Can People Distinguish **Pâté** from **Dog Food**?

John Bohannon, Robin Goldstein, and Alexis Herschkowitsch

The diet of domestic dogs in most of the world consists of scraps, the by-products of human food preparation and consumption. Indeed, as noted by J. W. S. Bradshaw in the 1991 *Proceedings of the Nutrition Society* article "Sensory and Experiential Factors in the Design of Foods for Domestic Dogs anad Cats," the close overlap between the diet of *Canis familiaris* and *Homo sapiens* may have been crucial for its evolution as a human companion species.

According to K. E. Michel's 2006 article "Unconventional Diets for Dogs and Cats," that appeared in the *Journal of Small Animal Practice*, commercialized dog food is a recent phenomenon, becoming popular only in relatively wealthy industrialized nations since the mid-20th century. Nonetheless, it has grown rapidly into a $45 billion industry. Intense competition for market share has kept the price of dog food low compared to edible goods for humans, even those such as liverwurst and Spam that are derived from similar meat industry by-products.

In spite of its attractive price, commercial dog food is left uneaten by humans. One valid concern is the risk of food poisoning. As reported by D. Barboza in his *New York Time*s article "China Makes Arrest in Pet Food Case," the discovery in 2007 that several commercial brands of pet food were contaminated with melamine. The presence of melamine, an industrial fire retardant that can cause renal failure, caused widespread concern. Partly as a result of this scandal, "organic" pet foods have gained significant market share. For example, Newman's Own Organics Premium Pet Food is made exclusively from "human grade" agricultural products.

Even if dog food is safe for humans to eat, however, it must overcome considerable prejudice. Part of the barrier is the perception that dog food is unpalatable. According to Bradshaw, the pet food industry has invested decades of research and development to make its products more appealing to the humans who purchase and handle the food. Pickering reports on the use of human volunteers to compare the sensory qualities of pet food formulae. The aim has been to reduce feelings of disgust while owners serve the food to their pets, rather than to make it more palatable for human consumption. Schaffer's book describes how the diet and lifestyle of dogs in the industrialized world has converged with that of humans. Could dog food be approaching acceptance as a comestible good fit for humans?

Assessing the intrinsic palatability of dog food is a first step in answering this question. Controlling for bias is a challenge. Expectation has a large effect on the hedonic tone of food. As reviewed by R. Deliza and H. J. H. MacFie in their 2007 *Journal of Sensory Studies* article "The Generation of Sensory Expectation by External Cues and its Effect on Sensory Perception and Hedonic Ratings: A Review," there are many

Table 1—Raw data

Subject	Ranking of samples A	B	C	D	E	Which is dog food?
1	1	4	3	2	5	E
2	1	4	5	3	2	D
3	5	2	1	4	3	E
4	1	2	5	3	4	B
5	2	4	5	3	1	B
6	1	5	4	2	3	E
7	2	4	5	1	3	E
8	1	2	5	4	3	E
9	1	4	5	3	2	D
10	2	1	5	3	4	A
11	3	2	5	1	4	C
12	4	2	5	1	3	E
13	1	4	5	4	4	E
14	1	5	4	3	2	C
15	1	4	5	3	2	C
16	3	2	1	5	4	E
17	3	4	5	2	1	B
18	1	3	5	2	4	B
Sums:	**34**	**58**	**78**	**49**	**54**	

Table 2— Distribution of Rankings

		A Duck liver mousse	B Spam	C Dog food	D Pork liver pate	E Liver-wurst
Ranking (n, %)	1st	10 (56%)	1 (6%)	2 (11%)	3 (17%)	2 (11%)
	2nd	3 (17)	6 (33)	0 (0)	4 (22)	4 (22)
	3rd	3 (17)	1 (6)	1 (6)	7 (39)	5 (28)
	4th	1 (6)	8 (44)	2 (11)	3 (17)	6 (33)
	5th	1 (6)	2 (11)	13 (72)	1 (6)	1 (6)
	Rank sums	**34**	**58**	**78**	**49**	**54**

Percent totals by row might not add to 100% due to rounding. The rank sum is the sum of the ranks given by all 18 subjects to each product.

levels at which expectation can have its effects, and many mechanisms have been proposed. In *Try It, You'll Like It*, L. Lee, S. Frederick, and D. Ariely emphasize that the effects can be subtle and depend on when information is gained relative to consumption. In *Do More Expensive Wines Taste Better? Evidence From a Large Sample of Blind Tastings*, R. Goldstein, J. Almenberg, A. Almenberg, J. W. Emerson, A. Herschkowitsch, and J. Katz showed with respect to tasting expensive wines, measuring the hedonic tone free of bias requires a double-blind trial.

A double-blind trial is a comparative test of two or more inputs (treatments for disease in a clinical trial; edible materials in taste tests) in which neither the subject nor the person administering the test knows which input is being given to a subject. Neither the subject nor the clinician should know or have any preferential attitudes about the input being received. The researcher, of course, controls and keeps track of everything using confidential codes.

We predicted that in a double-blind taste test, subjects would be unable to identify dog food among five samples of meat products with similar appearance and texture, thus allowing them to assess palatability independent of prejudice. We hypothesized that if the dog food were ranked favorably relative to human comestible goods with similar ingredients, it should be considered fit in terms of taste for human consumption.

Materials, Methods, and a Free-for-All

The dog food tested was Newman's Own Organics Canned Turkey & Chicken Formula for Puppies/Active Dogs. The four meat products used for comparison were duck liver mousse ("Mousse de Canard," Trois Petits Cochons, New York); pork liver pâté ("Pâté de Campagne," Trois Petits Cochons, New York); supermarket liverwurst (D'Agostino); and Spam (Hormel Foods Corp., Austin, Minnesota).

Each product was pulsed in a food processor to the consistency of mousse. Samples were allocated to serving bowls, labeled A through E, garnished with parsley to enhance presentation, and chilled in a refrigerator to 4°C. To allow one researcher (Bohannon) to perform a double-blind trial, the preparation was carried out by the co-authors (Goldstein and Herschkowitsch). To ensure safety, the researchers did taste the dog food before the preparations were made.

As previously reported by Bohannon, the experiment was carried out between 7 p.m. and 10 p.m. on December 31, 2008, in Brooklyn, New York. After fully disclosing the aim of the experiment—to evaluate the taste of dog food—18 subjects volunteered. Subjects were college-educated male and female adults between the ages of 20 and 40.

The five sample dishes, A through E, were presented to subjects with a bowl of crackers ("Table Water Crackers," Carr's of Carlisle, UK). The identity of the samples, unknown to the researcher, was as follows: A, duck liver mousse; B, Spam; C, dog food; D, pork liver pâté; and E, liverwurst. Subjects were asked to rank the "tastiness" of the samples relative to each other on scale of 1 (best) to 5 (worst). No ties were allowed.

Due to the small number of subjects, we used the following design. Subjects sat down around a table in groups of three to five. We laid out the samples in the middle of the table in order (A–E) along with a big plate of crackers. We instructed them to "try all the pâtés, comparing their tastes until you are satisfied that you can rank your preferences based on flavor." The subjects had a data sheet in front of them with a table (sample A–E and a column for ranking 1–5). We observed them trying samples multiple times in a variety of orders.

It was a free-for-all. They took their time and made careful choices. The ordering of the samples on the table could, of course, have had some effect, but it should have been reduced by the arrangement of subjects and the fact that they made multiple comparisons of the samples at will. They were not permitted to discuss or interact with each other before submitting their evaluations in writing. Subjects were not allowed to discuss the tastes with each other until after the evaluations were submitted. They were asked not to make faces or display signs of pleasure or displeasure, although there was no way to enforce perfect compliance with facial expressions, as some responses were more or less involuntary. After the rankings were recorded on data sheets, the subjects stated which of the five samples they believed to be dog food.

Rating the Best and Wurst

The dog food (sample C) was ranked lowest of the five samples by 72% (13) of subjects. The duck liver mousse (sample A) was rated as the best by 55% (10) of subjects. Between these extremes, the majority of subjects ranked Spam, pork liver pâté, and liverwurst in the range of second to fourth place (see Tables 1 and 2). The rank sum is the sum of the ranks given by all 18 subject to each product. Duck liver mousse has the lowest rank sum (34), and dog food had the highest (78). The others are in the middle and quite similar. A graphical presentation of the data is given in Figure 1.

Table 3—Differences in Rank Sums with Significant Results Indicated

		D	E	B	C
		49	54	58	78
A	34	15	20	24	***44 (p<0.01)***
D	49	–	5	9	***29 (p<0.10)***
E	54	–	–	4	24
B	58	–	–	–	20

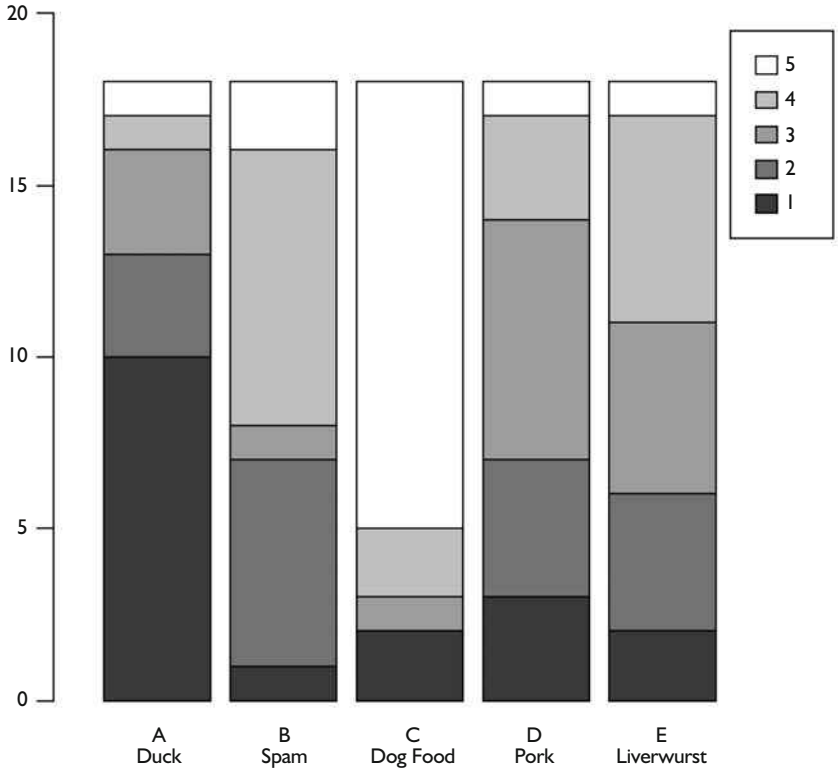

Figure 1. Distribution of rankings of five food items

The rankings were analyzed using the multiple comparison procedure described by Christensen and colleagues. The method compares the observed differences in rank sums to the differences in rank sums that would be observed if rankings were purely random (see Table 3). Tables in the article apply to situations with 20 panelists and six items being ranked. The table goes down to only 20 panelists, but the critical values are changing slowly. For 18 panelists, by extrapolation we'll use 37 for p=0.01; 31 for p=0.05; and 28 for p=0.10. This means only A (duck liver mousse) is significantly different from C (dog food, difference 44, p-value less than 0.01), and D (pork liver pate) is marginally significantly from C (dog food, difference 29, p-value less than 0.10). We can conclude, even with the small number of volunteers, for some foods people have a clear preference over dog food. The three items with intermediate ranks certainly do not appear to be significantly different in their evaluations.

Could the subjects identify the dog food? Only three of 18 subjects correctly identified sample C as the dog food. If subjects were randomly guessing, you would expect on average 3.6 (=18(.2)) to

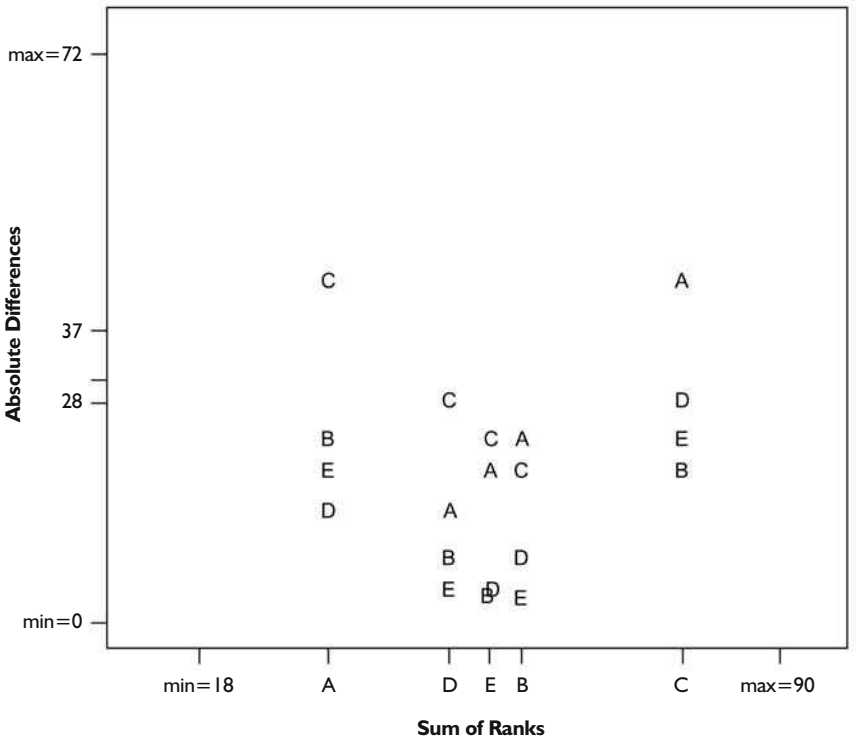

Figure 2. Graph of absolute differences in sum of ranks versus sum of ranks. Sums of ranks for 18 raters of five items range from 18 to 90. Absolute differences in ranks range from 0 to 72. Absolute differences above 37 are significant at the 0.01 level (bold italics). Absolute differences above 28 are significant at the 0.10 level (bold). Note that there are two points for each comparison (e.g., A–C and C–A). Symbols B and D above E are toggled for better visibility.

guess correctly. The probability of getting 0, 1, 2, or 3 correct guess when the chance of guessing correctly is 0.20 is 0.02, 0.08, 0.17, and 0.23, respectively. Thus a (one-sided) *p*-value for assessing the hypothesis of random guessing was about 0.50. Clearly, in the context of this experiment, the volunteers could not identify the dog food.

Conclusions and Paradoxes

Subjects significantly disliked the taste of dog food compared to a range of comestible meat products with similar ingredients. Subjects were not better than random at identifying dog food among five unlabeled samples. These two results would seem to be paradoxical. Why did the 72% of subjects who ranked sample C as worst in terms of taste not guess that sample C was dog food?

One possibility is that slight differences in appearance and texture skewed the guesses. A full 44% (n=8, 44%) of subjects incorrectly chose liverwurst (sample E) as the dog food. As the texture of samples had been equalized with a food processor, it is possible that subjects were attempting to discern which sample was dog food based on taste, not texture. The explanation we find more compelling, however, is that subjects were primed to expect dog food to taste better than it does. As we assured subjects that the experience would not be disgusting, they might have excluded the worst-tasting sample from their guesses.

Regardless of the cause of the distribution of guesses, we are confident that the comparison of taste was free of prejudice that would have been present had the volunteers known before tasting the identity of the products. Even with the benefits of added salt, a smooth texture, and attractive presentation, canned dog food is unpalatable compared to a range of similar blended meat products. We also conclude that to make distinctions between products that taste very similar, one needs a much larger party with far more volunteers.

Further Reading

Barboza, D. China makes arrest in pet food case. *New York Times*, May 4, 2007.

Bohannon, J. 2009. Gourmet food, served by dogs. *Science* 323(5917):1006. DOI: 10.1126/science.323.5917.1006b [*http://www.sciencemag.org/cgi/content/full/323/5917/1006b*]

Bradshaw, J. W. S. 1991. Sensory and experiential factors in the design of foods for domestic dogs and cats. *Proceedings of the Nutrition Society* 50:99–106.

Bradshaw, J. W. S. 2006. The evolutionary basis for the feeding behavior of domestic dogs (*Canis familiaris*) and cats (*Felis catus*). *Journal of Nutrition* 136:1927–1931.

Christensen, Z. T., Ogden, L. V., Dunn, M. L., and Eggett, D. L. 2006. Multiple comparison procedures for analysis of ranked data. *Journal of Food Science* 71(2):S132–S143.

Deliza, R., and MacFie, H. J. H. 2007. The generation of sensory expectation by external cues and its effect on sensory perception and hedonic ratings: a review. *Journal of Sensory Studies* 11(2):103–128.

Goldstein, R., Almenberg, J., Almenberg, A., Emerson, J. W., Herschkowitsch, A., and Katz, J. 2008. Do more expensive wines taste better? Evidence from a large sample of blind tastings. *Journal of Wine Economics* 3(1):1–9.

Lee, L., Frederick, S., and Ariely, D. 2006: Try it, you'll like it: The influence of expectation, consumption, and revelation on preferences for beer. *Psychological Science* 17(12):1054–1058.

Michel, K. E. 2006. Unconventional diets for dogs and cats. *Small Animal Practice* 36(6):1269–1281.

Pennisi, L. 2002. Canine evolution: A shaggy dog story. *Science* 298(5598):1540–1542.

Pickering, G. J. 2008. Optimizing the sensory characteristics and acceptance of canned cat food: Use of a human taste panel. *Journal of Animal Physiology and Animal Nutrition* 93(1):52–60.

Schaffer, M. 2009. *One nation under dog: adventures in the new world of Prozac-popping puppies, dog-park politics, and organic pet food*. New York: Holt and Co.