**Table S2 Summary of statistical analyses**

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| Figure | Sample size (n) | Statistical Test | Values |
| 1a | Chow: n=11  HFD: n=12 | Two-way repeated-measure ANOVA  Post-hoc multiple comparisons test (Sidak's) | Interaction: F=35.92, P=0.0468  Time: F=456.3, P<0.0001  Genotype: F=26.57, P<0.10001  Multiple comparison:  6 weeks: P=0.7823  8 weeks: P=0.1847  10 weeks: P=0.0663  12 weeks: P=0.0001  14 weeks: P<0.0001  16 weeks: P<0.0001 |
| 1b | Chow: n=11  HFD: n=6 | Two-tailed unpaired Student’s t-test | LBM: t=1.338, P=0.2009  Fat: t=6.743, P<0.0001 |
| 1c | Chow: n=11  HFD: n=6 | Two-tailed unpaired Student’s t-test | LBM: t=8.122, P<0.0001  Fat: t=8.331, P<0.0001 |
| 1d | Chow: n=10  HFD: n=9 | Two-tailed unpaired Student’s t-test | t=17.75, P<0.0001 |
| 1e | Chow: n=11  HFD: n=6 | Two-tailed unpaired Student’s t-test | Fed: t=2.563, P=0.0264  Fasted: t=6.285, P<0.0001 |
| 1f | Chow: n=11  HFD: n=6 | Two-tailed unpaired Student’s t-test | Fed: t=2.587, P=0.0361  Fasted: t=3.202, P=0.0084 |
| 1g | WT: n=8  HFD: n=5 | Two-way repeated-measure ANOVA  Post-hoc multiple comparisons test (Sidak's) | Interaction: F=5.108, P=0.0018  Time: F=215, P<0.0001  Genotype: F=12.86, P=0.0043  Multiple comparison:  0 min: P>0.9999  15 min: P<0.0001  30 min: P=0.3461  60 min: P=0.0866  120 min: P=0.1487 |
| 1h | WT: n=5  HFD: n=8 | Two-way repeated-measure ANOVA  Post-hoc multiple comparisons test (Sidak's) | Interaction: F=8.484, P<0.0001  Time: F=47.88, P<0.0001  Genotype: F=17.74, P=0.0015  Multiple comparison:  0 min: P=0.0043  15 min: P<0.0001  30 min: P=0.1302  60 min: P=0.1718  120 min: P=0.0184 |
| 1i | Chow: n=11  HFD: n=6 | Two-tailed unpaired Student’s t-test | t=4.347, P=0.0006 |
| 1j | Chow: n=9  HFD: n=9 | Two-tailed unpaired Student’s t-test | t=4.073, P=0.0009 |
| 1k | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | t=4.529, P=0.0011 |
| 1l | Chow: n=10  HFD: n=10 | Two-tailed unpaired Student’s t-test | t=14.36, P<0.0001 |
| 2a | Chow: n=7  HFD: n=6 | Two-tailed paired Student’s t-test | Day: t=1.667, P=0.1237  Night: t=1.406, P=0.1873 |
| 2b | Chow: n=7  HFD: n=6 | Two-tailed paired Student’s t-test | Day: t=0.5561, P=0.5893  Night: t=5.575, P=0.0002 |
| 2c | Chow: n=7  HFD: n=6 | Two-tailed paired Student’s t-test | Day: t=1.437, P=0.1785  Night: t=2.242, P=0.0466 |
| 2d | Chow: n=7  HFD: n=6 | Two-tailed paired Student’s t-test | Day: t=7.016, P<0.0001  Night: t=19.31, P<0.0001 |
| 2e | Chow: n=7  HFD: n=6 | Two-tailed paired Student’s t-test | Day: t=2.235, P=0.0471  Night: t=2.489, P=0.0301 |
| 2f | WT: n=7  HFD: n=6 | Linear regression | F=7.935, Pgenotype=0.01483 |
| 2g | WT: n=7  HFD: n=6 | Linear regression | F=5.095, P=0.5678 |
| 3b | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | BAT: t=2.373, P=0.0391  ingWAT: t=4.596, P=0.0010  eWAT: t=2.398, P=0.0374 |
| 3c | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | BAT: t=2.753, P=0.0204  ingWAT: t=3.756, P=0.0037  eWAT: t=2.266, P=0.0469 |
| 4a | ctrl-mim: n=6  mim-148a: n=6 | Two-tailed unpaired Student’s t-test | t=4.115, P=0.0021 |
| 4c | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | BAT: t=4.328, P=0.0015  ingWAT: t=2.695, P=0.0225  eWAT: t=3.83, P=0.0033 |
| 4e | Chow: n=4  HFD: n=4 | Two-tailed unpaired Student’s t-test | BAT: t=4.264, P=0.0053  sWAT: t=4.671, P=0.0034  eWAT: t=3.998, P=0.0071 |
| 5b | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | Ucp1: t=2.27, P=0.0466  Cidea: t=2.413, P=0.0365  Cox8b: t=5.187, P=0.0004  Elov13: t=7.844, P<0.0001 |
| 5d | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | Ucp1: t=3.072, P=0.0118  Cidea: t=4.992, P=0.0005  Cox8b: t=2.268, P=0.0467  Elov13: t=2.838, P=0.0176 |
| 5f | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | Ucp1: t=2.251, P=0.0481  Cidea: t=0.8966, P=0.3910  Cox8b: t=0.789, P=0.4484  Elov13: t=4.92, P=0.0006 |
| 5h | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | Ucp1: t=2.788, P=0.0192  Cidea: t=9.539, P<0.0001  Cox8b: t=0.5525, P=0.5927  Elov13: t=4.18, P=0.0019 |
| 5i | Chow: n=6  HFD: n=6 | Two-tailed unpaired Student’s t-test | Ucp2: t=2.287, P=0.0453  Cpt1: t=2.249, P=0.0482  Cd36: t=4.422, P=0.0013  Ldlr: t=2.229, P=0.0499  Fas: t=4.316, P=0.001522  ACC1: t=5.426, P=0.00029  ACC2: t=0.4785, P=0.642607  GPAT: t=2.93, P=0.01504  Srebp1: t=1.475, P=0.170981  ChREBP: t=0.5828, P=0.572914  S14: t=0.6546, P=0.527494  HMGCR: t=0.7004, P=0.5035 |