Rostral Hypothalamic Fetal Transplants Reduce Activity-Based Anorexia in Rats with Lesions Aimed at the Suprachiasmatic Nucleus

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There is considerable interest in the relationship between exercise and anorexia nervosa /1/. For this reason, we have been exploring a self-induced weight loss phenomenon in the rat that is exercise dependent. The phenomenon has been known for 30 years /2/ and is now called activity-based anorexia (ABA) /3/. It is produced by placing rats on a restricted feeding schedule with voluntary access to activity wheels. Compared to rats simply placed on restricted-feeding schedules, ABA rats progressively lose body weight and increase running. We have found that a disruption of light entrainable circadian rhythms with constant bright illumination or suprachiasmatic (SCN) lesions increases vulnerability to ABA /4/. The purpose of this investigation was to determine if fetal rostral hypothalamic transplants mitigate the effect of SCN lesions on susceptibility to ABA.

The subjects were 26 adult male Sprague-Dawley rats. They were housed in a vivarium with a 12:12 h L/D cycle. Water was freely available. All rats were given SCN lesions. They were then given either two rostral hypothalamic (RH) fetal transplants (embryonic ages 16-18) or equal-sized fetal cortical transplants. Transplantation was performed immediately after electrolytic lesions (1 mA for 15 seconds) aimed at the SCN. All rats were subjected to ABA 30 days after surgery. The conditions were 1.5 h/day Purina chow access and 22.5 h/day running wheel access. Susceptibility to ABA was defined as the number of days necessary to reach a 25±1.5% weight loss criterion.

It was found (Table 1) that rostral hypothalamic transplants reduced the incidence of ABA during the first 10 days of the protocol. The RH transplanted group also had more animals that were resistant to ABA across the 35-day experimental period. The increased resistance was associated with increased food intake; terminal wheel revolutions did not differ.

This investigation demonstrates that RH fetal transplants mitigate the effect of lesions aimed at the suprachiasmatic nucleus on ABA and do so by attenuating the anorexia. We are currently evaluating vasopressin immunoreactive parvicellular neurons as an index of SCN transplantation. Nonetheless, this investigation demonstrates that rostral hypothalamic tissue is sufficient to lessen the effects of brain damage on susceptibility to ABA. In addition, this investigation provides further evidence that a disruption of light entrainable circadian rhythms increases vulnerability to self-induced weight loss syndrome that is exercise dependent.

ACKNOWLEDGEMENTS

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REFERENCES

Table 1. Incidence of animals reaching the activity-based anorexia (ABA) weight-loss criterion in 10 days, incidence of animals resistant to ABA across the entire 35-day protocol and mean(±SE) terminal food intake and wheel turns for the cortical and rostral hypothalamic (RH) transplant groups.

<table>
<thead>
<tr>
<th></th>
<th>Cortical Transplant</th>
<th>RH Transplant</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABA during first 10 days</td>
<td>9/13 (69%)</td>
<td>4/13 (31%)</td>
<td><em>P</em>&lt;.05</td>
</tr>
<tr>
<td>Resistant to ABA</td>
<td>0/13 (0%)</td>
<td>4/13 (31%)</td>
<td><em>P</em>&lt;.01</td>
</tr>
<tr>
<td>Food Intake</td>
<td>9.6±0.7</td>
<td>12.7±1.0</td>
<td><em>P</em>&lt;.022</td>
</tr>
<tr>
<td>Wheel Turns</td>
<td>1,234±261</td>
<td>1,607±342</td>
<td>n.s.</td>
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