BRIEF COMMUNICATION

Differential Effects of Quinine and Sucrose Octa Acetate on Food Intake in the Rat

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KRATZ, C. M., D. A. LEVITSKY AND S. LUSTICK. Differential effects of quinine and sucrose octa acetate on food intake in the rat. PHYSIOL. BEHAV. 20(5) 665-667, 1978. - Twenty-seven adult female rats were fed chow diets containing quinine sulfate, sucrose octa acetate, or alphacel. Quinine produced a greater, more prolonged depression of food intake than did SOA. Quinine also resulted in loss of body weight.

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<th>Quinine</th>
<th>Sucrose octa acetate</th>
<th>Taste</th>
<th>Food intake</th>
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QUININE has long been used in feeding studies to assess the contribution of oral factors to control of food intake; the choice of quinine as a dietary adulterant is based on the characteristic bitter taste of this substance. Miller, Bailey and Stevenson [5] reported that the addition of quinine to a chow diet caused a significant reduction in food consumption of rats and suggested that palatability is a major determinant of food intake in animals. Since then, several investigators have confirmed the suppression of food intake by quinine adulteration in the rat [1, 2, 3, 7, 9].

The implicit assumption in these studies is that the anorexia that occurs upon introduction of quinine is attributable to the aversive taste of this compound. Since quinine also produces a broad spectrum of systemic effects [8], it is possible that some of these other factors may contribute to the quinine-induced anorexia.

Sucrose octa acetate, like quinine, is an unpleasant tasting substance. It tastes bitter to humans and produces aversion in rats in food preference tests (Kratz, unpublished data). Unlike quinine, which is fatal at high doses in animals [6] and has widespread physiological effects at lower doses, prolonged ingestion of sucrose octa acetate seems to be without pathological effects [4]. The purpose of the following study was to compare the effects of equally aversive doses of sucrose octa acetate and quinine on food intake and body weight. It was expected that if the effects of quinine on food intake and body weight are directly attributable to its unpalatable taste, then sucrose octa acetate should produce identical results.

METHOD

Animals

Twenty-seven adult female Sprague-Dawley rats served in this experiment; body weights ranged from 219 to 332 g. These animals had previously been used in an experiment studying the relationship between quinine-induced anorexia and body weight.

Procedure

Before initiating administration of SOA on a chronic basis, it was first necessary to equate quinine and SOA on the basis of palatability. This was accomplished by testing animals in a 20 min preference test following 6 hr of food deprivation. One cup of ground chow was adulterated with .75% quinine sulfate, while the other contained various concentrations of sucrose octa acetate (SOA), ranging from 0.1% to 6%. A 4% concentration of SOA was found to be ingested to the same extent as the .75% quinine sulfate, and was selected for use in the following experiment.

Group 1 served as the control group and received powdered chow. Group 2 was fed the chow adulterated with .75% quinine sulfate. Group 3 was given the chow diet adulterated with 4% SOA. A fourth group received the powdered chow adulterated with 4% cellulose (Alphacel). The purpose of this group was to control for the effects of caloric dilution induced by the addition of SOA to Group 3, and to assess the effect of the introduction of a novel adulterant.
RESULTS

The results show quantitatively different effects of quinine and SOA dilution. Adulteration of food supply with either quinine or SOA resulted in a significant depression in food intake on the first day of treatment. However, the anorexia was far greater with quinine adulteration than with SOA (see Fig. 1). Moreover, 24 hr food intake of the SOA adulterated diet returned to control levels by the second day, whereas approximately one week was necessary for the food intake of the quinine animals to recover.

Another difference between SOA and quinine adulteration can be seen in Fig. 2. This figure shows the amount of food spilled from the food cup. The addition of SOA or
DIFFERENTIAL EFFECTS OF QUININE

Quinine to the food supply caused an immediate increase in food spillage. However, the spillage of the animals receiving SOA returned to control values by the third day, whereas the spillage of the quinine fed animals persisted throughout the period of treatment. Finally, a third difference in the effect of quinine and SOA adulteration can be seen in Fig. 3.

Quinine adulteration produced a prolonged depression in body weight that persisted (for several days) longer than the anorexia. On the other hand, the addition of SOA to the food supply produced only a one day depression in body weight. Neither the introduction of a novel taste nor diluting the food supply with 4% cellulose had any effect on food intake or body weight during the course of the experiment.

DISCUSSION

The results from this study show quite clearly that the behavioral effect of adulteration of the food supply with quinine is quite different from that seen with SOA. Both substances produce aversion in brief exposure tests of food preference. However, when matched for aversiveness, the two substances display differential effects on long term food intake and body weight. This suggests that the effects which occur with quinine may not be attributable to its sensory properties alone. Although SOA is generally assumed to be physiologically benign [4], very little is actually known about its physiological effects or metabolism; quinine, on the other hand, is universally recognized as a potent pharmacologic agent with numerous systemic and central effects. Because of the nature of the present experiment and the limited knowledge about the fate of SOA, it is not possible to elucidate the mechanism through which quinine exerted its chronic behavioral changes and produced weight loss. However these results indicate that caution should be exerted when interpreting experiments in which quinine has been used as a food adulterant.

REFERENCES