Supporting Information

Barton and Capellini 10.1073/pnas.1019140108

SI Methods

Data Collection and Sources. Data are provided in Dataset S1. Continuous variables are expressed as logs except for litter size and milk composition variables (arc sine square root transformed). Sources and protocols were as follows:

- Neonatal brain and neonatal body mass (g), maternal body mass (g), gestation length (days), litter size, developmental state (altricial, 0 if eyes closed at birth; or precocial, 1 if eyes open at birth). Data collection, and sources are as described in Capellini et al. (1), with the following additions:
  - *Anmottagus lervia* (2, 3); *Antilope cervicapra* (3, 4); *Arctocebus calabarensis* (5); *Cricetulus barabensis* (4); *Cystophora cristata* (4); *Gerbillus pygmaudum* (4); *Lepilemur mustelinus* (5); *Leptonychotes weddellii* (4); *Lynx canadensis* (4); *Mastomys natalensis* (4); *Notomys alexis* (4); *Nyctalus noctula* (3); *Physeter catodon* (6); *Plecotus auritus* (4); *Potos flavus* (4); *Rupicapra rupicapa* (3); *Sigmodon hispidus* (4); *Stenella attenuata* (4); *Urocyon littoralis* (4).

- Adult brain masses (in g) were compiled from primary and secondary sources (3, 6–20). Postnatal brain growth and postnatal body growth were calculated as the difference between adult and neonate brain and body size, respectively. Lactation duration represented the age at weaning in days (21–23). Maternal investment duration calculated as gestation plus lactation. Milk composition data are from compilations in Oftedal (24, 25), Langer (23), and their primary references (26–39). Milk composition varies throughout lactation (24), so we followed the protocol of Oftedal and Iversen (25) and standardized the dataset by considering only data that were obtained at peak (mid-) lactation and for a sample of at least three females. We used the formula of Perrin (40) to calculate milk energy content as follows:

\[
\text{Total gross energy} \ (\text{MJ}/100g) = (39.8 \times \%\text{fats}) + (23.9 \times \%\text{proteins}) + (16.7 \times \%\text{sugars})
\]

Milk intake (g/d) (41–50), age at first reproduction (21), and lifespan (51) were as previously described. Juvenile period was calculated as age at first reproduction minus duration of lactation. Adult lifespan was calculated as lifespan minus age at first reproduction. BMRR and body size of individuals from which BMR estimates obtained (52–55). We used only estimates of BMR that fulfilled the requirements of the protocol described in McNab (measurement in thermoneutral environment, on adult non-reproducing individuals, quietly resting and postabsorptive) (56).

Statistics. Use of residuals versus multiple regression. A methodological issue in several previous studies is the use of residuals as data in multiple regression analyses. Often, the effects of confounding variables (e.g., body size) are removed from brain size and life history variables by regression before examining the inter-relationships between those variables (57–63). Although this has sometimes been done with the laudable aim of using indepen-
30. Oftedal OT, Hauschka SP, Seier J (1999) Milk composition of captive vervet monkey (Chlorocebus pygerythrus) and rhesus macaque (Macaca mulatta) with observations on gorilla (Gorilla gorilla gorilla) and white handed gibbon (Hylobates lar). Comp Biochem Physiol 1528:332–338.
46. Oftedal OT, Hauschka SP, Seier J (1999) Milk composition of captive vervet monkey (Chlorocebus pygerythrus) and rhesus macaque (Macaca mulatta) with observations on gorilla (Gorilla gorilla gorilla) and white handed gibbon (Hylobates lar). Comp Biochem Physiol 1528:332–338.
### Table S1. Additional PGLM analyses of relationship between postnatal brain growth (dependent variable) and milk composition and daily intake

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Model 1 (n = 48)</th>
<th>Model 2 (n = 48)</th>
<th>Model 3 (n = 48)</th>
<th>Model 4 (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>−6.67 (&lt;0.001)</td>
<td>−8.28 (&lt;0.001)</td>
<td>−3.45 (&lt;0.01)</td>
<td>−5.42 (&lt;0.001)</td>
</tr>
<tr>
<td>Postnatal body growth</td>
<td>12.90 (&lt;0.001*)</td>
<td>13.65 (&lt;0.001*)</td>
<td>12.85 (&lt;0.001*)</td>
<td>2.53 (&lt;0.05*)</td>
</tr>
<tr>
<td>Lactation</td>
<td>4.21 (&lt;0.001*)</td>
<td>4.21 (&lt;0.001*)</td>
<td>4.22 (&lt;0.001*)</td>
<td>2.28 (&lt;0.05*)</td>
</tr>
<tr>
<td>Fat, %</td>
<td>—</td>
<td>0.95 (&gt;0.1)</td>
<td>1.01 (&gt;0.1)</td>
<td>—</td>
</tr>
<tr>
<td>Protein, %</td>
<td>—</td>
<td>−0.67 (&gt;0.1)</td>
<td>−0.38 (&gt;0.5)</td>
<td>—</td>
</tr>
<tr>
<td>Sugar, %</td>
<td>—</td>
<td>—</td>
<td>0.43 (&gt;0.5)</td>
<td>—</td>
</tr>
<tr>
<td>Milk energy value</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.32 (&gt;0.5)</td>
</tr>
<tr>
<td>Milk daily intake</td>
<td>−0.04 (&gt;0.5)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>λ</td>
<td>0.15</td>
<td>0.14</td>
<td>0.13</td>
<td>0.01</td>
</tr>
<tr>
<td>P value (λ = 0)</td>
<td>&gt;0.5</td>
<td>&gt;0.5</td>
<td>&gt;0.1</td>
<td>&gt;0.5</td>
</tr>
<tr>
<td>P value (λ = 1)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Model summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximized log-likelihood</td>
<td>0.77</td>
<td>0.52</td>
<td>0.87</td>
<td>−0.46</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.92</td>
<td>0.92</td>
<td>0.91</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Variables not included in a particular model are indicated by dashes. λ is the estimated ML value of the phylogenetic signal, included as a parameter in the models, with P values for tests of statistical difference from a model with no phylogenetic signal (λ = 0) and a model with a λ of 1.

*Significant predictors of postnatal brain growth.

### Other Supporting Information Files

Dataset S1 (XLSX)