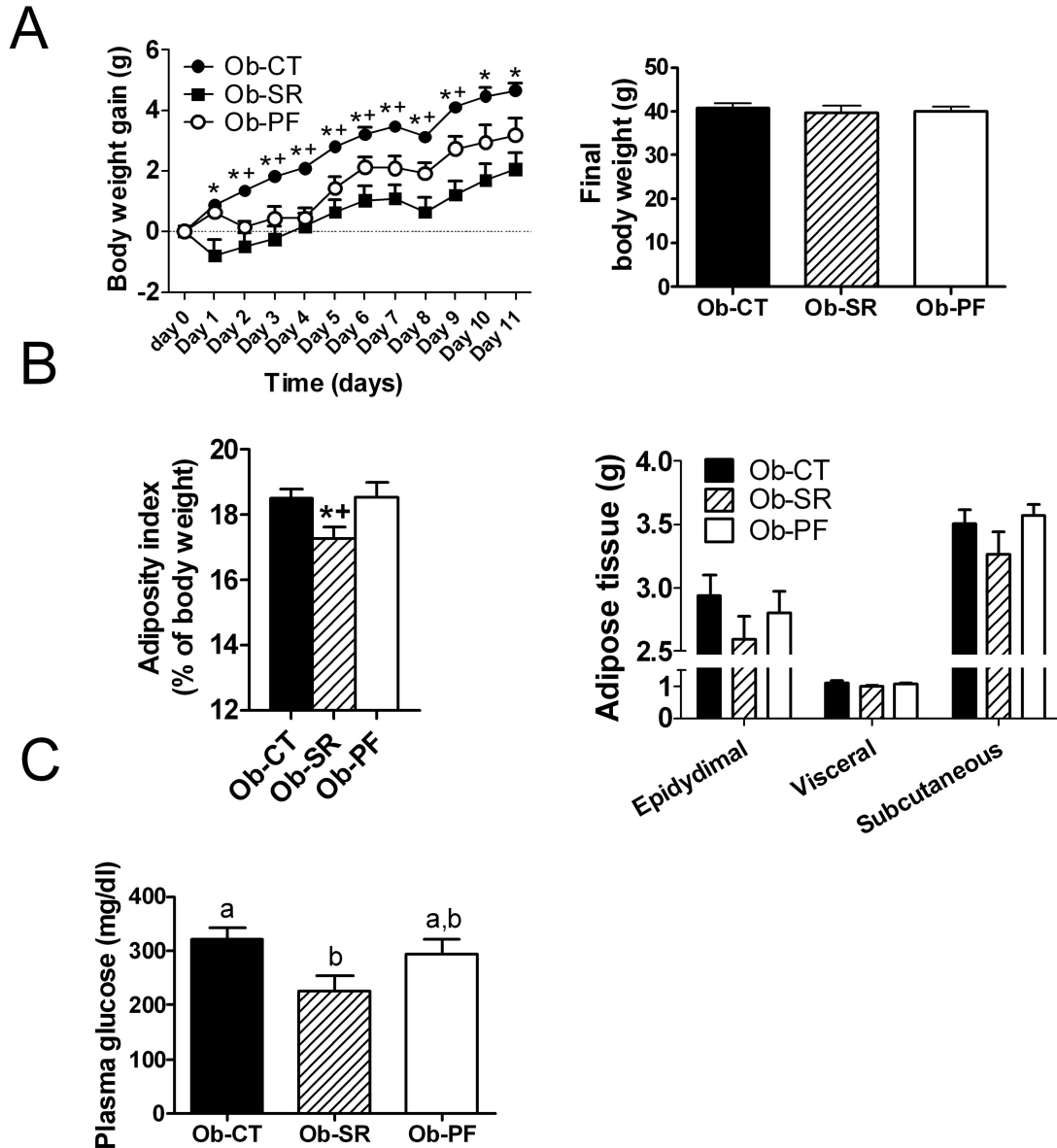
Supplementary Figure S4 CB1 receptor controls gut permeability independently of body weight or adiposity.

(**A**) Body weight gain (g) and final body weight (g) (**B**) adiposity index (% of body weight) and adipose tissues (g) (epidydimal, visceral, subcutaneous) (**C**) plasma glucose levels in obese *ob/ob* mice treated with vehicle (Ob-CT), CB_1 receptor antagonist, SR141716A (Ob-SR) ($10mg\ kg^{-1}\ d^{-1}$) or pair fed (Ob-PF) for 12 days ($n = 6$). *$P<0.05$ versus Ob-SR, +$P<0.05$ versus Ob-PF, data with different superscript letters were significantly different according to post-hoc ANOVA one-way statistical analysis.
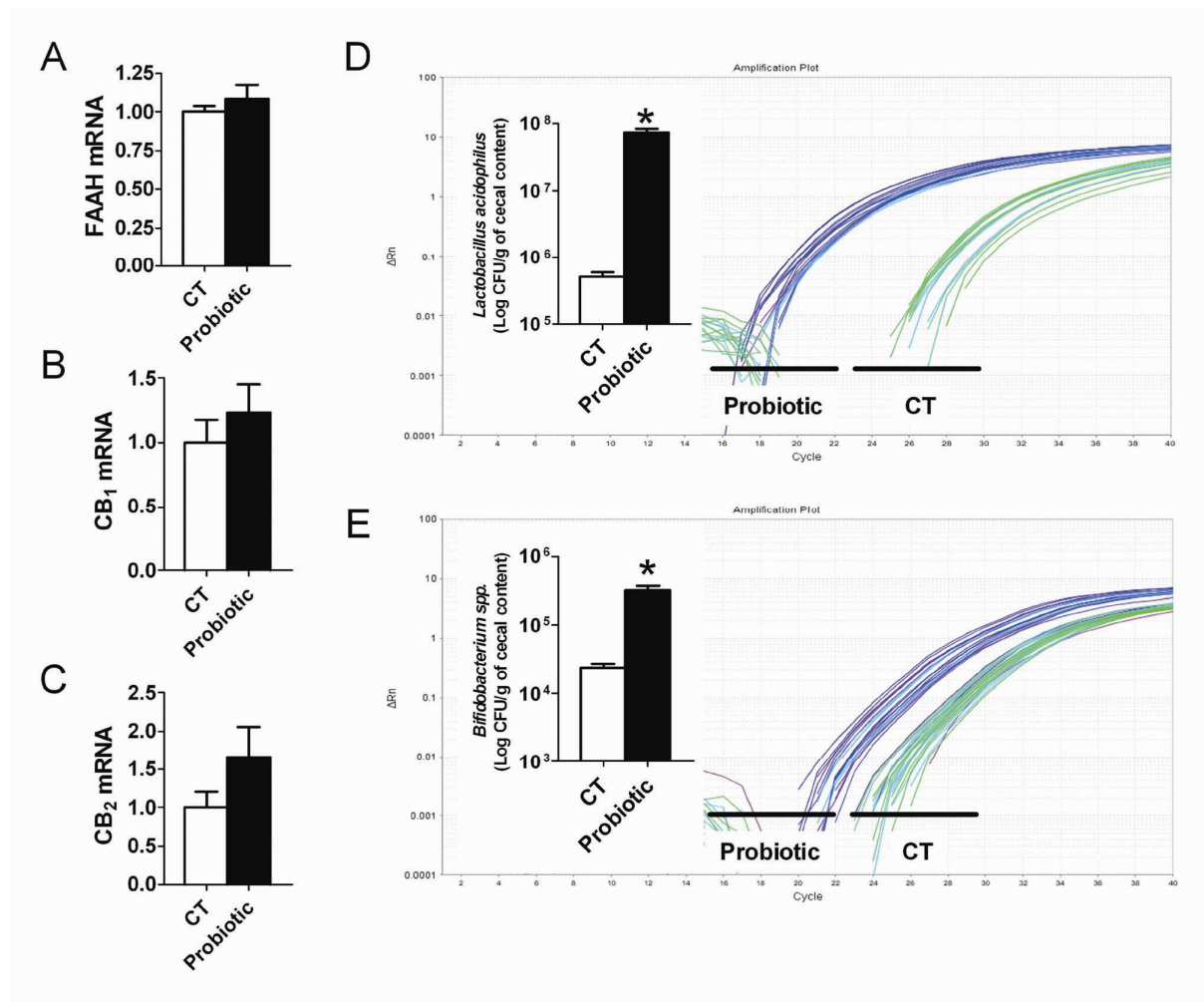
Supplementary Figure S5 Effect of Probiotic administration on the colonic eCB system tone.

(**A**) FAAH mRNA (**B**) CB$_1$ mRNA (**C**) CB$_2$ mRNA levels (**D**) real-time qPCR quantification expressed as Log CFU/g of cecal content and amplification plot of *Lactobacillus acidophilus* (**E**) real-time qPCR quantification expressed as Log CFU/g of cecal content and amplification plot of *Bifidobacterium spp.* measured in mice receiving oral administration of Probiotic (*Lactobacillus acidophilus* NCFM® and *Bifidobacterium lactis* BI-07) (Probiotic) 1.2 10^9 colony-forming units (CFU) of each strain per day for 10 consecutive days (n=10 mice), or saline (CT) (n=10 mice). *$P<0.05$ as determined by a two-tailed Student's *t*-test.
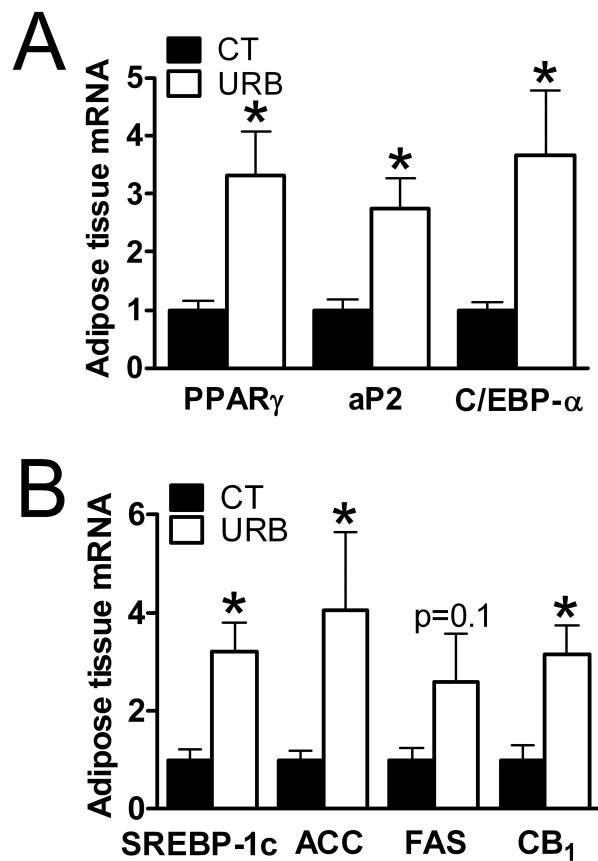
Supplementary Figure S6 Fatty acid amide hydrolase inhibitor promotes adipogenesis

(**A**) Adipocyte differentiation (PPAR-γ, aP2, C/EBP-α) and (**B**) lipogenesis (SREBP-1c, ACC, FAS), and CB_1 mRNA expression levels measured in the adipose tissue of wild-type lean mice having received a single injection of vehicle (CT) or FAAH enzyme inhibitor URB-597 (URB) (3mg kg^{-1} d^-) (n = 7). *$P<0.05$ as determined by a two-tailed Student's t-test.