Journal of Comparative Psychology
2005, Vol. 119, No. 1, 8–13

0735-7036/05/$12.00 DOI: 10.1037/0735-7036.119.1.8

Differences Between Golden Hamsters (*Mesocricetus auratus*) and Norway Rats (*Rattus norvegicus*) in Preference for the Sole Diet That They Are Eating

Bennett G. Galef Jr. and Elaine E. Whiskin
McMaster University

D. DiBattista (2002) reported that hamsters but not rats showed reduced preferences for the sole diet they had eaten for 10 days. In the current study, the authors fed Norway rats (*Rattus norvegicus*) a nutritious diet for either 3 or 10 days, then tested them either immediately or 1 or 3 days later. The authors found that like golden hamsters (*Mesocricetus auratus*), rats exhibited reduced preferences for a prefed diet but only if tested either immediately or 1 day after prefeeding, not if tested 3 days later (when D. DiBattista tested his hamsters). Rats and hamsters differed in the longevity, not the development, of reduced preferences for a palatable food eaten for several consecutive days. Such a response might aid dietary generalists in constructing balanced diets when no single available food is nutritionally adequate.

In a recent article, DiBattista (2002) described a series of experiments in which adult golden hamsters (*Mesocricetus auratus*) were exposed for 10 days to a nutritionally complete base diet to which a distinctive flavorant had been added before choosing for 30 min between that now familiar food and the same base diet with a different flavorant added to it. The hamsters consistently preferred the food with the unfamiliar flavor. In contrast, Norway rats (*Rattus norvegicus*) examined under identical conditions preferred the food with the familiar flavor. Not unexpectedly, DiBattista interpreted these results as providing evidence of a difference in the responses of hamsters and of rats to prolonged exposure to a single food.

Coincidently, when DiBattista's (2002) article appeared in print, we had in press a manuscript describing experiments in which we exposed adult Norway rats to a nutritionally complete, distinctively flavored base diet for several days before giving them a choice between that food and the same base diet with a different flavorant added to it (Galef & Whiskin, 2003). Unlike DiBattista, we found that, in a variety of circumstances, rats exhibited robust reductions in preference for the food with the familiar flavor.

Of course, there were numerous differences in details of the procedures that we (Galef & Whiskin, 2003) and DiBattista (2002) used in our respective experiments. For example, DiBattista exposed his subjects (both hamsters and rats) to the flavored diet for 10 days, whereas we exposed our rats to that diet for only 3 days. After exposing his subjects to a food for 10 days, DiBattista fed them unflavored base diet for 3 days before testing their preferences between unfamiliar and familiar flavored base diets; we tested our subjects immediately after they completed their 3 days of prefeeding. DiBattista used a 30-min choice test, whereas we measured intake for 24 hr. Further, the two laboratories used different base diets and added different flavorants to them. However, both laboratories used more than one base diet and more than one set of flavorants, and each got consistent results, so it is unlikely that the particular foods used in the two sets of experiments were important in producing the contradictory outcomes in experiments in which rats served as subjects.

Here, we first determined the causes of the markedly different outcomes in experiments by examining effects of preexposure to nutritionally complete diets on food preference in Norway rats found in DiBattista's laboratory and in our own. We first examined effects on subsequent preference of (a) 10 versus 3 days of exposure to a distinctively flavored base diet, (b) testing for 30 min versus testing for 24 hr, and (c) whether there was a delay (as in DiBattista, 2002) or no delay (as in Galef & Whiskin, 2003) between the end of prefeeding and the start of preference testing. We then explored further the robustness of the preference of Norway rats for novel foods (Galef & Whiskin, 2003) by examining the effects of simultaneous exposure to several flavored diets on subsequent preference for each and of repeated exposures to familiar diets.

Experiment 1

DiBattista (2002) exposed rats to a distinctively flavored base diet for 10 days and then fed them the base diet for 3 days before testing subjects for their food preferences for 30 min. We exposed rats to an unfamiliar food for 3 days and tested subjects immediately thereafter for 24 hr to determine their food preferences (Galef & Whiskin, 2003). Differences in the outcome of our previous experiments and those of DiBattista in which rats served as subjects might reflect these differences in procedure.

In the present experiment, we exposed rats to either a cinnamon-flavored (diet cin) or cocoa-flavored (diet coc) nutritionally complete base diet for 10 days, then, either immediately or after 3 days of maintenance on the base diet, offered them a choice between

Bennett G. Galef Jr. and Elaine E. Whiskin, Department of Psychology, McMaster University, Hamilton, Ontario, Canada.

This research was supported by a grant from the Natural Sciences and Engineering Research Council of Canada. We thank Alex Ophir and Kamini Persaud for helpful comments on a draft of the manuscript.

Correspondence concerning this article should be addressed to Bennett G. Galef Jr., Department of Psychology, McMaster University, Hamilton, Ontario L8S 4K1, Canada. E-mail: galef@mcmaster.ca

diet cin and diet coc for both 30 min and 24 hr. The pattern of outcomes in such an experiment should permit determination of whether these procedural differences were responsible for the striking difference in outcome of the rather similar experiments conducted in our laboratory (Galef & Whiskin, 2003) and in DiBattista's (2002).

Method

Subjects. Seventy-four female Long-Evans rats (*Rattus norvegicus*), obtained from Charles River Canada (St. Constant, Quebec, Canada) at 6 weeks of age, served as subjects. To facilitate recovery from any stress associated with transportation, for 7 days after subjects arrived in the laboratory we housed them in groups of three or four in standard shoe-box cages before transferring them to individual, stainless steel, wire mesh hanging cages, measuring 21 cm high × 46 cm deep × 25 cm wide, where we conducted the experiment.

We housed the rack of cages containing subjects in a temperature- and humidity-controlled colony room maintained on a 12:12-hr light–dark cycle. All subjects received ad libitum access to water and pellets of PMI Rodent Chow 5001 (diet PMI; PMI Nutrition International, Brentwood, Missouri), a nutritionally complete diet, until the start of the experiment.

Apparatus. During the experiment, subjects ate powdered food from semicircular, stainless steel food cups, measuring 10 cm in diameter and 5 cm deep, that we attached to one wall of each subject's cage. To minimize spillage, we filled each cup with powdered food to only half of its depth. A paper towel placed under each food cup permitted monitoring of spillage, which was negligible. Subjects ate pelleted food, when it was available, from stainless steel bins hanging on one wall of their cages.

Diets. We prepared diet coc and diet cin by mixing, respectively, 20 g of Hershey's Low-fat Cocoa or 10 g of McCormick's Pure Ground Cinnamon with 1 kg of powdered diet PMI.

Procedure. To begin the experiment, we placed a single food cup containing diet cin in the home cages of 37 subjects and a single food cup containing diet coc in the home cages of the remaining 37 subjects. We then left subjects undisturbed, except for daily replacement of ingested food, for either 3 (n = 20) or 10 (n = 54) days of prefeeding.

At the end of the prefeeding period, we removed the food cup from the home cages of 42 subjects and replaced it with two weighed food cups, one containing diet cin and the other diet coc. We replaced the food cup that we removed from the home cage of each of the remaining 32 subjects with a food bin containing pellets of diet PMI. Three days later we removed the food bin and replaced it with two weighed food cups, one containing diet cin and the other diet coc.

We removed and reweighed the two food cups 30 min after introducing them into each subject's home cage; then we replaced each food cup in the cage from which we had taken it. We again removed and reweighed all food cups 23 1/2 hr later. Consequently, we had two measures of a subject's intake: one 30 min and one 24 hr after the start of testing. We determined the amount of each diet that each subject had eaten after both 30 min and 24 hr, then calculated the percentage of each subject's intake during 30 min and 24 hr of testing that was diet cin.

Data analysis. We included the following three variables in Experiment 1 to determine whether prefeeding a diet to Norway rats reduces their preference for that diet in a subsequent choice test: (a) the number of days that subjects are prefed a diet, (b) the duration of the delay between prefeeding and testing, and (c) the duration of the preference test.

In order to answer these questions while minimizing the number of animals used in our experiments, we looked within subjects for effects of duration of testing and between subjects for effects of duration of exposure to a food and duration of delay between the end of prefeeding and the start of testing. The design required two separate analyses of variance (ANOVAs): one to examine effects of number of days of prefeeding (either 3 or 10) and one to examine effects of number of days of delay between the end of prefeeding and the start of preference testing (either 0 or 3).

Results and Discussion

The main results of Experiment 1 are presented in Figure 1, which shows the mean amount of diet cin, as a percentage of each subject's total intake, ingested by subjects assigned to the various conditions. A between-subjects (days of exposure) and within-subjects (duration of testing) ANOVA revealed no main effect of exposure duration, $F(1, 38) = 0.63$, *ns* (the criterion for significance was set at $p < .05$); a main effect of diet, $F(1, 38) = 81.82$, $p < .00001$; and a significant interaction between days of prefeeding and diet, $F(1, 38) = 4.78$, $p < .04$, although that statistically significant interaction does not help to explain the difference in outcome of Galef and Whiskin (2003) and DiBattista (2002).

The within-subjects analysis of subjects tested immediately following prefeeding revealed no main effects and no significant second-order interactions but a significant three-way interaction among duration of exposure, duration of testing, and diet, $F(1, 38) = 3.18$, $p < .005$, that, as inspection of Figure 1 reveals, does not help to explain the difference in outcome between DiBattista's (2002) studies of rats and ours (Galef & Whiskin, 2003).

The absence of a significant Days of Exposure × Diet interaction is of greatest importance. Regardless of whether rats tested immediately after prefeeding were prefed diet cin or diet coc for 3 days or for 10 days, they exhibited a markedly reduced preference for the diet that they were prefed (see Figure 1). The difference in the number of days of exposure used in our laboratory (Galef & Whiskin, 2003) and in DiBattista's (2002) was not the cause of the difference between laboratories in experimental outcome.

Examination of the effects of duration of delay between the end of 10 days of diet preexposure and preference testing revealed no main effect of delay, $F(1, 50) = 0.72$, *ns*; a significant main effect of diet, $F(1, 50) = 24.33$, $p < .0001$; and, most important, a

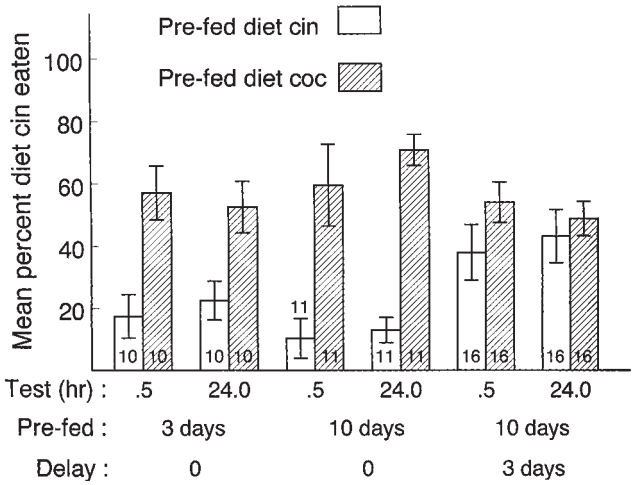

Figure 1. Mean amount of cinnamon-flavored diet (diet cin) eaten, as a percentage of total intake by rats prefed either diet cin or cocoa-flavored diet (diet coc) for either 3 or 10 days and tested for 0.5 or 24 hr either immediately after testing or 3 days later. Numbers inside histograms = subsample size n. Error bars represent standard errors of the mean.

significant Delay × Diet interaction, $F(1, 50) = 24.20$, $p < .0001$, that is consistent with the hypothesis that the duration of the delay between diet preexposure and preference testing affects preference for preexposed diets. The within-subjects analysis again revealed no effect of duration of testing on preference for preexposed diets, $F(1, 50) = 3.01$, *ns*.

In sum, the results of Experiment 1 revealed no affect on diet preference of number of days of preexposure to a diet or of duration of testing but a profound affect of duration of the delay between the end of prefeeding and the beginning of preference testing. These findings suggest that the difference between Norway rats and golden hamsters in response to eating a single nutritionally adequate diet for 10 days as described by DiBattista (2002) was a result of differences not in the development but in the longevity of reduced preference for that diet. Like hamsters, rats develop a reduced preference for a food they have eaten for several days, which can be seen for at least 24 hr afterward, but that reduced preference is short-lived in rats relative to hamsters.

Unlike DiBattista (2002), we did not find a preference for familiar diets in our studies with rats tested 3 days after the end of prefeeding. However, we used pigmented Long-Evans rats as subjects, whereas DiBattista used albino rats of the Wistar strain. DiBattista used garlic and sage as flavorants and Purina Rodent Laboratory Chow 5001 as a base diet, whereas we used cinnamon and cocoa as flavorants and PMI chow as a base diet. Such differences in procedure might have produced the observed difference in outcome.

Experiment 2

The results of Experiment 1 suggest that a potent variable determining whether rats avoid the sole food that they have eaten for several consecutive days is the time between the end of prefeeding and the start of testing. In Experiment 2, we further examined effects of delays of varying duration between when subjects finished eating a food and when they were tested for their preference for that food in a choice situation.

Method

Subjects. Forty-eight experimentally naive, 7-week old, female Long-Evans rats served as subjects. Subjects were treated identically before the start of the experiment to those that participated in Experiment 1.

Apparatus. We used the same apparatus that we used in Experiment 1.

Procedure. The procedure was very similar to that used in Experiment 1. However, in the present experiment, we fed subjects either diet cin or diet coc for 3 days and then tested equal numbers of subjects for 24 hr immediately after prefeeding or either 1 or 7 days later. As in Experiment 1, between the end of prefeeding and the start of preference testing we provided the 32 subjects whose testing was delayed with ad libitum access to bins containing pellets of diet PMI.

Results and Discussion

Data from 2 subjects were lost when each overturned a food dish during testing. The main results of Experiment 2 are presented in Figure 2, which shows the mean amount of diet cin, as a percentage of total amount eaten by each subject during testing, as a function of the time between the end of prefeeding and the start of testing. As is evident from inspection of Figure 2, subjects tested either immediately after prefeeding or 1 day later showed a substantial preference for the unfamiliar diet. Subjects tested 7 days after prefeeding showed no preference for either the familiar or the unfamiliar diet that they were offered. There was a main effect of diet, $F(1, 40) = 6.32$, $p < .02$; no main effect of delay, $F(2, 40) = .07$, *ns*; and a significant interaction of diet and delay, $F(2, 40) = 4.31$, $p < .02$, demonstrating, as in Experiment 1, an impact of the delay between prefeeding and preference testing on diet choice in rats.

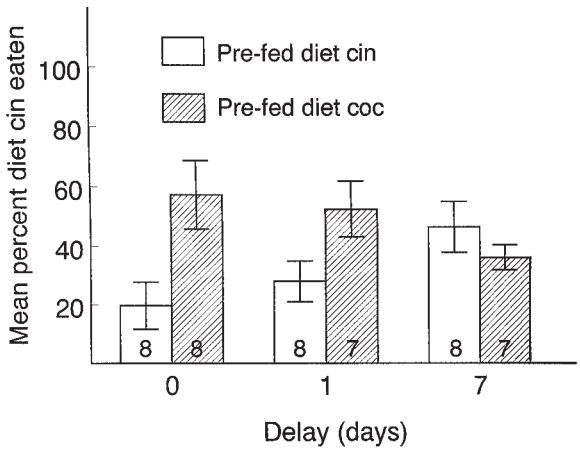

Figure 2. Mean amount of cinnamon-flavored diet (diet cin) eaten, as a percentage of total intake by rats prefed either diet cin or cocoa-flavored diet (diet coc) for 3 days and tested for 24 hr immediately after or 1 or 7 days after prefeeding. Numbers inside histograms = subsample size *n*. Error bars represent standard errors of the mean.

There was also a significant linear trend relating time to testing and amount of the prefed diet eaten by subjects assigned to the three groups: linear-trend analysis, $F(2, 45) = 7.67$, $p < .01$. Again this suggests that the difference in outcome of experiments with rats conducted by DiBattista (2002) and Galef and Whiskin (2003) reflected differences in the interval between the end of prefeeding and the start of testing.

Experiment 3

The results of Experiments 1 and 2, like the results of previous studies in our laboratory, demonstrate a tendency of Norway rats to avoid a food that they have eaten for 3 or more consecutive days. In the present experiment, we continued our exploration of this phenomenon by determining how many different diets a rat can be restricted to eating and still develop a tendency to avoid those diets. We prefed rats either two or four distinctively flavored diets for 3 consecutive days and then determined whether independent groups of subjects avoided each of those diets in a 24-hr preference test conducted immediately after prefeeding.

Method

Subjects. Fifty-two experimentally naive, female Long-Evans rats identical to those serving as subjects in Experiment 1 served as subjects here. We assigned half of the subjects to experimental groups and half to control groups and prefed half of each group two diets and half, four diets (see *Procedure*, below).

Apparatus. We used the same apparatus that we used in Experiment 1.

Diets. In the present experiment, we used diet cin, diet coc, and diet PMI, which we had used in Experiments 1 and 2, as well as anise-, marjoram-, and clove-flavored diets. We prepared the latter three diets by adding, respectively, 10 g ground anise (diet ani), 20 g ground marjoram (diet mar), or 5 g ground cloves (diet clo) to 1 kg of diet PMI.

Procedure. During prefeeding, we treated subjects assigned to experimental conditions in the present experiment as we treated subjects in Experiment 2 except that instead of prefeeding subjects one diet for 3 days, we prefed them either two (diets ani and mar) or four (diets ani, mar, cin, and clo) diets for 3 days. We then offered each subject, for 24 hr, a choice between one of the diets it had been prefed and an unfamiliar diet (diet coc). We treated subjects assigned to control conditions exactly as we treated those assigned to experimental conditions except that we prefed subjects assigned to the control condition diet PMI (the base diet out of which we made flavored diets) instead of flavored diets for 3 days.

We offered to 5 of the 10 subjects that we prefed diet ani and diet mar for 3 days a choice between diet ani and diet coc for 24 hr, and to the remaining 5 we offered a choice between diet mar and diet coc for 24 hr. We similarly offered to half of 10 subjects assigned to the control condition a choice between diet ani and diet coc and to the 5 others a choice between diet mar and diet coc.

We prefed 16 subjects diet cin, diet clo, diet mar, and diet ani for 3 days, then offered to 4 subjects a choice for 24 hr between diet cin and diet coc; 4 subjects, a choice between diet clo and diet coc; 4 subjects, a choice between diet mar and diet coc; and 4 subjects, a choice between diet ani and diet coc. Sixteen control subjects, prefed diet PMI for 3 days, were offered similar choices for 24 hr.

Results and Discussion

Data from a single subject were lost when it spilled its food during testing. The main results of Experiment 3 are presented in Figure 3, which shows the mean amount of unfamiliar diet coc eaten by those rats in the experimental group that were prefed two or four diets and by their respective control subjects as a percentage of the total amount they ate during the 24-hr choice test.

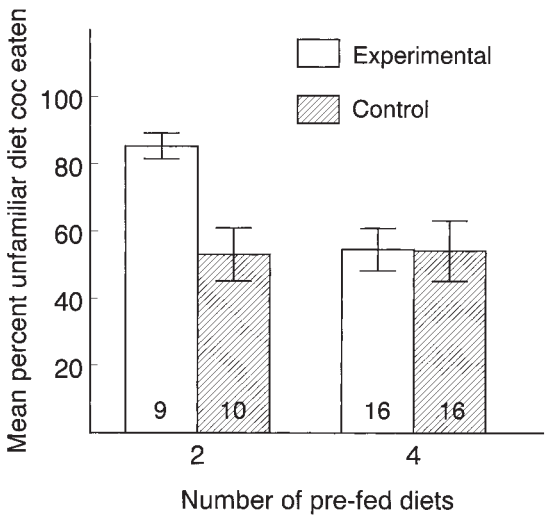

Figure 3. Mean amount of unfamiliar cocoa-flavored diet (diet coc) eaten by subjects prefed either two or four diets and tested for 24 hr immediately after prefeeding. Numbers inside histograms = subsample size *n*. Error bars represent standard errors of the mean.

As is evident from inspection of Figure 3, subjects that were prefed two diets ate more unfamiliar diet coc than did subjects assigned to the control group, whereas subjects prefed four diets did not eat more unfamiliar diet coc than did subjects assigned to the control group. Further, experimental subjects prefed two diets ate more diet coc than did subjects prefed four diets. A 2 (condition) $\times$ 2 (number of prefed diets) ANOVA of the percentage diet coc eaten revealed a significant interaction between condition and number of prefed diets, $F(1, 47) = 5.45$, $p < .03$. Main effects of both condition, $F(1, 47) = 3.46$, *ns*, and number of diets, $F(1, 47) = 3.15$, *ns*, were marginal.

Of course, with longer periods of exposure and more salient flavors, subjects might have avoided each of four or more prefed foods. However, the present results suggest an upper bound of two or three on the number of foods that rats avoid as a result of 3 days of prefeeding.

Experiment 4

In each of the preceding three experiments, we have described limits on the effects of prefeeding diets on subsequent avoidance of those diets. However, focus on such limits obscures the substantial effect of familiarity-induced diminished preference for foods. We therefore end the present series of experiments by providing further evidence of the impact on food selection of continuous exposure to a single food.

Method

Subjects. Sixteen experimentally naive, female Long-Evans rats identical to those used in preceding experiments and randomly assigned to two groups of eight served as subjects.

Apparatus. We used the same apparatus that we used in Experiment 1.

Diets. We used diet cin, diet coc, and diet PMI.

Procedure. We imposed a procedure consisting of 11 steps on each group of 8 subjects. We gave one group (a) ad libitum access to diet cin for 3 days, (b) a choice between diet cin and diet coc for 24 hr, (c) diet PMI for 1 day, (d) diet coc for 3 days, (e) a second choice between diet cin and diet coc for 24 hr, and (f) again fed subjects diet PMI for 24 hr. We then repeated the first five steps of the procedure so that each subject in the group received four choice tests, two immediately after eating diet cin for 3 days and two immediately after eating diet coc for 3 days.

We treated the second group of subjects exactly as we treated the first except that we reversed the order in which we fed them diet cin and diet coc (i.e., we prefed subjects in the second group diet coc during each 3-day period when we fed subjects in the first group diet cin, and diet cin during each 3-day period when we prefed subjects in the first group diet coc). Consequently, subjects assigned to the first group were prefed diets in the order cin, coc, cin, coc, whereas subjects assigned to the second group were prefed diets in the order coc, cin, coc, cin. We tested subjects in both groups for their preference between diet cin and diet coc for 24 hr immediately after each 3-day prefeeding period.

Results and Discussion

The results of Experiment 4 are presented in Figure 4, which shows the amount of diet cin eaten, as a percentage of total amount ingested, by each subject in the two groups on each of the 4 days of preference testing. As can be seen in Figure 4, on each of the 4 days of preference testing subjects exhibited greater significant preference for the diet other than the one they had just eaten for 3

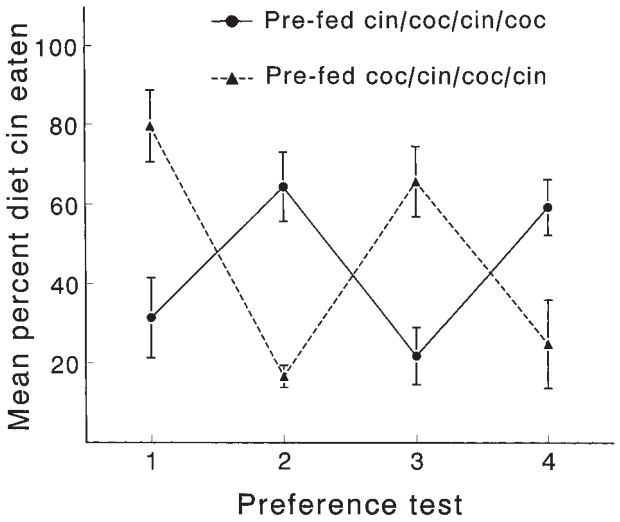

Figure 4. Mean amount of cinnamon-flavored diet (diet cin), as a percentage of total amount eaten by subjects prefed either diet cin or cocoa-flavored diet (diet coc) for 3-day periods immediately before testing. Subjects were fed diet cin or diet coc for 3 days before each preference test in the order indicated in the figure legend.

days. A repeated measures ANOVA showed no main effects of group, $F(1, 45) = 0.09$, *ns*; or of preference test, $F(3, 45) = 1.86$, *ns*; and a massive interaction, $F(3, 45) = 28.9$, $p < .0001$, that reflected the impact on food choice of the food fed to each subject for the 3 days immediately preceding each preference test. Effects of 3 days of feeding a single diet were robust and repeatable in rats and occurred following prefeeding on familiar as well as unfamiliar diets.

General Discussion

The results of the present series of experiments provide an explanation for the very different outcomes in our laboratory and in DiBattista's of experiments conducted to examine effects of prefeeding a single diet on Norway rats' subsequent preference for that diet.

Results of Experiment 1 and 2 show that Norway rats, like golden hamsters (DiBattista, 2002), reduce their ingestion of a single food that they have been given to eat for several days and, together with DiBattista's (2002) data, suggest that such effects are longer lasting in hamsters than in rats. The results of Experiment 3 indicate that effects of prefeeding on food choice are also seen in rats whose diets have been restricted for 3 days to two but not four distinctively flavored foods. The outcome of Experiment 4 showed that repeated prefeedings of a diet, even a familiar one, produced repeated reduction in preference for that diet.

Previous studies have provided evidence that rats exhibit decreased acceptance of foods immediately following their ingestion, a phenomenon known as *sensory-specific satiety* (Rolls, 1986). However, with the exceptions of Galef and Whiskin (2003) and DiBattista (2002), demonstrations of sensory-specific satiety in animals have involved changes in preference lasting only minutes (e.g., Balleine & Dickinson, 1998; Colwill & Rescorla, 1985), and even these transitory changes were sometimes so small as to be statistically unreliable (e.g., Berridge, 1991).

Previous reports in the literature of enhanced, rather than reduced, preference for familiar foods (reviewed in DiBattista, 2002), which at first glance appear to contradict both our results and those of DiBattista (2002), are not comparable. Those experiments demonstrated increased preferences for flavors experienced either relatively briefly or in addition to a subject's maintenance diet. Apparently, decreases in preference for foods develop only when rats or hamsters are given access to one food for several days in succession (Galef & Whiskin, 2003).

The finding that rats show a reduced preference for a food ingested for several consecutive days requires reconsideration of some classic issues in diet selection. For example, early in the 20th century, scientists engaged in a heated debate with workers in applied nutrition regarding the ability of animals presented with an array of foods of varying nutritional content to compose an adequate diet (Stone, 1942; for review, see Galef, 1991). Jordan (1906), a biochemist who doubted that animals generally, and cows in particular, could construct a healthy diet from a cafeteria of foods, suggested that "if a dozen commercial feeding stuffs were spread around on a barn floor . . . [a cow] would probably get at the corn meal and stay with it until well on the way to a fatal case of indigestibility" (p. 206).

The present results suggest that Jordan was probably wrong in proposing that animals will continue to ingest only the most inherently palatable of available foods, because over time if an animal eats only one food, that food will become less preferred relative to available alternatives. The present results, like those of DiBattista (2002), suggest that, quite contrary to Jordan's proposal, changes in food preference will motivate animals to seek variety in the foods that they ingest, so they never eat only the most inherently palatable from among the foods available to them.

The present results also suggest a possible need to reinterpret results of classic experiments using cafeteria feeding as a means of assessing the ability of animals to construct a nutritionally adequate diet from a number of different purified dietary components (for reviews, see Booth, 1985; Epstein, 1967; Galef, 1991; Rozin, 1976). If differences in the inherent palatability of components lead animals initially to focus intake on one or two dietary components, then the relative palatability of those components would decrease over days, resulting in increased ingestion of previously ignored alternatives. Subjects might appear to have learned to ingest less palatable elements in a cafeteria by sampling them and evaluating their postingestive consequences, when only subjective relative palatabilities of dietary components have changed.

The robust and long-lasting preference for a diet produced by restricting ingestion to a single diet seen in both golden hamsters (DiBattista, 2002) and rats raises questions concerning the possible function of such exposure learning. Unfortunately, given how little is known about the feeding behavior of free-living rodents, proposed answers to functional questions concerning their feeding patterns can be no more than informed speculations. Still, some such speculation seems appropriate.

It seems reasonable to propose that seeking variety in foods would be advantageous to dietary generalists because no single food reliably available to rodents in their environment of evolutionary adaptation provides all the nutrients that they require. A gradually developing reduction in preference for a food eaten for

an extended period of time could motivate dietary breadth without waiting for deficiency states to produce avoidance of a nutritionally deficient but highly palatable food (Rozin, 1967, 1968). Why, as seems to be the case, reduced preferences for a food eaten for several days should last longer in golden hamsters than in Norway rats remains a mystery. Not enough is known of the environment of evolutionary adaptation of either species to make speculation on the subject seem profitable.

References

Balleine, B. W., & Dickinson, A. (1998). The role of instrumental learning in instrumental outcome reevaluation by sensory-specific satiety. *Animal Learning & Behavior, 26,* 46–59.

Berridge, K. C. (1991). Modulation of taste affect by hunger, caloric satiety, and sensory-specific satiety in the rat. *Appetite, 16,* 103–120.

Booth, D. A. (1985). Food-conditioned eating preferences and aversions with interoceptive elements: Conditioned appetites and satieties. In N. S. Braveman & P. Bronstein (Eds.), *Annals of the New York Academy of Sciences: Vol. 443. Experimental assessments and clinical applications of conditioned food aversions* (pp. 22–41). New York: New York Academy of Sciences.

Colwill, R. M., & Rescorla, R. A. (1985). Postconditioning devaluation of a reinforcer affects classical conditioning. *Journal of Experimental Psychology: Animal Behavior Processes, 11,* 120–132.

DiBattista, D. (2002). Preference for novel flavors in adult golden hamsters (*Mesocricetus auratus*). *Journal of Comparative Psychology, 116,* 63–72.

Epstein, A. N. (1967). Oropharyngeal factors in feeding and drinking. In C. F. Code (Ed.), *Handbook of Physiology: Vol. 1. Alimentary canal* (pp. 197–218). Washington, DC: American Physiological Society.

Galef, B. G., Jr. (1991). A contrarian view of the wisdom of the body as it relates to dietary self-selection. *Psychological Review, 98,* 218–223.

Galef, B. G., Jr., & Whiskin, E. E. (2003). Preference for novel flavors in adult Norway rats (*Rattus norvegicus*). *Journal of Comparative Psychology, 117,* 86–100.

Jordan, W. H. (1906). *The feeding of animals.* New York: Macmillan.

Rolls, B. J. (1986). Sensory-specific satiety. *Nutrition Reviews, 44,* 93–101.

Rozin, P. (1967). Specific aversions as a component of specific hungers. *Journal of Comparative and Physiological Psychology, 64,* 237–242.

Rozin, P. (1968). Specific aversion and neophobia resulting from vitamin deficiency or poisoning in half-wild or domestic rats. *Journal of Comparative and Physiological Psychology, 66,* 82–88.

Rozin, P. (1976). The selection of foods by rats, humans, and other animals. *Advances in the Study of Behavior, 6,* 21–76.

Stone, C. P. (1942). Motivation. In F. A. Moss (Ed.), *Comparative psychology* (pp. 65–97). New York: Prentice Hall.

Received February 19, 2004
Revision received May 5, 2004
Accepted May 11, 2004 ■