Supplemental Figure Legends

Supplemental figure 1. A parental effect accounts for the body weight regulation by *Obrq2a.* Body weight and litter sizes are shown for control B6, control 6C2d, and reciprocal F1 male mice following 100 days on the HFSC diet. Circles represent females, squares represent males. Mean values ± SEM are shown using the parent as the unit of analysis. Red indicates homozygosity for the *Obrq2a*$^{A/J}$ allele.

Supplemental figure 2. Obesity-resistance conferred by *Obrq2a*$^{A/J}$ does not depend on inheritance of the *Obrq2a*$^{A/J}$ allele. Body weight and litter sizes are shown for control B6, control 6C2d, F2-"B6" and F2-"6C2d" male mice following 100 days on the HFSC diet. Circles represent females, squares represent males. Mean values ± SEM are shown using the parent as the unit of analysis. Mean values with different superscript letters correspond to groups that are significantly different ($p < 0.05$ following Tukey's multiple testing correction) whereas mean values with identical superscript letters correspond to groups that are not significantly different ($p > 0.05$ following Tukey's multiple testing correction). Red indicates heterozygosity or homozygosity for the *Obrq2a*$^{A/J}$ allele.

Supplemental figure 3. Multi-generational inheritance of obesity-resistance. Body weight and litter sizes are shown for control B6, F2-"B6" and F3-"B6" male mice following 100 days on the HFSC diet. Circles represent females, squares represent males. Mean values ± SEM are shown using the parent as the unit of analysis. Mean values with different superscript letters correspond to groups that are significantly different ($p < 0.05$ following Tukey's multiple testing correction) whereas mean values with identical superscript letters correspond to groups that are not significantly different ($p > 0.05$ following Tukey's multiple testing correction). Red indicates heterozygosity or homozygosity for the *Obrq2a*$^{A/J}$ allele.

Supplemental figure 4. Obesity-resistance is inherited through the paternal, but not maternal lineage. Body weight and litter sizes are shown for control B6, control 6C2d, and N2-"B6" male mice following 100 days on the HFSC diet. N2-"B6" mice of all four parental and grand-parental combinations of *Obrq2a*$^{A/J}$ heterozygosity are shown, namely P,GM, P,GP, M,GP, M,GM, where M and P denote maternal or paternal heterozygosity, and GM and GP denote grand-maternal or grand-paternal heterozygosity. Circles represent females, squares represent males. Mean values ± SEM are shown using the parent as the unit of analysis. Red indicates heterozygosity or homozygosity for the *Obrq2a*$^{A/J}$ allele.

Supplemental figure 5. A transgenerational genetic effect on food intake. Food intake per day, food intake per gram body weight, and litter sizes are shown for control B6, control 6C2d, N2-"B6", N3-"B6", and N4-"B6" male mice. Circles represent females, squares represent males. Mean values ± SEM are shown using the parent as the unit of analysis. Mean values with different superscript letters correspond to groups that are significantly different ($p < 0.05$ following Tukey's multiple testing correction) whereas mean values with identical superscript letters correspond to groups that are not significantly different ($p > 0.05$ following Tukey's multiple testing correction). Red indicates heterozygosity or homozygosity for the *Obrq2a*$^{A/J}$ allele.

Supplemental figure 6. The paternal influence of *Obrq2a* on food intake does not require social interactions. Food intake per day, food intake per gram body weight, and litter sizes are shown for B6 and "B6" offspring from control B6 males crossed to B6 females and (B6 x 6C2d)F1 males crossed to B6 females respectively. Fathers were removed from the cage following a single night. Circles represent females, squares represent males. Mean values ± SEM are shown using the parent as the unit of analysis. P values shown are relative to the control B6 cross. Red indicates heterozygosity for the *Obrq2a*$^{A/J}$ allele.

Supplemental figure 7. Multi-generational inheritance of obesity-resistance demonstrated using grandparental anlaysis. Body weights are shown for control B6 and F3-“B6” male mice following 100 days on the HFSC diet. Circles represent females, squares represent males. Mean values ± SEM are shown using the grandparent as the unit of analysis. P values shown are relative to the control B6 cross. Red indicates heterozygosity for the *Obrq2a*$^{A/J}$ allele.

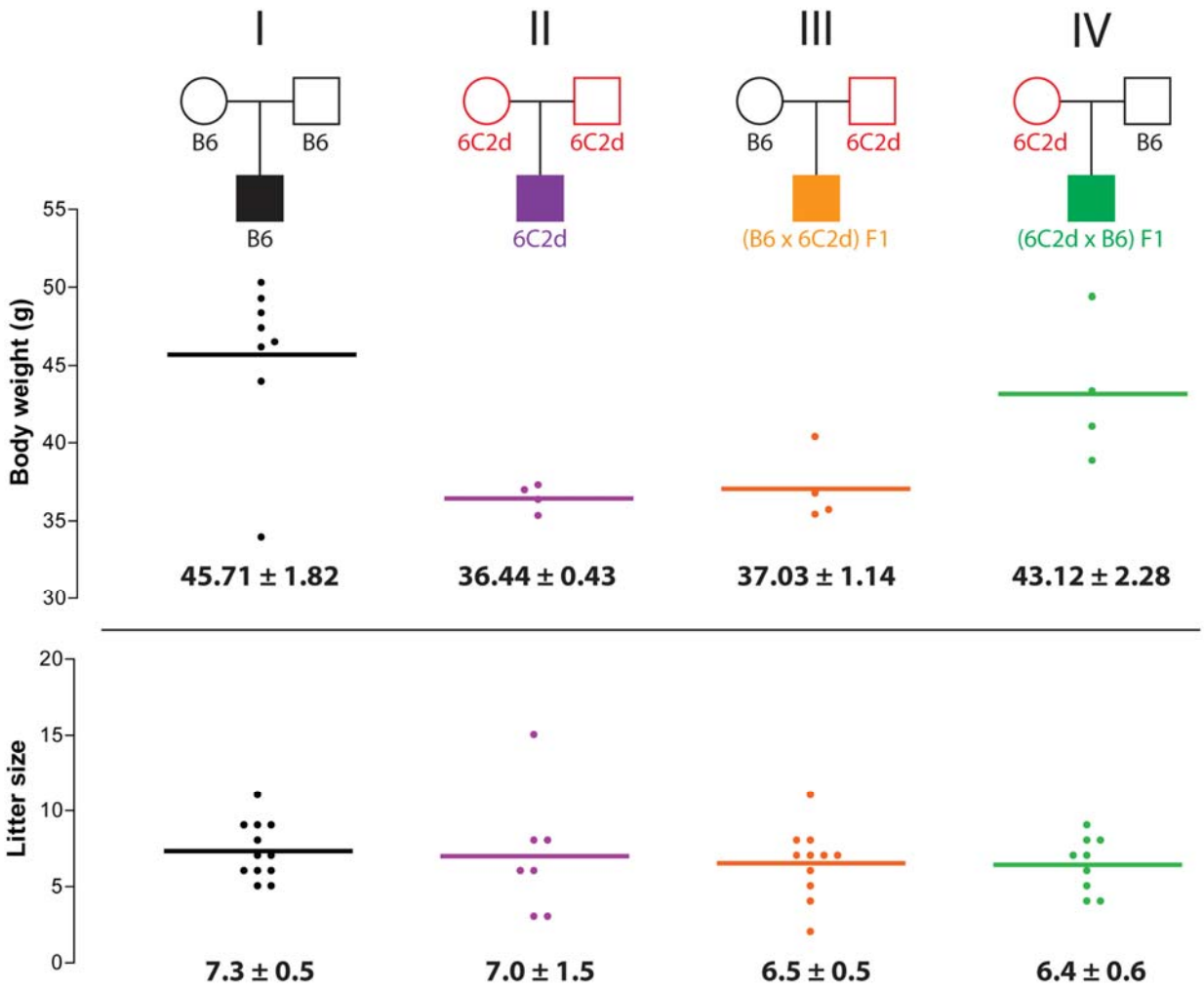
I
II
III
IV
B6
B6
6C2d
6C2d
B6
6C2d
6C2d
B6
B6
6C2d
(B6 x 6C2d) F1
(6C2d x B6) F1
Body weight (g)
55
50
45
40
35
30
45.71 ± 1.82
36.44 ± 0.43
37.03 ± 1.14
43.12 ± 2.28
Litter size
20
15
10
5
0
7.3 ± 0.5
7.0 ± 1.5
6.5 ± 0.5
6.4 ± 0.6

Fig. S1

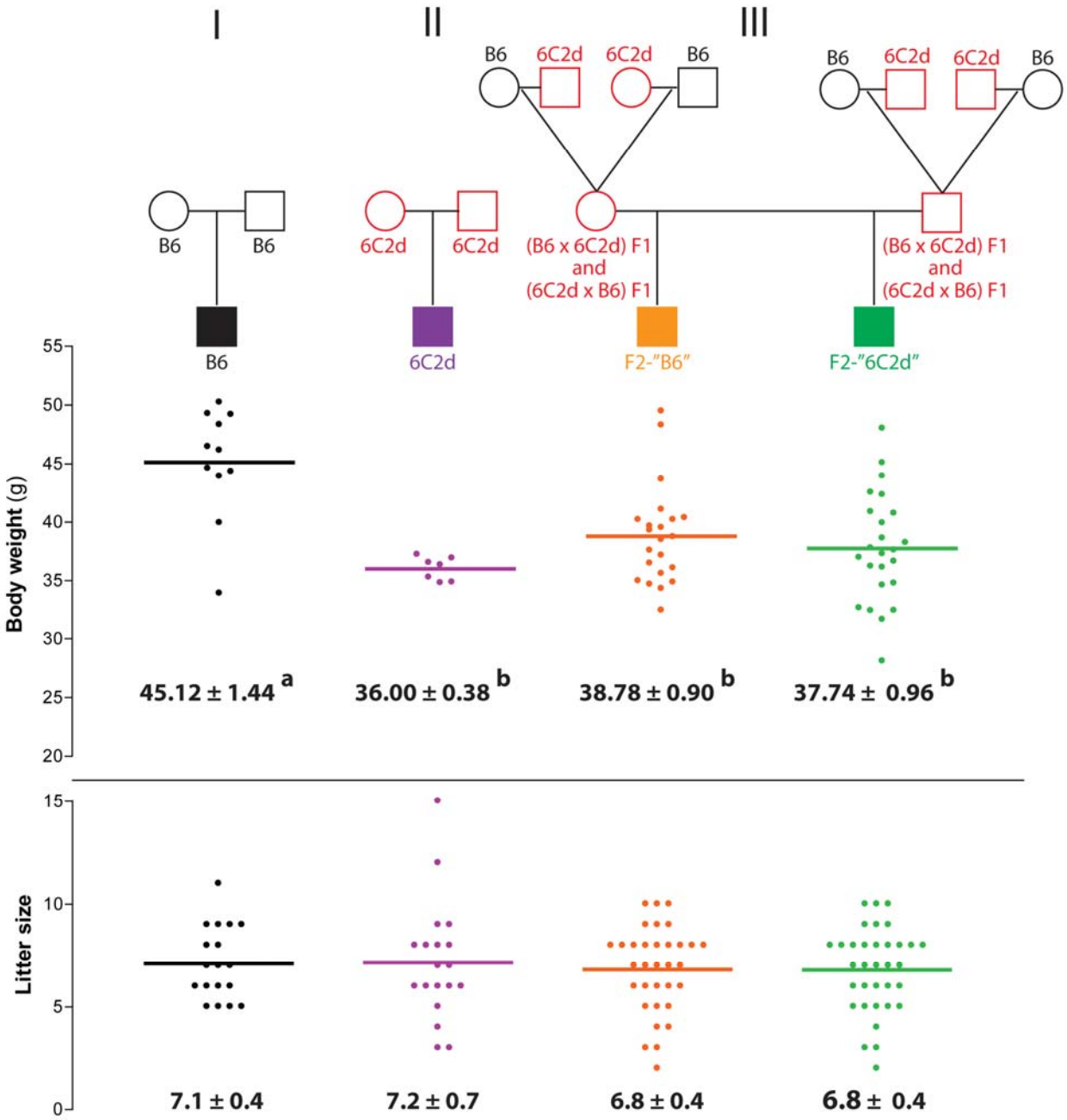
I
II
III
B6
B6
6C2d
6C2d
B6
6C2d
6C2d
B6
B6
6C2d
6C2d
B6
(B6 x 6C2d) F1
and
(6C2d x B6) F1
(B6 x 6C2d) F1
and
(6C2d x B6) F1
B6
6C2d
F2-"B6"
F2-"6C2d"
Body weight (g)
55
50
45
40
35
30
25
20
45.12 ± 1.44 a
36.00 ± 0.38 b
38.78 ± 0.90 b
37.74 ± 0.96 b
Litter size
15
10
5
0
7.1 ± 0.4
7.2 ± 0.7
6.8 ± 0.4
6.8 ± 0.4

Fig. S2

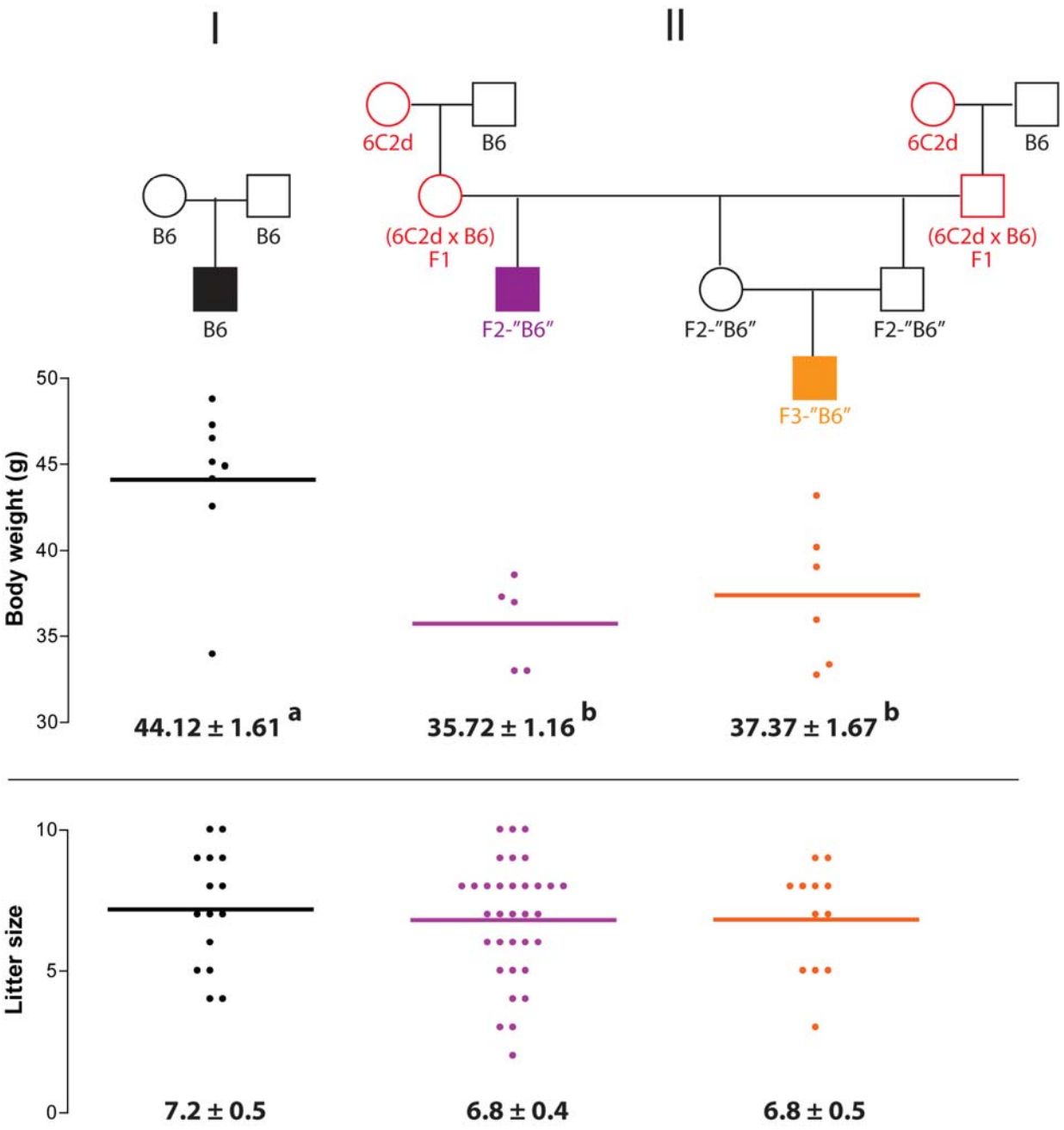
I
II
6C2d
B6
6C2d
B6
B6
B6
(6C2d x B6)
F1
(6C2d x B6)
F1
B6
F2-"B6"
F2-"B6"
F2-"B6"
F3-"B6"
Body weight (g)
50
45
40
35
30
44.12 ± 1.61 a
35.72 ± 1.16 b
37.37 ± 1.67 b
Litter size
10
5
0
7.2 ± 0.5
6.8 ± 0.4
6.8 ± 0.5

Fig. S3

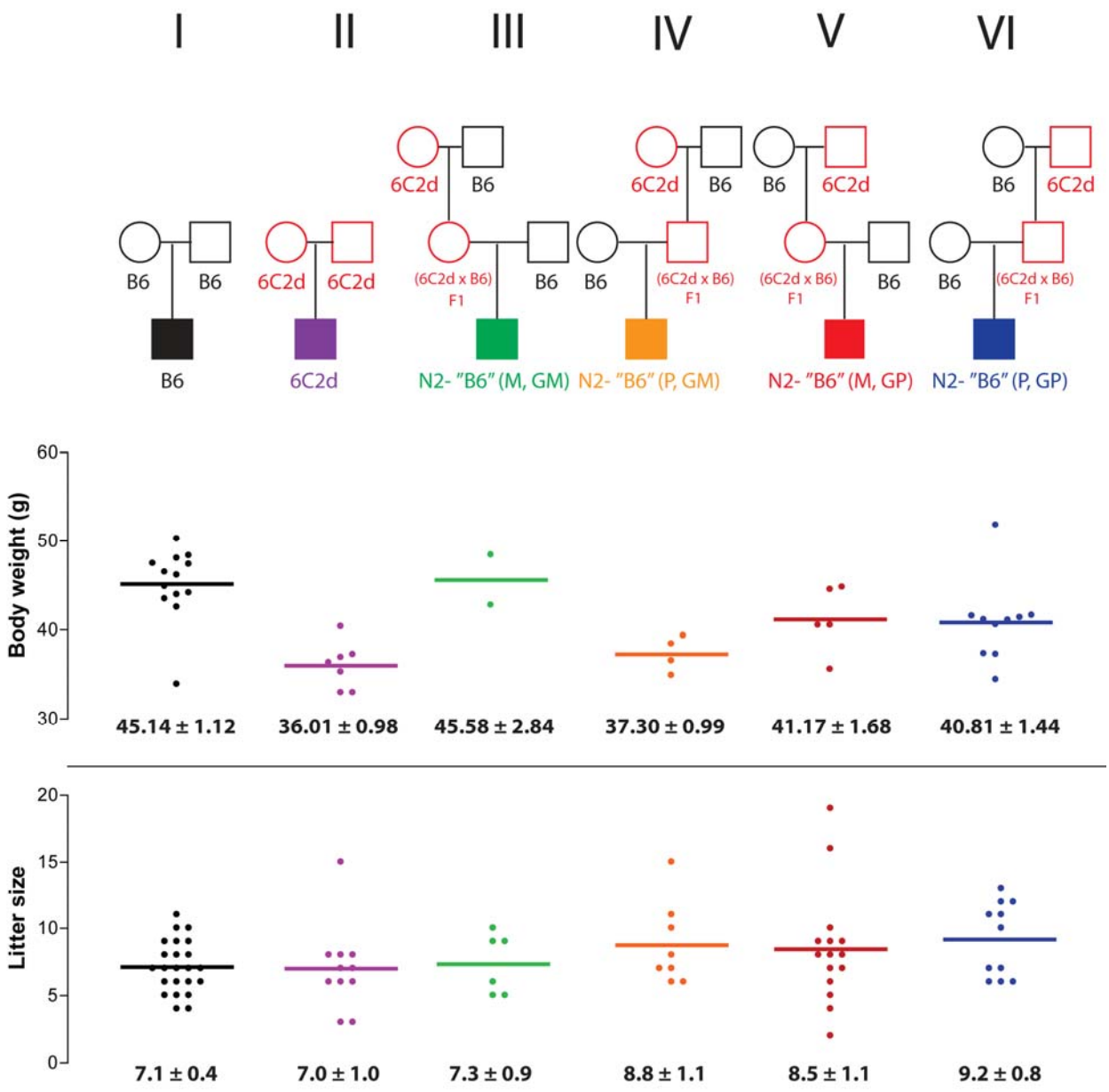
I
II
III
IV
V
VI
B6
B6
6C2d
6C2d
6C2d
B6
(6C2d x B6) F1
B6
6C2d
B6
(6C2d x B6) F1
B6
6C2d
(6C2d x B6) F1
B6
B6
6C2d
(6C2d x B6) F1
B6
B6
6C2d
N2- "B6" (M, GM)
N2- "B6" (P, GM)
N2- "B6" (M, GP)
N2- "B6" (P, GP)
Body weight (g)
60
50
40
30
45.14 ± 1.12
36.01 ± 0.98
45.58 ± 2.84
37.30 ± 0.99
41.17 ± 1.68
40.81 ± 1.44
Litter size
20
15
10
5
0
7.1 ± 0.4
7.0 ± 1.0
7.3 ± 0.9
8.8 ± 1.1
8.5 ± 1.1
9.2 ± 0.8

Fig. S4

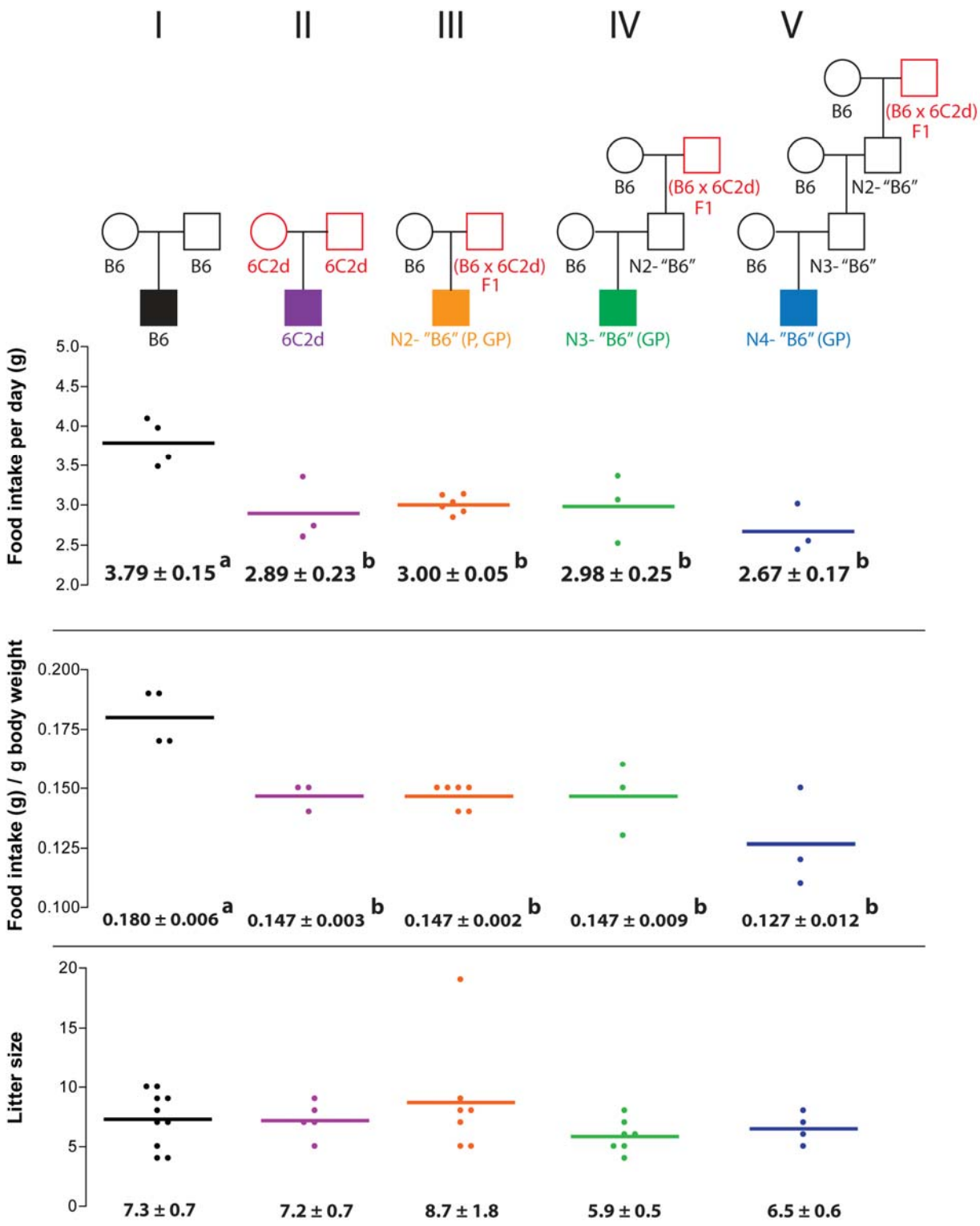
I
II
III
IV
V
B6
B6
6C2d
6C2d
B6
(B6 x 6C2d) F1
B6
N2-"B6"
B6
(B6 x 6C2d) F1
B6
N3-"B6"
B6
N2-"B6"
B6
6C2d
N2-"B6" (P, GP)
N3-"B6" (GP)
N4-"B6" (GP)
Food intake per day (g)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
3.79 ± 0.15 a
2.89 ± 0.23 b
3.00 ± 0.05 b
2.98 ± 0.25 b
2.67 ± 0.17 b
Food intake (g) / g body weight
0.200
0.175
0.150
0.125
0.100
0.180 ± 0.006 a
0.147 ± 0.003 b
0.147 ± 0.002 b
0.147 ± 0.009 b
0.127 ± 0.012 b
Litter size
20
15
10
5
0
7.3 ± 0.7
7.2 ± 0.7
8.7 ± 1.8
5.9 ± 0.5
6.5 ± 0.6

Fig. S5

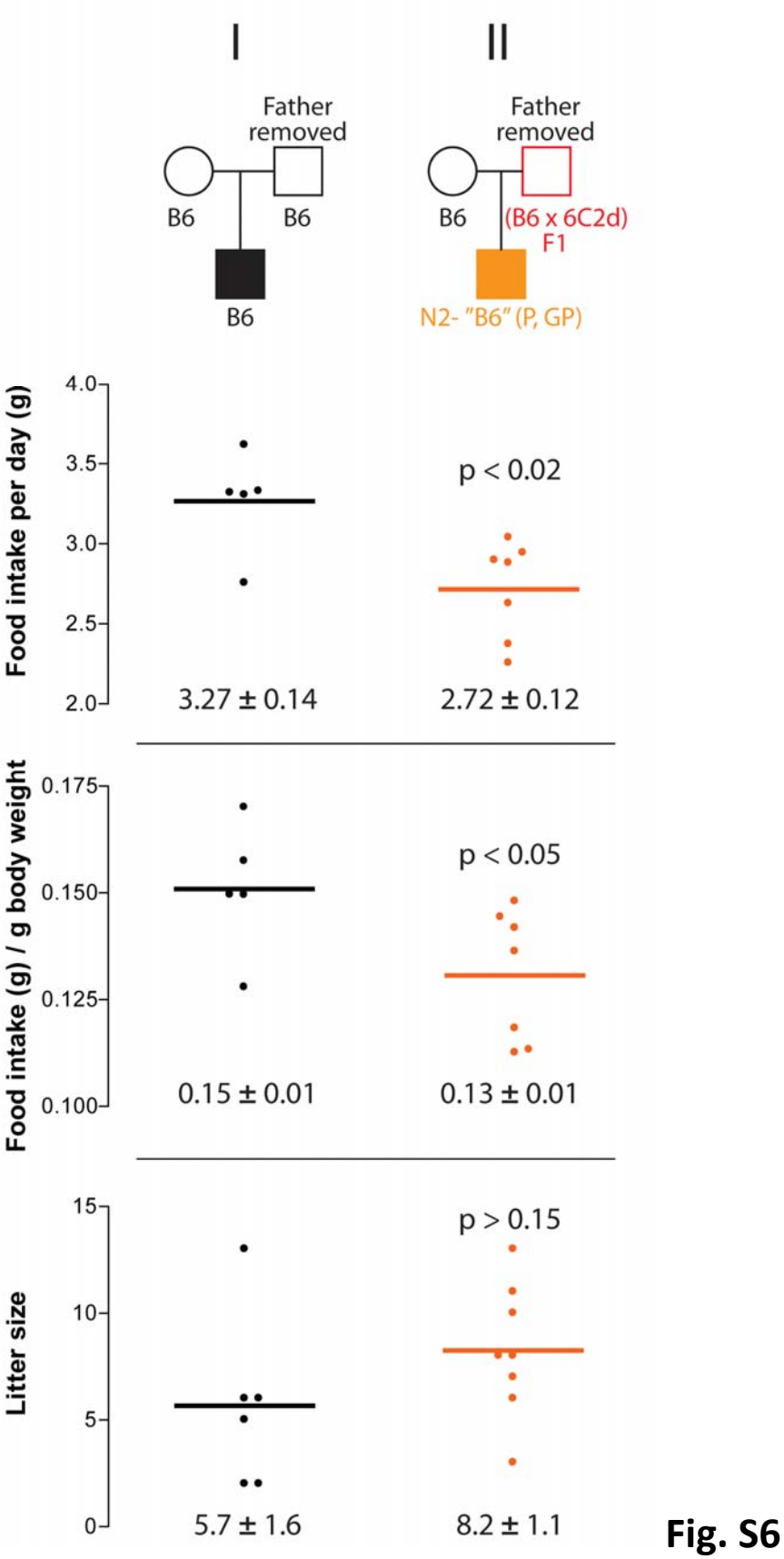
I
II
Father removed
B6
B6
B6
Father removed
B6
(B6 x 6C2d) F1
N2- "B6" (P, GP)
Food intake per day (g)
4.0
3.5
3.0
2.5
2.0
p < 0.02
3.27 ± 0.14
2.72 ± 0.12
Food intake (g) / g body weight
0.175
0.150
0.125
0.100
p < 0.05
0.15 ± 0.01
0.13 ± 0.01
Litter size
15
10
5
0
p > 0.15
5.7 ± 1.6
8.2 ± 1.1

Fig. S6

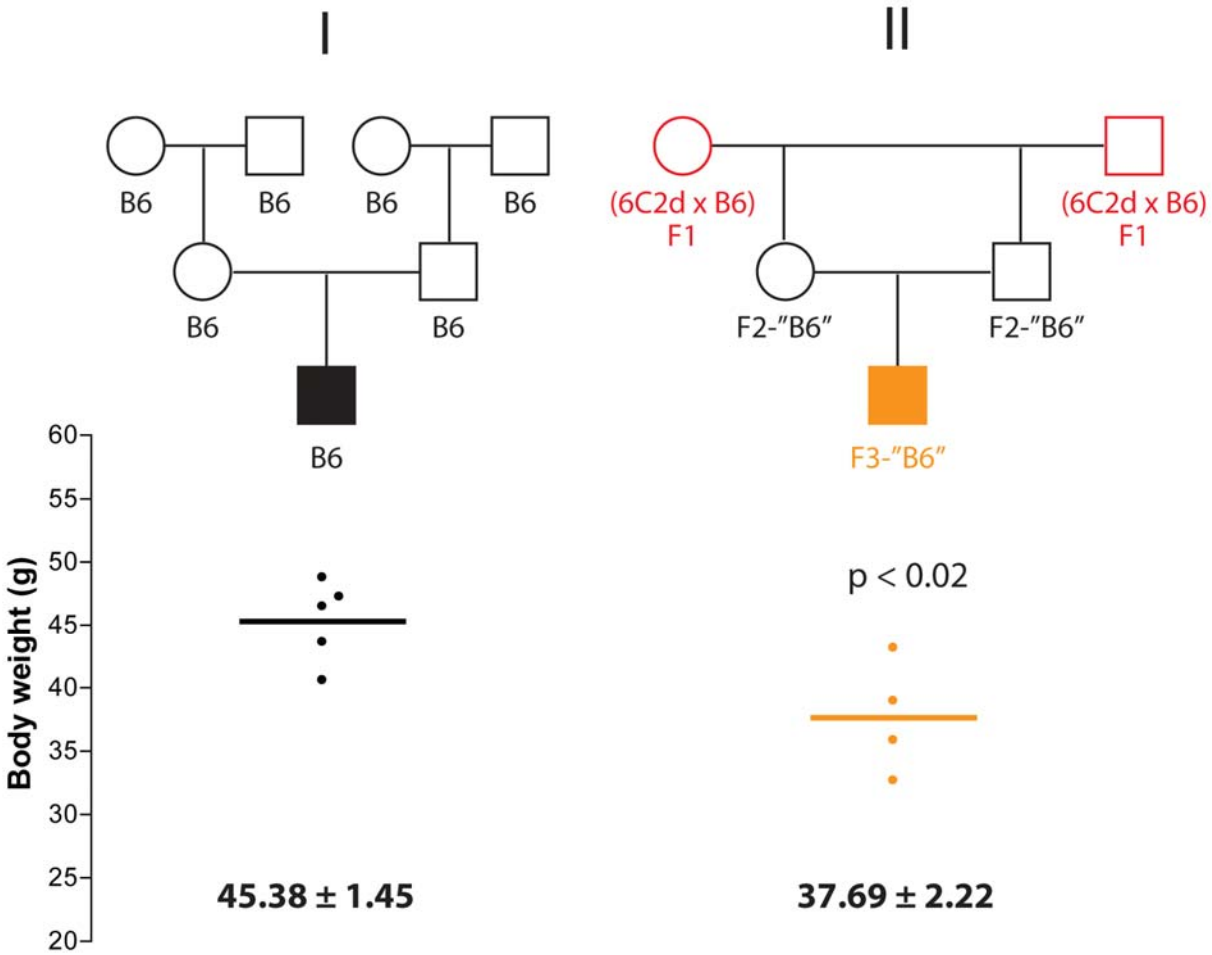
I
II
B6
B6
B6
B6
B6
B6
B6
(6C2d x B6)
F1
(6C2d x B6)
F1
F2-"B6"
F2-"B6"
F3-"B6"
Body weight (g)
60
55
50
45
40
35
30
25
20
p < 0.02
45.38 ± 1.45
37.69 ± 2.22

Fig. S7