Some Determinants of Intake of Glucose + Saccharin Solutions

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SMITH, J. C. AND D. F. FOSTER. Some determinants of intake of glucose + saccharin solutions. PHYSIOL. BEHAV. 25(1) 127–133, 1980.—In the present three experiments, tests were run to see if postigestional factors played a role in the excessive drinking elicited by the combination of 3% glucose and 0.125% saccharin solutions. The first experiment showed a marked increase in the total daily caloric intake and a decrease in the proportion of calories taken from the food when the glucose + saccharin (G+S) solution was presented to rats. In spite of this alteration of diet induced by G+S drinking, Experiment 2, which compared the drinking of various concentrations of glucose solutions and G+S solutions, demonstrated that the rat drinks these large quantities of the G+S solution for taste, not calories. The final experiment compared preference tests on various concentrations of saccharin, glucose or G+S solutions and showed that preference data across concentrations of G+S were qualitatively similar to the saccharin preference data, and different from the glucose data, even though it was the amount of glucose in the concentrations that was manipulated.

<table>
<thead>
<tr>
<th>Glucose</th>
<th>Saccharin</th>
<th>Preference</th>
<th>Fluid intake</th>
<th>Food intake</th>
<th>Taste</th>
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</table>

WHEN offered a combination of saccharin and glucose in solution, the laboratory rat consumes exceedingly large quantities over a 24-hour period. Valenstein, Cox and Kakolewski [6] described this excessive drinking as a polydipsia elicited by the synergistic action of saccharin and glucose. In their study, using a mixture of 1.25 g (or 2.50 g) of sodium saccharin, 30 g glucose and a liter of distilled water, they found that rats increased intake by an order of magnitude over baseline water intake, with some rats exceeding their own body weight in daily consumption. In a more detailed analysis of the glucose + saccharin (G+S) drinking, Smith, Castonquay, Foster and Bloom [3] reported that rats neither licked the solution at a greater rate than water nor consumed more fluid per lick, and they only slightly increased the number of drinking episodes initiated. Their data indicated that the most important determinant of the way a rat drinks G+S as compared to water is that drinking bouts, once initiated, continue approximately four times longer than water drinking bouts.

Valenstein et al. [6] found that the rats exhibit an almost immediate preference for the G+S solution, a finding that would not be expected if some polyuric or postigestional feedback were the underlying cause of this copious drinking. They found that non-deprived rats consumed an average of 10.3 ml of G+S during the first 30 min of access to the fluid. Similarly treated rats consumed less than one ml of H2O during a comparable period. They concluded that the G+S mixture had a minimum of postigestional factors and that it was probably consumed largely on the basis of its palatability. In a more recent study, Smith, Williams and Jue [5] by measuring individual licks found that in mildly deprived rats the rate of drinking G+S in the first two to three minutes after initial contact exceeded the rate observed for either a glucose or a saccharin solution. Furthermore, Smith et al. [5] demonstrated that some of the rats would rapidly alternate drinking from glucose to saccharin if the two solutions were presented in separate bottles.

While all of the above experiments suggest that the rat initiates drinking of the G+S solution because of its taste, the effect on G+S drinking of variables that typically play a role in feeding and drinking (e.g., calories) is not known. In order to understand why the rat regulates its intake in preference tests involving a nutritive sweeter Collier and Bolles [2] have stressed the importance of measuring the total daily caloric intake. They reported that as the concentration of the sugar solutions was increased, the calories taken from the sweeterened solutions also increased. Conversely, the calories taken from the ad lib laboratory chow decreased as the concentration of the sugar increased. Although these effects resulted in a relatively constant total daily caloric intake, the caloric feedback from the sweet solution to a large extent determines the quantity consumed.

When a rat drinks 200–300 ml of G+S solution in 24 hours, it is taking 25–35 calories from the fluid, assuming 4 cal/g of glucose. Since no measurements of fluid intake have been made from rats drinking G+S it is not possible to assess if total caloric intake is altered or if calories possibly play any role in explaining the excessive G+S drinking. If total daily caloric intake does not increase when a rat is switched from H2O drinking to G+S drinking, then a reduction of calories from the laboratory chow is inevitable. It is possible that as much as 30% of the daily calories could come from the G+S

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2Reprint requests should be sent to the first author.
solution, resulting in a change in overall nutritional balance, which could in turn affect the quantity of solution consumed. The purpose of Experiment 1 was to see if the introduction of the G+S solution to the rat’s daily diet significantly alters the total caloric intake. By measuring both the daily food and G+S intake the proportion of calories taken from each can be observed. If G+S drinking does markedly change the nature of the rats caloric intake, then it is possible that this longer term post-ingestional influence in some manner contributes to the sustained and excessive drinking of G+S.

**EXPERIMENT 1**

**METHOD**

**Subjects**

The subjects were six male albino rats (CD strain, Charles River Breeding Laboratories) weighing a mean of 499 g at the start of testing. The animals were housed in Hoeltge HB 12A cages with food tunnels. These tunnels were equipped with crumb trays to retrieve spilled food. Ground Purina Chow and water were available at all times throughout testing. The animal room was on a 12/12 hr light/dark cycle.

**Procedure**

For six days, ad lib food and water intake were measured at approximately 1000 hours, three hours after the light onset. During this baseline period the rats had access to two bottles containing water. The water bottles and food cups were emptied, cleaned and refilled daily.

For the next five days, one of the water bottles was replaced with a bottle containing a G+S solution. The solution was made daily by mixing the following: 30 g of Dextrose, 1.25 g of sodium saccharin, and one liter of tap water. The solution was stored over night in a refrigerator before use. The G+S solution was at room temperature when placed on the cages.

**RESULTS**

For the six days of the baseline period the mean food intake was 20.6 g of the Purina Chow or a daily average of 74.3 calories. The average daily water intake was 47.5 ml.

During the next five days the average daily food intake dropped to 17.9 g, a significant reduction from the baseline level (matched t(5)=3.15, p<0.05). The daily intake of water dropped to an average of 4.4 ml and the average daily intake of the G+S was 258 ml, a fivefold increase over baseline water intake.

During the G+S phase, the average caloric intake from the Purina Chow was 64.3 (3.6 calories/g of chow), while 30.1 calories came from the G+S solution, yielding a total average caloric intake of 94.4, a 27% increase from the baseline level of 74.3 calories. This increase was significant with a matched t-test, t(5)=5.03, p<0.01.

**DISCUSSION**

These data show that introduction of the G+S solution into the rats daily diet results in a significant increase in total daily caloric intake and a significant decrease in the caloric intake from the laboratory chow. The nutritional balance of the rat’s diet is slightly altered. Although these data show no role for post-ingestional factors in the G+S drinking, they allow the possibility that the maintenance of the excessive G+S drinking may not be totally due to oral cavity inputs.

If one compares drinking of the standard G+S solution in a group of rats with drinking of glucose 3% alone in a comparable group, the average daily G+S drinking exceeds the glucose drinking by about 150 ml [6]. While there is much evidence to infer that G+S merely “tastes good” to the rat [5,6] data from Experiment 1 show that there is a small, but significant alteration in caloric intake when the rat drinks G+S. This presumably results from the caloric feedback from the glucose in the solutions. It seems possible that this feedback could play some role in the factors which determine the cessation of the long drinking bouts which occur during G+S drinking. One hypothesis for explaining the excessive G+S drinking would be that the rat receives markedly conflicting information from the oral cavity and from caloric counting mechanisms about the nature of the solution, i.e., a very strong sweet taste, but little caloric feedback from the mild 3% glucose solution. Hence, the failure to stop a drinking bout would result from an attempt to increase the caloric input to more nearly match the sweet taste. A simple test of this hypothesis would be to compare G+S drinking in a group of rats with glucose drinking in a comparable group as the concentration of the glucose in both solutions was systematically increased. Higher concentrations of glucose in the G+S solution would give greater caloric input and thus less discrepancy between oral cavity and caloric feedback. Since there is some evidence that the taste of the G+S to the rat is dominated by the saccharin [6], it is assumed that increasing the concentration of the glucose in the solution would not make the solution less palatable.

**EXPERIMENT 2**

The purpose of this experiment was to test the hypothesis that the difference in intake between G+S and glucose solutions would decrease as the concentration of glucose increased in both solutions. In addition, food intake was measured during all tests so that the total caloric intake could be assessed.

**METHOD**

**Subjects**

Twenty-four male albino rats (CD strain, Charles River Breeding Laboratories) averaged 497 g at the start of testing. This experiment used the identical housing apparatus and conditions as Experiment 1.

**Procedure**

For a six day baseline period, ad lib food and water intake for all rats were measured at approximately 1000 hours, three hours after the light onset. During this 6 day period the rats had access to two bottles containing water. These bottles as well as the food cups were emptied, cleaned and refilled daily.

The subjects were then divided equally into 4 groups (N=6/group). For the next five days, for each group, one of the water bottles was replaced with one containing either a glucose solution or a G+S solution, depending on the rat’s group assignment.

Table 1 lists the glucose and G+S solutions for the first five-day period for each group as well as values for the next three similar conditions. Note that Groups 1 and 2 differ only in the order in which the G+S solutions were presented.
DETERMINANTS OF GLUCOSE+SACCHARIN DRINKING

### TABLE 1
TEMPORAL ORDERING OF GLUCOSE AND G+S CONDITIONS OF EXPERIMENT 2

<table>
<thead>
<tr>
<th>Group</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24% G+S</td>
<td>12% G+S</td>
<td>6% G+S</td>
<td>3% G+S</td>
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<tr>
<td>2</td>
<td>3% G+S</td>
<td>6% G+S</td>
<td>12% G+S</td>
<td>24% G+S</td>
</tr>
<tr>
<td>3</td>
<td>24% G</td>
<td>12% G</td>
<td>6% G</td>
<td>3% G</td>
</tr>
<tr>
<td>4</td>
<td>3% G</td>
<td>6% G</td>
<td>12% G</td>
<td>24% G</td>
</tr>
</tbody>
</table>

Groups 3 and 4 differed in order of presentation of the glucose solution. Each condition was separated by a two-day return to the ad lib food and water baseline. The solutions were made daily and stored overnight in a refrigerator before use. The solutions were at room temperature when attached to the cages.

After the final condition, the initial ad lib food and water baseline condition was replicated for 6 days. While the amount of glucose in solution for the G+S groups increased or decreased across conditions, the amount of saccharin (1.25 g) per liter of water was held constant. Amount of fluid consumed and amount of food eaten were recorded for all conditions. As in the initial baseline period, both bottles and food trays were emptied, cleaned, and refilled daily at approximately 1000 hours.

### RESULTS AND DISCUSSION

The rats in Groups 1 and 2 received identical treatment except that the order of presentation (increasing or decreasing concentrations) of glucose was reversed to observe any sequential effect. Since matched t-tests between the comparable groups revealed no statistical differences, data from Groups 1 and 2 were combined. Similar tests for Groups 3 and 4 yielded no evidence for a sequence effect in glucose drinking, so the data from these groups were also combined.

A drinking score was obtained for each rat by averaging the daily intake over the five days in each condition. The means of these drinking scores can be seen as a function of the solution and the concentrations in Fig. 1. Scores of water drinking were not plotted since the average water intake was only 5 ml for all conditions involving the sweet solutions and there were no significant differences in water intake among the groups. It can be seen that the difference between G+S and glucose consumption (described by the vertical dotted lines) at 3% concentration was 137 ml and this difference decreased to 75 ml, 44 ml, and 12 ml as the concentration of the glucose increased to 6%, 12%, and 24%. This description of the data is supported by statistical analysis.

A two-way repeated measures ANOVA across solutions and concentration revealed significant main effects beyond the 0.01 level of significance, for glucose vs G+S: F(1,88)=33.67; and for concentration: F(3,88)=75.07. Orthogonal comparisons across the values of the concentration variable showed statistical differences beyond the 0.01 level for 6% vs 0%, 6% and 12% vs 24%, and 12% vs 0%. A statistically significant interaction effect, F(3,88)=14.84, p<0.01, suggests that the discrepancy between glucose and G+S drinking decreases as the concentration of the glucose is increased. To be sure of this effect across all concentrations, interaction orthogonal comparisons were run. Two of these tests found significant interactions between 3% and 6% across solutions and between 12% and 24% across solutions. The remaining comparison tested the combined effects of 3% and 6% against the combined effects of 12% and 24%. Again, a statistically significant interaction obtained. These comparisons support the general conclusion that as the concentration of glucose was increased in both the glucose and G+S solutions, the difference in daily fluid intake decreased.

From the data presented in Fig. 1 and the statistical analysis it is clear that as the concentration of the glucose is changed from 0% to 24% in both solutions, the mean difference in fluid intake decreases significantly. The original hypothesis predicted this change based on the idea that the higher concentrations of glucose in the G+S solution would give greater caloric feedback and hence less discrepancy between oral cavity inputs and caloric feedback. Taken alone, these results would indicate that the caloric feedback from the glucose indeed could be a major determinant in explaining the polydipsia elicited by the synergistic action of the G+S solution.

On the other hand, a study of total caloric intake during these testing situations leads to the conclusion that caloric feedback probably plays no role in the excessive G+S drinking. In Fig. 2 the mean daily caloric consumption is plotted as a function of the concentration of glucose in the solutions. For each of the G+S and glucose groups, the total calories, the calories obtained from the solutions, and the calories obtained from the laboratory chow are plotted at each concentration.

When observing total caloric intake (circles), calories from the solutions (triangles), or calories from the laboratory chow
of solution by concentration for total fluid intake as can be seen in Fig. 1. There is a significant difference in the quantity of fluid taken when comparing G+S with glucose drinking; yet the caloric input in animals drinking G+S parallels that of animals drinking glucose alone. It seems unlikely then that caloric input plays any significant role in the excessive drinking of the G+S.

One further interesting observation can be made from Fig. 2. In the initial water baseline period before the introduction of either the G+S or glucose solutions, the average caloric intake for the rats from the Purina Chow was 76 calories daily. In the six day water baseline period following this experiment this baseline caloric intake was recovered with an average of 82 calories daily. During the four week course of testing of the sweet solutions the caloric intake rose markedly depending on the concentration of the glucose. Yet these rats did not gain weight when compared to ad lib normal animals. On the two days of water baseline between each of the sweet solution testing periods, the rat reduced caloric intake to the baseline level. It is possible that glucose was passed in the urine, however, this was not measured.

**EXPERIMENT 3**

In this experiment, an additional test was conducted to present further evidence that taste is the motivational factor responsible for the excessive drinking behavior toward G+S. In general, the fluid taken in a preference test between two concentrations of a sugar depends not only on the taste of the sweetener, but upon caloric feedback information [2]; but the fluid taken in a preference test between two concentrations of sodium saccharin depends only on oral cavity factors since there is no caloric feedback. The purpose of the present experiment was to conduct preference tests between two concentrations of G+S where the concentration of the glucose was altered (as in Experiment 2) but the concentration of the saccharin was held constant. If the rat treats G+S as a sugar solution, the results of this pairing should mimic those of sugar tests. If however, the G+S solution is treated only as a sweetener, these results should mimic the saccharin test. More precisely, when a rat is given water versus sucrose in 24 hour two bottle preference tests the water is usually ignored and most of the fluid is consumed from the sucrose bottle [2]. The absolute amount of sucrose consumed in these tests is a function of the concentration of the sucrose, with more of 8% sucrose drunk than of either lower or higher concentrations. However, 8% sucrose is not the most preferred concentration in tests where one concentration of sucrose is paired with another. In this case the rat will always drink more of the higher concentration than of the lower, i.e., more of either 32% or 16% than of 8%. Collier and Bolles [2] reported that the food intake in these rats decreased appropriately as the concentration of the sucrose increased in these tests so that total daily caloric intake remained fairly constant. The drinking behavior of the rat encountering sucrose solutions in these long term tests is therefore determined by caloric feedback in addition to inputs of taste.

In drinking from saccharin solutions, where there is no caloric feedback, the test results are quite different from those using the sugars. Rats drink more of 0.1% than of 0.05% or 0.9% [1] when these concentrations are paired with water in 24 hour two bottle tests. Unlike the sugars, however,
TABLE 2
TEMPORAL ORDERING OF TWO-BOTTLE PREFERENCE TEST CONDITIONS OF EXPERIMENT 3

<table>
<thead>
<tr>
<th>Group</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
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</thead>
<tbody>
<tr>
<td>Saccharin Subjects (n=12)</td>
<td>0.0125% S</td>
<td>0.0125% S</td>
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<td>0.125% S</td>
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<tr>
<td>Glucose Subjects (n=12)</td>
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when two concentrations of saccharin are paired against each other, rats drink more of the particular intermediate concentration than they do of higher or lower values. The 0.1% solution is preferred to both 0.03% and 0.9%, presumably only because of its taste [4].

From Fig. 1 in Experiment 2 it can be seen that rats drink more of 3% G + S than 24% G + S in 24 hour tests when these solutions were paired with water. From previous unpublished data in this laboratory it has been shown that more 3% G + S is consumed than 1% G + S when each of the two solutions has been paired with water. The purpose of Experiment 3 was to pair G + S solutions against G + S solutions where the concentration of the glucose in the solution was varied but the saccharin concentration remained constant at the standard 1.25 g/l.

If the rats always select the higher over the lower concentration of the G + S it would be implied that they are responding to the caloric feedback from the sugar in the solution. If, however, they drink more of 3% G + S than of 24% G + S and more of 3% G + S than of 1% G + S, they are ignoring the calories and drinking for the taste, not unlike the rats behavior with saccharin solutions. With the latter outcome, the evidence would be quite strong that G + S drinking results from the taste of the solutions and has little to do with the caloric information.

METHOD

Subjects

The subjects were 36 male rats, obtained from the Sprague-Dawley derived stock bred at Southern Animal Farms (Prattville, AL). Each subject previously had minimal experience with a saccharin solution. Wayne Chow was available ad lib throughout the experiment. Water was also available unless otherwise specified. A 12/12 hr light-dark cycle was in effect throughout the experiment, with light onset at 0700 hr.

Subjects were housed individually in Hoeltge HB 12A cages equipped with two water bottles (Girtom Model 16-38; Millville, PA) mounted externally on the front and an internal food bin located toward the rear of the cage.

Procedure

Testing consisted of 5-day phases of two bottle, 24 hr tests. Each phase was separated by two days of water available ad lib. As in the previous experiments the bottles were weighed, emptied, rinsed and refilled at approximately 1000 hours each day.

The 36 rats were divided into six groups of six animals each. Rats in Groups 1 and 2 received three concentrations of saccharin paired either with water or another saccharin solution. The sequence of presentation of solutions was counterbalanced across Groups 1 and 2 to allow observation of any sequential effects. The particular solutions and order of presentation are shown in the upper panel of Table 2. Rats in Groups 3 and 4 received glucose concentrations in ascending or descending series as described in the middle panels of Table 2. Rats in Groups 5 and 6 received the G + S solutions in concentrations and sequences described in the lower panel of Table 2.
RESULTS AND DISCUSSION

By computing the average intake from each bottle across all five days of each condition, a subject's score representing mean intake per day was obtained. These scores served as the basic data in various statistical tests.

Independent t-tests were run to determine whether the replication of the conditions of the experiment with different groups during the final three weeks was statistically different from groups run in the first three weeks. With alpha set at 0.01, none of these tests proved significant. In light of these data, showing essentially that sequence effects had no effect, the data from the groups were combined, Group 1 with Group 2, Group 3 with Group 4 and Group 5 with Group 6.

In Fig. 3 average daily intake levels per bottle are presented as a function of the six saccharin preference tests. On the left panel of the figure intake data for the three saccharin solutions and water are presented. Greater intakes were observed with the intermediate saccharin concentration, 0.125% saccharin. A repeated measures ANOVA across saccharin solutions and orthogonal comparisons revealed all these mean intake differences to be statistically different, F(2,22) = 73.12, p < 0.01. A similar analysis across the three water intake levels was also statistically significant, F(2,22) = 34.48, p < 0.01.

The data from the three preference tests in the right panel of Fig. 3 provide additional evidence that 0.125% saccharin is the preferred concentration. Matched t-tests confirm that it is preferred to 0.0125% saccharin, t(11) = 9.25, p < 0.01, and to 1.25% saccharin, t(11) = 4.312, p < 0.01. In addition, 0.012% saccharin and 1.25% saccharin were not statistically different.

As with the saccharin data, the glucose versus water data in the left panel of Fig. 4 show that the highest average intake is recorded for the intermediate concentration, 3% glucose. An ANOVA across these concentrations proved this difference significant, F(2,22) = 11.259, p < 0.01. Orthogonal comparisons showed 3% glucose different from 1% glucose and 24% glucose which themselves were not reliably distinct. The ANOVA across the water levels revealed no significant effects.

The right portion of Fig. 4 shows a different pattern than was seen in the saccharin data of Fig. 3. That is, instead of the peak value (as derived from the left side of each figure) being preferred over the other two, for glucose concentrations, it is the higher concentration that is reliably preferred. Matched t-tests confirm that 1% glucose differs from 3% glucose, t(11) = 7.432, p < 0.01; that 1% glucose differs from 24% glucose, t(11) = 10.055, p < 0.01; and that 3% glucose differs from 24% glucose, t(11) = 2.25, p < 0.05. These data imply that with glucose solutions the high caloric feedback from the higher concentration is a significant contributor to the demonstration of preference when the solutions are pitted against each other. With saccharin, these data show that preference between separate solutions is determined largely on the basis of taste.

An examination of the left panel of Fig. 5 reveals a pattern similar to the solution-versus-water data of Figs. 3 and 4—that the intermediate concentration, 3% G+S in this case, resulted in greater average intake values than the lesser concentrations, F(2,22) = 56.395, p < 0.01. That all three concentrations differed significantly from each other was confirmed by orthogonal comparisons.

The question of whether G+S generally mimics the preference data for saccharin or glucose is answered by the G+S

FIG. 3. Histograms depicting mean daily intake of saccharin and water when these two solutions are paired in two-bottle 24 hr tests are given in the left panel. The density of diagonal lines in each histogram is directly correlated with the concentration of saccharin in the solution. The right panel shows similarly plotted data for saccharin versus saccharin two-bottle 24 hr preference tests. In that panel, from left to right, the tests are 0.0125% saccharin versus 0.125% saccharin, 0.0125% saccharin versus 1.25% saccharin and 0.125% saccharin versus 1.25% saccharin.

FIG. 4. Histograms depicting mean daily intake of glucose and water when these two solutions are paired in two-bottle 24 hr tests are given in the left panel. The density of diagonal lines in each histogram is directly correlated with the concentration of glucose in the solution. The right panel shows similarly plotted data for glucose versus glucose two-bottle 24 hr preference tests. In that panel, from left to right, the tests are 1% glucose versus 3% glucose, 1% glucose versus 24% glucose and 3% glucose versus 24% glucose.

versus G+S preference tests, the data of which is presented in the right panel of Fig. 5. These data show that rats prefer 3% G+S over the lesser or greater concentrations, a finding comparable to the saccharin, but not the glucose data. Matched t-tests found differences between 1% G+S and 3% G+S, t(11) = 17.13, p < 0.01, and between 3% G+S and 24% G+S, t(11) = 3.33, p < 0.01, while the difference between 1% G+S and 24% G+S was not significantly different.
**GENERAL DISCUSSION**

The evidence seems to be quite conclusive that an appropriate mixture of glucose and saccharin results in an extremely large daily intake of the solution by the laboratory rat. This increase in intake results from an increase in the duration of drinking bouts and not from a change in local rate of licking or an increase in bout frequency. The motivation for this excessive intake of fluid, which sometimes exceeds the rats body weight in 24 hours, is not clear. There is considerable evidence that the taste of the solution to the rat largely determines the G+S phenomenon [5, 6]. Valenstein et al. [6] described this drinking as resulting from the synergistic action of a very palatable solution with a minimum of postigestional inhibition. In the present three experiments, tests were run to see if indeed postigestional factors were present in G+S drinking and if they played any significant role in maintaining the longer drinking bouts. In the first experiment it was shown that there is a marked change in the caloric intake when the rat drinks G+S and that the proportion of calories taken from the laboratory chow decreases when the sweetened solution is present. The rat responds by a reduction in food intake to G+S as to any sugar solution. In Experiment 2, however, it was demonstrated that in spite of this alteration in caloric input while drinking copious quantities of G+S, the evidence seems to strongly indicate that the rat drinks these large quantities of the G+S solution for taste and not calories. The final experiment compared preference tests on various concentrations of saccharin, glucose or G+S solutions and showed that preference data across concentrations of G+S were qualitatively similar to saccharin data and different from glucose data, even though it was the amount of glucose in the concentrations that was manipulated.

Although the rat responds appropriately by reducing caloric intake from food when drinking the G+S solution, the evidence from these experiments would indicate that this adjustment is a result and not a cause of the excessive G+S intake. The evidence is quite conclusive that the G+S is consumed because of its taste or other immediate feedback rather than from long term postigestional factors including caloric inputs. The conclusion drawn by Valenstein et al. [6] that G+S seemed to be a palatable solution with a minimum of postigestional inhibitions is a reasonable one. Why this particular combination of a nutritive and a non-nutritive sweetener results in such a profound increase in intake remains uncertain. Work is in progress to determine if this type of synergy is peculiar to glucose and sodium saccharin.

**REFERENCES**