Genetics of extreme body size evolution in mice from Gough Island

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Slides: bit.ly/stolaf2019
Gough Island
Gough Island
Gough Island
Big rodents
Big rodents
Big rodents
Gough mice
WSB and Gough mice
Leptin knockout
WSB and Gough mice
The Island Rule
Gough and WSB mice
Body weight

Males

<table>
<thead>
<tr>
<th>Week</th>
<th>Body weight (g)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>4</td>
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<td>8</td>
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Females

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<td>35</td>
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</table>
Growth rate

Males

Growth rate (g/week)

1 4 8 12 16

−1

0

1

2

3

4

5

GI

WSB

Females

Growth rate (g/week)

1 4 8 12 16

−1

0

1

2

3

4

5

GI

WSB
Partially-inbred Gough lines
Partially-inbred Gough lines
Partially-inbred Gough lines
Gough × WSB crosses
Gough × WSB crosses
Gough × WSB crosses
Gough × WSB crosses
Gough × WSB crosses
Growth curves

**Males**

Week | Body weight (g)
--- | ---
1 | 5 | 10 | 15
0 | 5 | 10 | 15 | 20 | 25 | 30 | 35

**Females**

Week | Body weight (g)
--- | ---
1 | 5 | 10 | 15
0 | 5 | 10 | 15 | 20 | 25 | 30 | 35
Growth curves

Males

Body weight (g)

Week

Females

Body weight (g)

Week

Gough

$F_2$

WSB
Growth rate

Males

Females

Week

Growth rate (g/week)

Week

Growth rate (g/week)
Growth rate

Males

Females

Week

Growth rate (g/week)

Week

Growth rate (g/week)
Growth rate

Males

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F 2
Gough
WSB

Females

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F 2
Gough
WSB
Genotypes

Chromosomes

Markers

Mice

Genotypes
Weight at 5 weeks vs genotype

UNC3333536 (Chr 2)

UNC14857054 (Chr 8)

UNC18857464 (Chr 10)
Genome scan
Permutation test

- genotype data
- markers
- phenotypes
- test statistics
- maximum test statistic
Permutation test
Histogram of permutation results

- Maximum LOD score
- Frequency
- Values range from 1 to 7
- Frequency ranges from 0 to 400
Genome scan for body weight
Genome scan for growth rate
Multiple genetic loci contribute to body size in Gough × WSB.

Gough alleles result in increased size.

The major effects are on growth rate in first five weeks.

Gray et al. (2015) Genetics 201:213–228
doi:10.1534/genetics.115.177790
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