

## Taste Preferences and their Relation to Obesity in Dogs and Cats

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### SUMMARY

In the laboratory situation the preferences of dogs and cats for food seem to be relatively uniform. Cats prefer fish and commercial cat food to rats. Dogs prefer beef, pork and lamb to chicken, liver and horsemeat and strongly prefer meat to cereal diets. They prefer canned meat to fresh meat, ground meat to cubed meat and cooked meat to raw meat. Canned or semimoist preparations are preferred to dry ones. Pet dogs have much more variable preferences according to their owner's subjective evaluation. A variety of factors seem to be related in an as yet unknown way to some flavor preferences of pet dogs, i.e. the dog's sex/reproductive status, weight and relationship to owners and the content of the dog's meals. The complicated interaction between (a) a pet's taste, texture and olfactory sensation, (b) its owner's perception of the pet and its preferences and (c) its physical and social environment deserves further investigation.

Obesity can result from endocrinological causes such as those following ovariectomy, but most cases appear to be related to owner-induced variables. In a kennel situation most, but not all, dogs can be allowed free access to palatable food without becoming obese.

### RÉSUMÉ

#### Les préférences du goût et leur relation

#### avec l'obésité, chez les chiens et les chats

Dans un laboratoire, les préférences alimentaires des chiens et des chats s'avèrent relativement uniformes. Les chats préfèrent le poisson et la nourriture commerciale préparée à leur intention, plutôt que les rats. Les chiens aiment mieux le boeuf, le porc et le poulet que l'agneau, le foie ou le cheval; ils préfèrent aussi la viande aux céréales. Ils aiment mieux la viande en conserve que la viande fraîche, la viande hachée plutôt que la viande en cubes et la viande cuite plutôt que la viande crue. Ils préfèrent les aliments en conserve ou humides aux aliments secs. Les chiens de compagnie manifestent des goûts beaucoup plus variés, d'après l'évaluation subjective de leurs maîtres. Plusieurs facteurs semblent reliés d'une façon encore obscure à la préférence de certains arômes par les chiens de compagnie, v.g. le sexe d'un chien par rapport à son statut reproducteur, son poids, sa relation avec son maître et la nature de ses repas. L'interaction compliquée entre a) le goût, la constitution et la sensation olfactive d'un chien de compagnie, b) la façon dont son maître perçoit un animal de compagnie et les préférences de ce dernier et c) son environnement physique et social, mérite une étude plus approfondie.

L'obésité peut résulter de causes endocriniennes, comme celles qui découlent d'une ovario-hystérectomie; dans la plupart des cas, elle semble

cependant reliée aux variations imputables au propriétaire. Dans un chenil, la plupart des chiens peuvent avoir libre accès à de la nourriture au goût agréable, sans devenir obèses.

### INTRODUCTION

The incidence of obesity among North American dogs and cats is unknown. Surveys carried out in Great Britain indicate that approximately 30% of dogs and only 9% of cats are obese (3,15). It is unlikely that the incidence of obesity is any less in Canada or the United States. Certainly, we and most practitioners feel that it is a common clinical problem.

Obesity has been defined as the condition in which body weight is 10% or more above normal (11). By itself obesity is not pathological, but the condition predisposes to diabetes and aggravated arthritic and cardiovascular problems (2). The tendency to obesity has probably survived as an inherited trait because those dogs that became obese were better able to tolerate long periods of limited food supply. The genetic basis is further supported by the finding that there are breed dispositions to obesity (3).

Consumption of more energy than is expended is the general cause of the obesity, but there are specific causes as well. Anderson (3) notes that, although only 34% of a sampled population of dogs were obese, 68% of females with oophorectomy were obese. More direct evidence of the

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inhibitory effect of ovarian hormones on food intake is the recent documentation of increased body weight and food intake in females with hysterovariectomy in comparison to sham-operated controls (9).

An endocrinological problem is the basis of some cases of obesity, but a more common cause is probably an increase in palatability of diets. Animals will defend a "set point" of body weight, a lean weight maintained or exceeded on all but the most distasteful diet. There is also an upper set point. The upper set point is raised as the palatability of the diet is increased. Dogs, even of the same breed, differ widely in their responsiveness to the palatability of the diet. When offered a highly palatable diet free choice, some beagles gained only a little weight, but others ate very large amounts and their body weight increased markedly (16).

Veterinarians should be aware of the relative palatability of various meats and commercial dog and cat foods so that they can advise pet owners. The owner will most often need to decrease the palatability of the diet, but in some cases palatability should be increased. The anorexic or under-weight animal should be offered preferred foods to stimulate its intake. There are three dietary approaches to obesity: (a) restrict intake, (b) offer unpalatable food and (c) offer palatable, but low energy food.

The purpose of this paper is to review the taste and odor preference of laboratory cats and dogs and to present a study of preferences of pet dogs in the home environment.

#### Preferences of Laboratory Cats

There have been relatively few studies of cats' food preferences (7,16). They show that cats prefer a new ration to a familiar one. The preference for the novel food may disappear if the familiar food is more palatable, but will persist if the newly introduced food is the more palatable of the two.

We know more about the tastes that cats dislike than about those they prefer. Cats dislike sucrose in water. This is true of the domestic cat as well as of the lion and other large cats (4,5). Sucrose in milk is accepted, however. Cats also dislike dilution of their food with a noncaloric solid and will not

consume food adulterated with kaolin or cellulose (8,12).

There are some interesting interactions between predatory behavior and taste preferences. Although some cats are not natural hunters and will not kill a rat when given the opportunity, almost all cats will kill rats if given access to food only once every two days. When given a choice between a rat they have killed and cat food, the cats choose to eat cat food. They also prefer a cold dead rat to a freshly killed warm one (1). Live prey is apparently the lowest item in a cat's taste hierarchy. The unpalatability of prey explains why so many pet cats bring home their catch and leave it uneaten. Hunger and prey killing are separate behaviors and it is only when domestic cats are semistarved that hunger can increase the expression of predatory behavior. Although rats are not a preferred food, fish is and cats prefer salmon over commercial cat food (fish, liver, chicken or beef flavored) (1). Chicken flavored commercial cat food is preferred to liver flavored (16). All of these tests employed a two-choice situation, but few cat owners present two different foods to their cat at the same time and base their cat food selection on the result.

#### Preferences of Laboratory Dogs

Almost all published work on canine taste preferences has also been the result of two-choice preference tests (10,13,14). The dogs studied either had two bowls of food available or were trained to press one of two levers with a paw to obtain a food reward. Pressing the lever that released one flavor rather than the other lever that released a second flavor of food was taken as evidence that the dog preferred the first flavor. Similarly, consumption of more food of flavor A than of flavor B was taken as evidence for a preference for flavor A. Side preferences could bias the apparent preferences, but in most studies these were carefully controlled by alternating the position of the feeding bowls.

The strongest taste preferences of dogs are for meat and for sugar. Dogs prefer meat to a high protein soybean and corn diet (10). They also prefer a diet containing sugar to one that does not and they prefer sugar in water to

water alone. Dogs do not like saccharin and will drink plain water rather than a saccharin solution (6). Apparently, there are species differences in sweetness perception because most humans have difficulty in differentiating saccharin and sugar flavors. There may be sex differences in sugar preferences among dogs. Females show a slightly greater preference than males for sugared diets (9).

Dogs show a strong preference for meat. There have been several studies of meat preferences of dogs (10,13,14). Unfortunately, none have tested every possible combination. Kitchell (13) found that dogs preferred chicken to horsemeat and to liver, and liver to horsemeat. The preferences of the same dogs were different when commercial dog food of the various meat flavors was tested. In that case they preferred horsemeat to chicken. The differences in preferences for pure meat flavors and commercial dog food indicate that other ingredients in the commercial foods are influencing preferences.

Two studies, one using an operant conditioning procedure and another using two bowl preferences, revealed similar preferences (10,14). The hierarchy of meat preferences appears to be beef, followed by pork, chicken, lamb and horsemeat (Figure 1). Even in the laboratory situation where meat was mixed with a bland diet there were differences in preferences depending on the fattiness of the meat. Lean beef

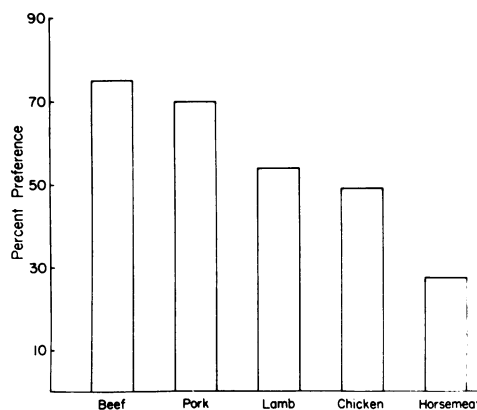


FIGURE 1. The average preferences of laboratory dogs for various meats, calculated from those of Houpt *et al* (10) and Lohse (14) by using the mean preference of one meat over the other four meats. They are based on two choice preferences either in the home cage or in an operant conditioning apparatus.

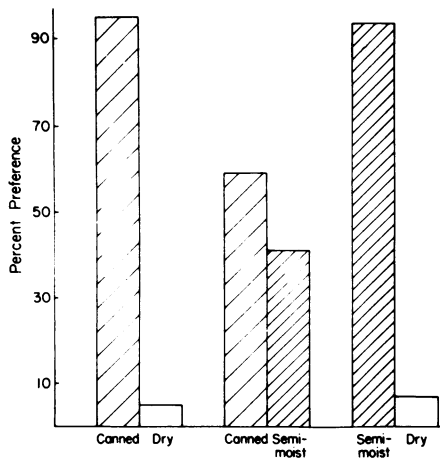


FIGURE 2. Preferences of dogs for various forms of food. Redrawn from Kitchell (13). These results are based on the choices made by dogs in an operant conditioning apparatus.

was preferred to lean pork, but pork with more fat was preferred to lean beef (10). The studies reported here utilized either a small number of dogs or only one breed in one environment. Individual dogs may have preferences quite different from those reported here.

Taste alone may not be responsible for food preference; texture and odor are also important. Dogs greatly prefer canned or semimoist food to dry food, but there is no preference for canned over semimoist (13) (Figure 2). Weaker preferences are seen for ground meat over chunks of meat and for canned meat over fresh meat. Canned chicken is preferred to fresh beef. Dogs prefer cooked meat to raw meat (Figure 3). Warm food is generally preferred to cold food (14).

Odor is also important in food selection, but is more important in location of food than in consumption of it. Although dogs, like cats, are initially attracted to food that smells but does not taste like meat, the attraction does not last and the dogs do not discriminate between meat odored and non-odored food. Unless odor is paired with taste, food preferences are not maintained. Odor is important in discrimination of one meat from another. The hierarchy of meat preferences seen in intact dogs disappears in anosmic dogs (dogs without the sense of smell). Dogs, experimentally anosmic following flushing of their nasal cavities with zinc sulfate, have no preference for one meat over another. Beef and horse-

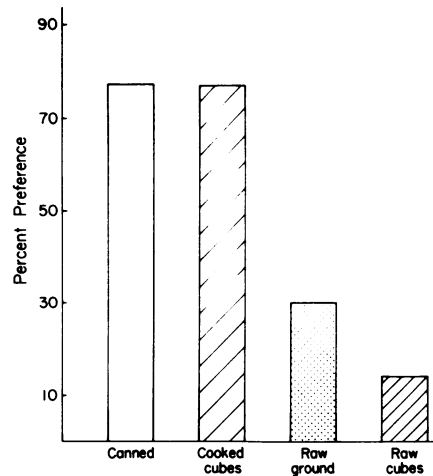


FIGURE 3. Preferences of dogs for types of meat preparation, calculated from those of Lohse (14) by using the mean preference of one preparation over the other three preparations. They are based on two choice preferences of laboratory dogs in an operant conditioning apparatus.

meat are equally preferred, although intact-dogs have an 85% preference for beef. Anosmic dogs cannot distinguish one meat from another, but still show a 90% preference for meat over a non-meat bland diet. In addition, anosmic dogs still have a preference for a diet containing sugar. Apparently, taste determines major food preferences and odor influences only minor or more subtle preferences such as one flavor of meat over another (10).

#### Preferences of Pet Dogs

Published information on food preferences is based solely on research on laboratory cats and dogs. Pet animals live in a much more varied environment and have had more complex past histories than laboratory animals. Both these factors may influence food preferences. In addition, the pet owner purchases the food presented to the animals. The food selected will be based on the owner's subjective evaluation of the dog's preference or needs. It was of considerable interest, therefore, to test dog foods in the home environment and use the owner's evaluation as the measurement of preference. These results were then compared with preferences for the same foods shown by laboratory dogs in a controlled environment. In addition, correlations were sought between preferences and certain variables or characteristics of the pet dogs

and their physical and social environment.

#### Owner Ratings of Pet Dog Preferences

Sixty dogs were studied. All of the dogs had been receiving dry food as part or all of their diet. Eighteen different American Kennel Club recognized breeds accounted for 52% (32/60) of the dogs. The rest were mixed breed dogs. Half of the population was male. Four male dogs were castrated and 26 intact. Six females were intact and 24 had undergone ovariectomy. Couples or families owned the dogs; no one lived alone with a dog. The person who bought and prepared the food, always a woman, was designated as the owner. The owners were asked many questions; those of importance for this paper are: (a) the content of typical meals, (b) the dog's weight, (c) the dog's sleeping place (bedroom or elsewhere) and (d) the person to whom the dog was most attached (the man or woman) or both members of the couple equally. The person who normally fed the dog rated the animal's response to each food. Three different flavors of dry food were tested. These dry foods were used by the owner in place of the dry food they had been using. The usual routine and method of feeding employed by the owner were continued during the test. Some served dry food alone. Others supplemented it with other dog food or table scraps. After serving the dog each test food for an average of seven days the owner rated the dog's response to each food on a five-point scale: strongly liked (+2), liked (+1), neutral (0), disliked (-1), and strongly disliked (-2). Analysis of variance (ANOVA), F test and nonpaired t-test were used to test mean owner ratings for significant differences. Ratings on the three test foods were compared. In addition, for each test food, ratings were compared between groups of dogs selected for certain physical and social characteristics.

Mean owner ratings of the test foods were close to neutrality (0) with large standard deviations for all three foods (Smith, Kronfeld and Banta, in preparation). Nevertheless, some interesting differences in food preference emerged correlating with the following physical and social factors: content of typical

meals, dog's body weight, its sleeping place and its relationship to the owner who feeds it (Table I). Dogs fed food 1 supplemented with dog food or table scraps had a greater preference for that food than dogs fed food 1 alone ( $t = -2.05, p \leq 0.045$ ). Large dogs had a greater preference for food 2 than small dogs ( $F_{2,57} = 5.33, p \leq .008$ ). Dogs that slept in a bedroom had a greater preference for food 3 than did dogs that slept elsewhere and were, presumably, not as attached to the family ( $t = -2.18, p \leq 0.03$ ). Food 2 was preferred by dogs that were more socially attached to the man in the household, but not by dogs that were more socially attached to the woman or were equally attached to both ( $t = 3.27, p \leq 0.002$ ).

Laboratory dogs, however, had marked preferences among the test foods, preferring food 3 to food 2 and food 1 to food 3 (Smith, Kronfeld and Banta, in preparation). Among the pet dogs some individuals eagerly accepted all three foods. Others found one or more of the foods unacceptable or less

acceptable, but did not agree on which foods to distinguish in this manner. This suggests that pet dogs (a) have more variable food flavor preferences than laboratory dogs have and (b) have an acceptability range for food flavors not based on flavor alone. Other variables examined (Table I) suggest aspects of the pet dog and its environment that seem to be associated with acceptability. Further research is needed to determine the nature of the association (e.g. cause-effect). It was also found, in a related study (Smith, Kronfeld and Banta, in preparation), that there are sex differences in some aspects of food preferences of pet dogs. Males were reported to like two of these three foods significantly less than did females. In addition, owners reported that males were finicky or selective about dog food twice as often as owners reported that females were. Because most male dogs were intact and most females spayed, the underlying basis for the difference in selectivity between the sexes remains unclear.

Earlier studies have also indicated that owner variables affect pet food intake and obesity. Anderson (3) noted that more obese people than lean people owned obese dogs. In addition, older people tended to own obese dogs while younger people owned lean ones. Dogs fed commercial dog foods tended to be less obese than those fed table scraps. Because obesity can result from too little energy output as well as too much energy input, it is unclear whether old and obese people are more sedentary and, therefore, exercise their dogs less or whether they fed the dogs more food or calorically more dense food.

## CONCLUSION

A large percentage of dogs are obese (2,3,15). The treatment is simple: reduce caloric intake. Despite the simplicity and economy of that treatment, dog owners find it difficult to reduce the body weight of their dogs. This is the result of the high palatability of commercial pet foods and of the table scraps that many obese dogs are fed. A hungry, but fat, dog will continue to beg for palatable food in the presence of a low calorie diet or after it has consumed a small portion of a calorically dense food. Owners can be advised to resist the obese dog's barks, begs and whines and to feed it outside the kitchen so the animal will not see and smell other food. Obesity is rarely a problem in the cat, but food preferences should be considered when treating the more commonly encountered anorexic cat.

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TABLE I  
MEAN RATINGS OF CANINE PREFERENCES BY OWNERS ON TEST FOODS  
BY SELECTED CHARACTERISTICS

	N	Food 1		Food 2		Food 3	
		X	s.d.	X	s.d.	X	s.d.
A. Usual dry food served							
alone	18	-0.11	1.13	0.06	1.55	0.06	1.35
with dog food or table scraps	42	0.52	1.09	0.69	1.14	0.52	1.07
<i>p</i>		0.045		n.s.		n.s.	
B. Weight (kg)							
< 18	20	0.25	1.29	-0.20	1.51	0.25	1.37
18-32	20	0.20	1.15	0.70	1.17	0.40	1.10
> 32	20	0.55	0.95	1.00	0.86	0.50	1.05
<i>p</i>		n.s.		0.008		n.s.	
C. Sleeping location at night							
Bedroom	35	0.11	1.16	0.26	1.36	0.11	1.18
Other	25	0.64	1.04	0.84	1.14	0.76	1.05
<i>p</i>		n.s.		n.s.		0.033	
D. Attached more to whom*							
Man	17	0.65	0.93	1.24	0.83	0.65	1.22
Woman	38	0.21	1.12	0.26	1.35	0.29	1.16
<i>p</i>		n.s.		0.002		n.s.	

Ratings: Strongly disliked (-2), Disliked (-1), Neutral (0), Liked (+1), Strongly liked (+2).

Probabilities were calculated using ANOVA, F test and non paired t-test with 1 d.f.

\*When family contains adults of both sexes.

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## LETTER TO THE EDITOR

### Mastitis Indicator

DEAR SIR:

This letter is to describe the field evaluation of a new product designed to aid in the detection of mastitis in dairy cows. The device is called "Mastitis Indicator" and is manufactured by Ambic Equipment Ltd. of England and marketed by Alfa-Laval of Peterborough, Ontario. It consists of a clear plastic outer shell surrounding a removable wire screen. It is inserted into the long milk tube between the claw and the pipeline or receiver jar and is designed to trap any flakes or clots which are present in the milk.

Four of these devices were installed on a local dairy farm that milks approximately 70 cows in a double two individual stall parlour. The dairyman routinely strips all cows before

milking in order to stimulate milk let down and to aid in the detection of clinical mastitis. In our experience, these screens provide an effective way of detecting clinical mastitis because clots generally appear on the screen at the same time as they are detected in the foremilk. However, they do not provide any earlier warning than stripping does.

In addition, we collected composite milk samples during one afternoon milking in order to compare the amount of debris visible on the screen with the somatic cell count. Five cows showed a few small clots which the manufacturer states do not necessarily indicate mastitis. Four of these five cows had somatic cell counts greater than 500 000, indicating the presence of subclinical mastitis in at least one quarter. The other cow had a somatic

cell count of 172 000. However, there were 15 other cows with cell counts over 500 000 for which no clots at all were observed on the screen. Clearly, the device is not a reliable indicator of subclinical mastitis but it appears that cows showing any clots at all on the screen should be investigated further by performing a somatic cell count or California Mastitis Test on individual quarter samples.

So far the dairyman has found the devices to be easy to use, durable and easy to clean both during and after milking. They appear to offer dairymen a useful additional tool in the detection of clinical mastitis.

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To encourage progress in the field of small animal medicine and surgery, General Foods Limited, through Gaines Professional Service Centre, has made available the "Gaines Veterinary Award".

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Primary consideration shall be given to *Achievements within the preceding five years and to those individuals still active in the profession.*

Nominations for the 1981 Award may be made to the

CVMA Executive Committee by anyone, no later than April 30, 1981. Each nomination shall include a description of the work done by the one nominated, a statement of how the work has contributed to the advancement of small animal medicine and surgery, a pertinent bibliography (if any) and suitable biographic information.

The Award will consist of a bronze and marble plaque and a \$1000 cash award, and will be presented at an appropriate time during the annual Convention.

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**Executive Secretary  
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