BRIEF COMMUNICATION

Ovariectomy Fails to Affect Rats' Quinine Aversion

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(Received 2 April 1975)

HIRSCH, S. M. AND P. M. BRONSTEIN. Ovariectomy fails to affect rats' quinine aversion. PHYSIOL. BEHAV. 16(3) 375-377, 1976. - Three studies investigated the effects of ovariectomy on the intake of quinine solutions. Despite significant elevations of body weight due to surgery, no change in quinine preference was noted. Varying the age of surgery (puberty, postpuberty, and adulthood), age of testing, and time between these events did not alter the basic findings.

<table>
<thead>
<tr>
<th>Quinine aversion</th>
<th>Ovariectomy</th>
<th>Taste preferences</th>
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</thead>
</table>

REMOVAL of a rat's ovaries results in an elevation of the animal's body weight [6, 7, 8]; however, the mechanism by which ovarian secretions influence body weight is unclear. It has been suggested [7, 8, 9] that central nervous system areas exist which maintain bodyweight regulation by monitoring both a lipostatic set point as well as factors resulting in deviations from this equilibrium. Thus, it has been hypothesized that ovariectomy raises the set point of a hypothalamic lipostat with this perturbation causing postsurgery increases in feeding and body weight.

Stating a theory not necessarily incompatible with the set point model, Marks and Hobbs [6] have shown that ovariectomy leads to a generalized reduction in rat's stimulus reactivity. The lowered sensitivity to quinine following the removal of ovaries [6,10] supports this position, and the postsurgery increase in eating may also be due to this change in reactivity. Recently however, several investigators have failed to replicate some of these results. Gale [1] and Kaestner [3] both were unable to demonstrate any change in the intensity of a rat's quinine aversion as a function of ovariectomy. These discrepant data call into question the hypothesis that overeating following the removal of ovarian tissue is a result of an alteration in the rat's oral sensitivity or reactivity.

The current paper reports 3 studies wherein quinine sensitivity was assayed following ovariectomy. These experiments were performed in order to replicate, if possible, the findings of Marks et al. [6], hence, to further determine whether sensitivity to tastes varies following the surgery.

METHOD

Animals
The animals for all studies were female albino rats of Sprague-Dawley descent born and reared in the Brooklyn College colony. Each experiment consisted of a group of experimental animals which underwent bilateral ovariectomy following anesthetization with Equi-Thesin. Sham operated rats were also used in every investigation. These animals experienced the same surgical procedures as the OVEX groups, except that ovaries were exposed with forceps and replaced before suturing. Furthermore, OVEX rats had become significantly heavier than the SHAMs prior to any quinine administration.

Each rat was maintained in an individual cage with ad lib Purina lab chow and water. The colony room was heated to approximately 22°C with bright, overhead lighting provided 18 hrs/day (8 a.m. to 2 a.m.).

Procedure
One-bottle tests were employed in all studies. During test periods, each animal's water bottle was removed and replaced with a bottle of quinine laced solution. The concentrations of quinine hydrochloride along with other experimental details are noted in Table 1. The different test solutions were always presented in order of ascending concentration with 2 days of ad lib water preceding each exposure to quinine. Test periods were 48 hr long in Experiment 3 and lasted for 24 hr in the other studies. In the first study distilled water was offered between tests as well as in the quinine mixtures, while in Experiments 2
TABLE 1
EXPERIMENTAL DESIGNS

<table>
<thead>
<tr>
<th>GROUP</th>
<th>n</th>
<th>Age at surgery</th>
<th>Age at start of testing</th>
<th>Mean body weight at start of testing ± SEM</th>
<th>Concentration*</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP 1 SHAM</td>
<td>6</td>
<td>22</td>
<td>125</td>
<td>277.99 ± 12.09</td>
<td>0.005, 0.01, 0.05, 0.1, 0.25</td>
</tr>
<tr>
<td>OVEX</td>
<td>5</td>
<td>22</td>
<td>125</td>
<td>357.54 ± 14.83</td>
<td></td>
</tr>
<tr>
<td>EXP 2 SHAM</td>
<td>10</td>
<td>125</td>
<td>163</td>
<td>361.60 ± 12.43</td>
<td>0.01, 0.025, 0.05</td>
</tr>
<tr>
<td>OVEX</td>
<td>5</td>
<td>125</td>
<td>163</td>
<td>400.43 ± 12.46</td>
<td></td>
</tr>
<tr>
<td>EXP 3 SHAM</td>
<td>13</td>
<td>50</td>
<td>85</td>
<td>260.56 ± 7.85</td>
<td>0.01, 0.025, 0.05</td>
</tr>
<tr>
<td>OVEX</td>
<td>13</td>
<td>50</td>
<td>85</td>
<td>302.83 ± 7.10</td>
<td></td>
</tr>
</tbody>
</table>

*Grams of quinine hydrochloride per liter of solution (e.g. 0.01g/1 = 0.001%).

and 3, tap water (with quinine added on test days) was used throughout.

Bottles were weighed (to 0.01g) every 24 hr to determine each animal's liquid intake. Using these measures, a suppression ratio as defined by Marks et al. [6] was calculated: The weight of quinine solution drunk was subtracted from the weight of the previous day's water ingestion, and this difference was then divided by the water intake during the pretest day. In Experiment 3, where 2 consecutive days of exposure to quinine were used, the average daily intake during testing was compared to the drinking on the day prior to the presentation of quinine solutions. Food intake was also measured in the third study.

RESULTS AND DISCUSSION

Level of statistical significance was set at 0.05 and two tailed tests were used throughout, with the main results depicted in Fig. 1.

In each experiment reliable suppression of quinine consumption was noted at concentrations of 0.005% (0.05g/I) and above. Independent t tests established that suppression was greater than zero at these higher concentrations. Furthermore, a significant reduction of quinine drinking appeared when a 0.0025% solution was used in Experiment 3. However, there were no reliable differences between OVEX and SHAM animals during presentation of any concentration of the test substance in any of 3 studies.

Food suppression ratios in Experiment 3 were calculated using the same formula as employed in determining the relative effect of quinine on drinking; food cups were weighed daily. A reliable decrement in the eating of both groups accompanied the presentation of 0.0025% and 0.005% solutions. During presentation of the 0.005% quinine solution the SHAMs ate significantly less food than the OVEX rats; the former reduced their ingestion of Purina by approximately 19% as compared with a 6% decrement in eating among the OVEX animals.

All 3 experiments failed to show OVEX animals to be disposed any differently to quinine solutions than were the SHAMs. Only the changes in eating during Experiment 3 remotely support the sensitivity change hypothesis. Hence, the current results add to the growing body of evidence [1,3] indicating that ovariectomy increases body weight without reducing the aversiveness of bitter substances. Recent evidence [4,5] also casts uncertainty on the claim [11] that ovariectomy alters a rat's gustatory sensitivity to saccharin. Furthermore, Jennings [2] has shown that taste preferences may not vary as a function of estrous cyclicity, and Kenney [4] has suggested that both the larger meal size and the weight gain following ovariectomy results not from changes in taste sensitivity but from interruption of postingestive satiety mechanisms.

The bulk of the evidence of which we are aware indicates that the hyperphagia of ovariectomized rats occurs without the increased gustatory finickiness associated with hyperphagia brought on by lesions of the ventromedial hypothalamus.
REFERENCES


