A Sensory Approach to Dry Dog Food

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Content

- Background: Missing information about sensory characteristics of pet food

- Sensory testing: descriptive & consumer

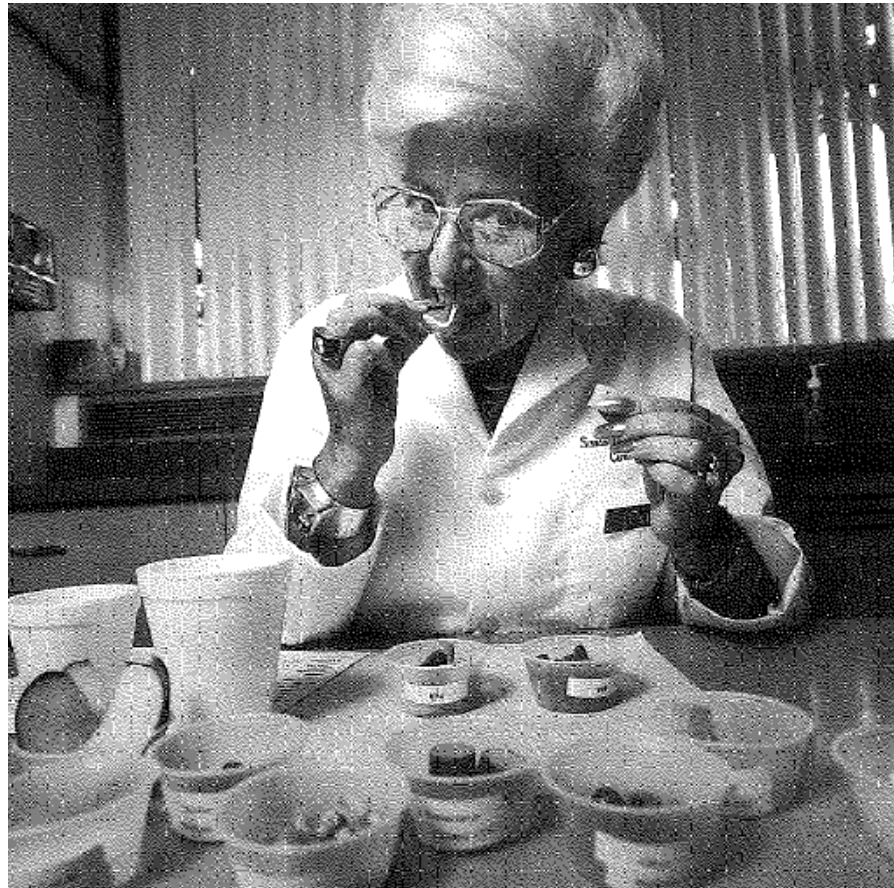- Results

- flavor

- aroma

- liking

Current situation

- Few publications using human sensory analysis:
- Koppel et al., 2013
- Di Donfrancesco et al., 2012
- Pickering, 2009 a,b
- Lin et al., 1998

- Ingredient effects:

Felix et al., 2012; Kumar et al., 2011; Carciofi et al., 2009

- Processing effects:

Tran et al., 2008; de Brito et al., 2010; etc.

Why?

- Schiff, 2006

Preferences and palatability of dog food

- Dogs prefer beef – pork – chicken – lamb – horsemeat;
- Cooked over raw meat;
- Warm over cold meat;
- Canned over dry food;
- Pet dogs have more variability in flavor preferences than kennel dogs;
- Meaty <u>odor</u> needs to be paired with meaty <u>flavor</u>;

Houpt and Smith, 1981.

Objectives

- Determine flavors and tastes present in dry dog foods

- Determine sensory and instrumental aroma relation

- Determine acceptance drivers

Take-home message

- Sensory analysis provides insight to dry dog food flavor and acceptance

- Dry dog foods have complex flavor and aroma

- Consumers may better accept visually stimulating products

Sensory evaluation

- Use our senses (sight, smell, touch, taste, hearing) to evaluate product properties such as appearance, aroma, flavor, texture

Materials & Methods

- 24 commercial dry dog food samples

Materials & Methods

- Descriptive sensory analysis: Modified flavor profile

- 5 highly trained panelists

- Develop lexicon: appearance, texture, aroma, & flavor

- Evaluate the samples

Materials & Methods

- GC-MS SPME volatile content sample subset

- 6 grain-free samples

- 8 grain-added samples

- Correlate volatiles and aroma data

Materials & Methods

- CLT – consumer acceptance of sample subset
- 100 dog owners in Kansas City area
- Scale 1 – dislike extremely, 9 – like extremely
- 8 samples

Lexicon for dry dog foods

- Identified 70 aroma, flavor, appearance, and texture attributes:
- Process-related: burnt, cooked, fermented, toasted
- Ingredient-related: spice complex, fish, grain, liver, meaty, oily, vitamin, soy
- Packaging/shelf-life related: plastic, cardboard, musty, stale, oxidized oil
- Texture: Initial crispness, fibrous, gritty, hardness
- Appearance: uniformity, color, specks, surface roughness
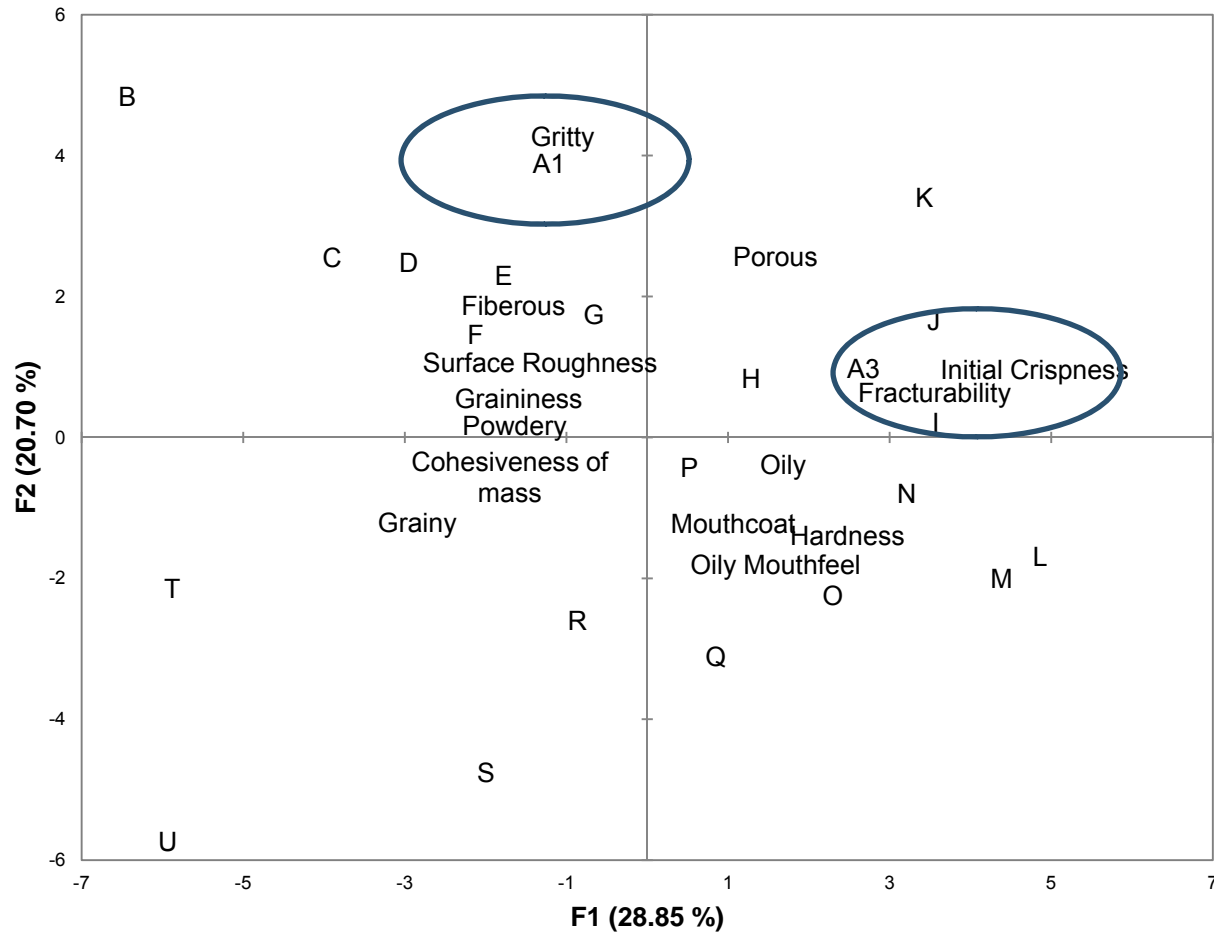
- Di Donfrancesco et al., 2012

Meat flavor?

- Very difficult to distinguish specific meats in these samples

Product map by texture
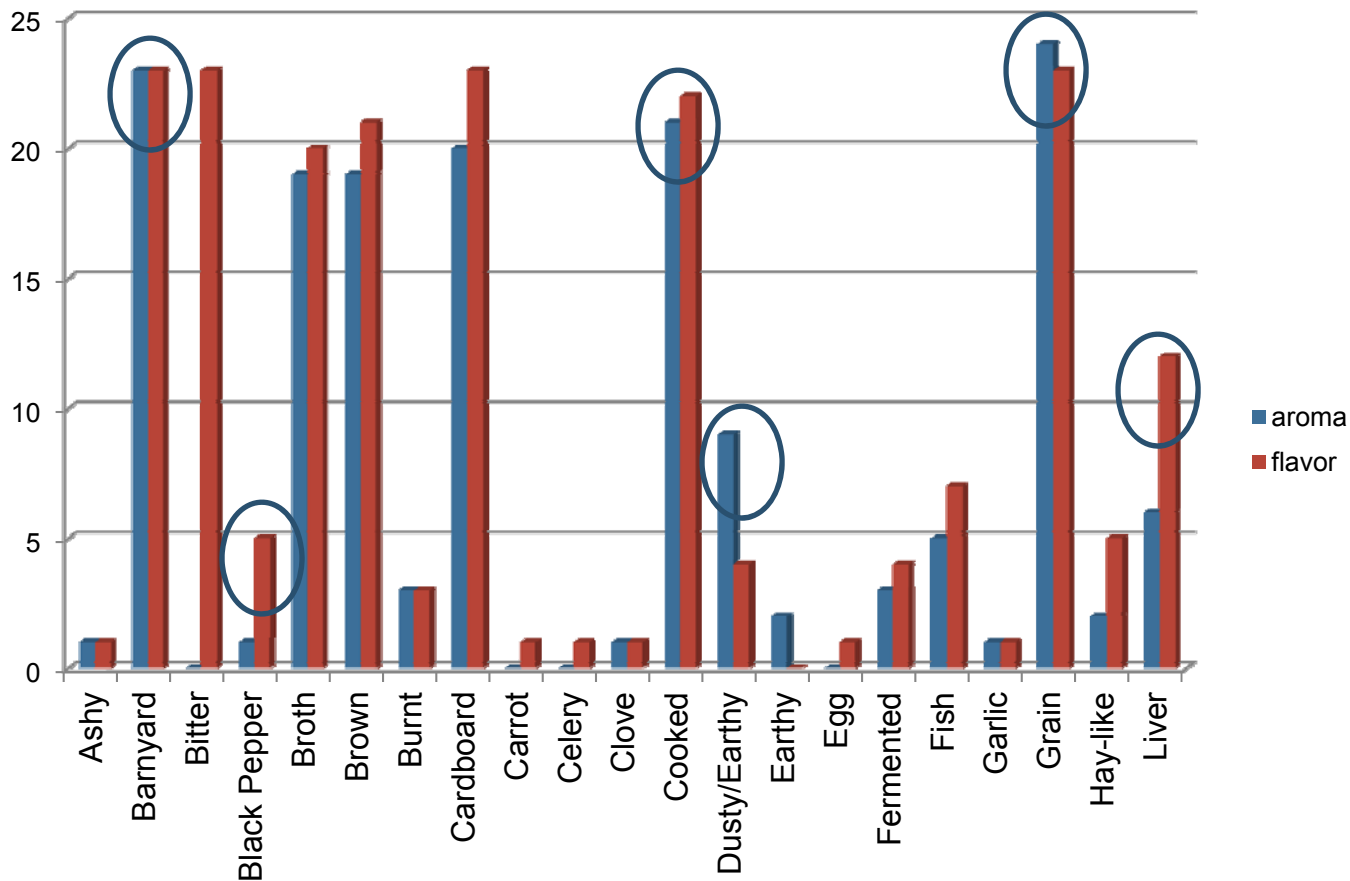

Biplot (axes F1 and F2: 49.54 %)

Flavor evaluation gives more information

- Flavor: 13 – 20 attributes per sample
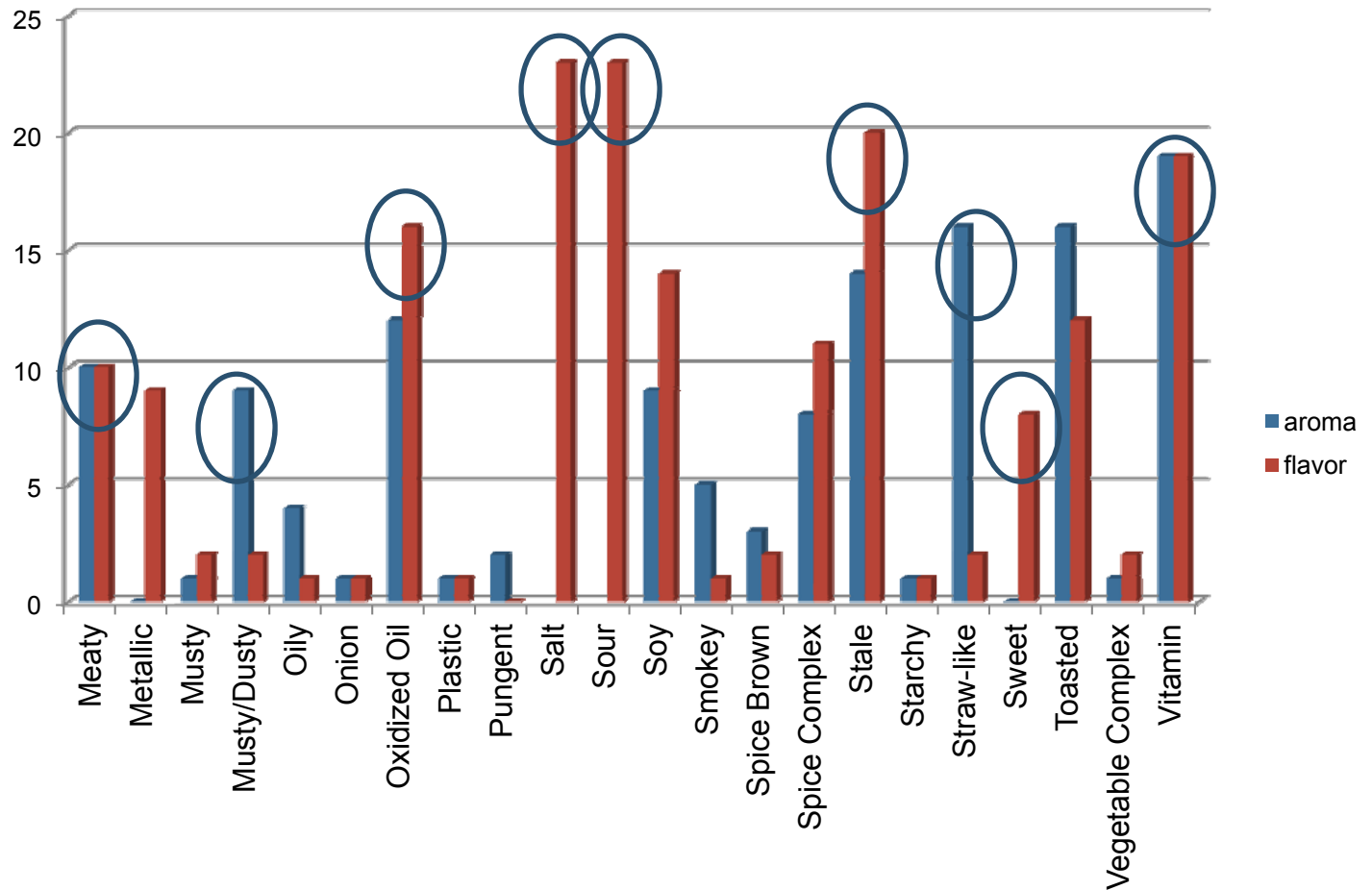- Aroma: 7 – 16 attributes per sample

Flavor and aroma attributes

Flavor and aroma attributes

Brothy
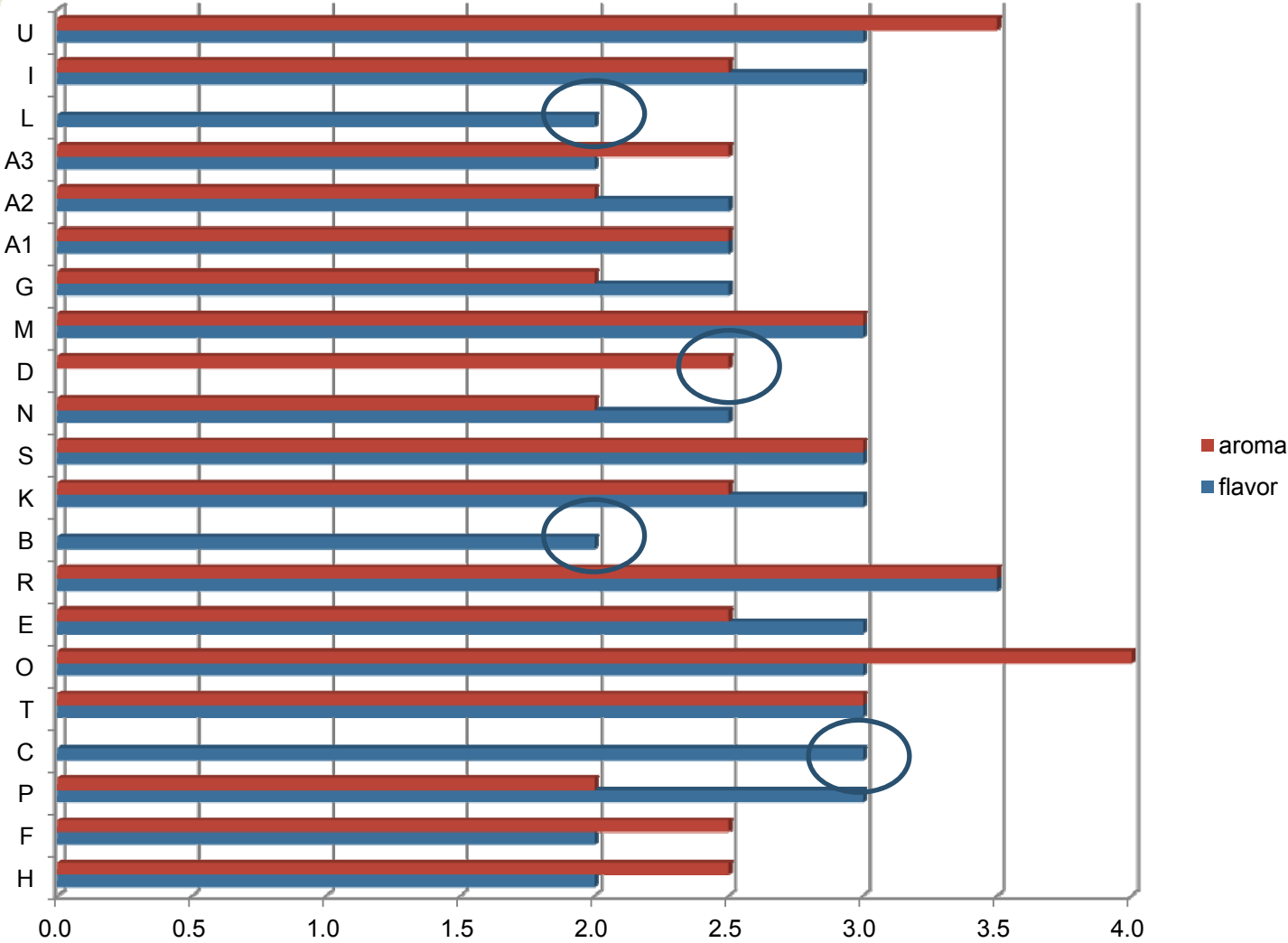
Oxidized oil
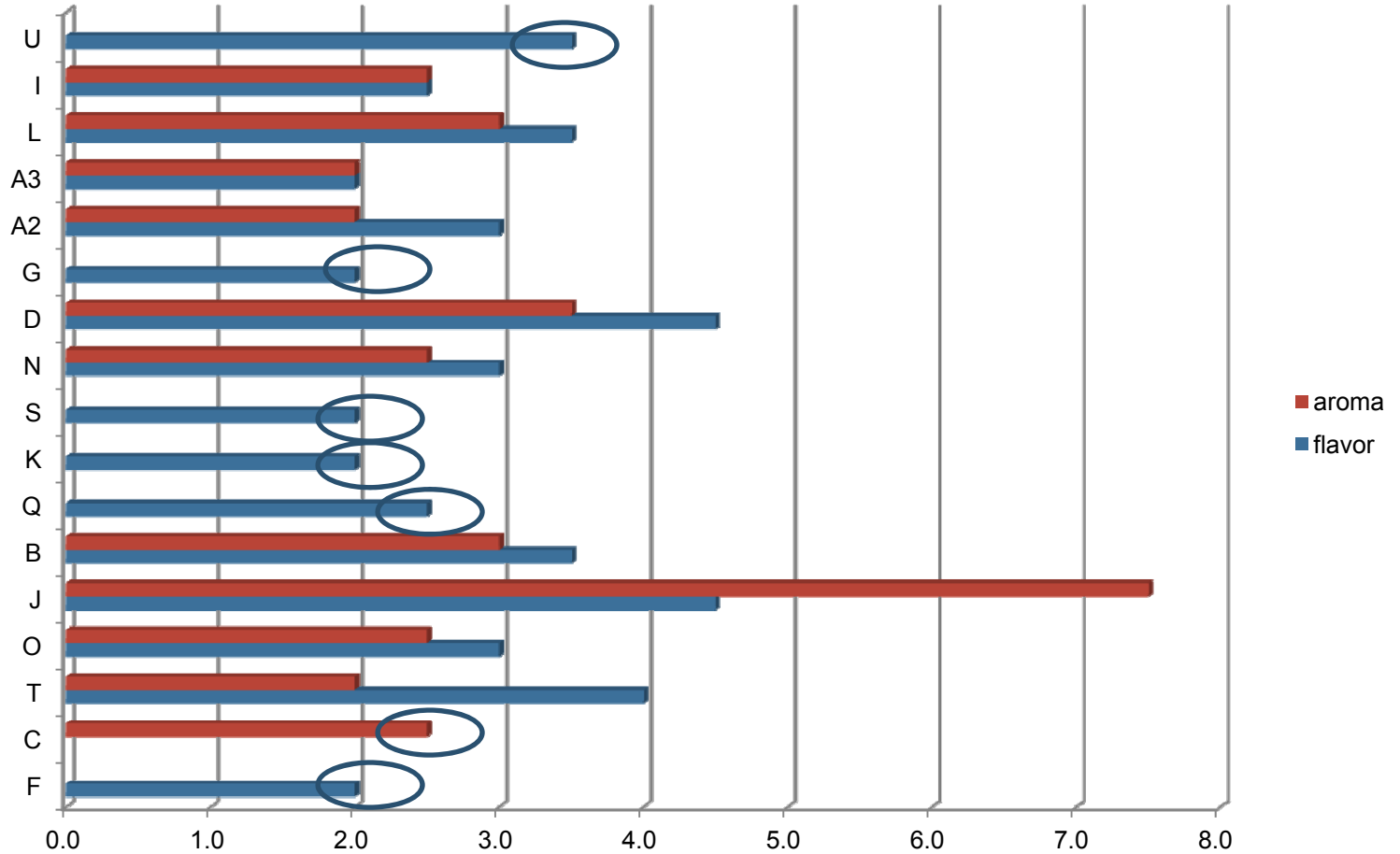
Complex aroma & flavor profile: sample H

Legend: Aroma (blue), Flavor (red), Aftertaste (green)

Categories: Barnyard, Bitter, Black pepper, Broth, Brown, Cardboard, Dusty/earthy, Fish, Grain, Hay-like, Liver, Salt, Sour, Spice brown, Spice complex, Stale, Straw-like, Toasted, Vitamin
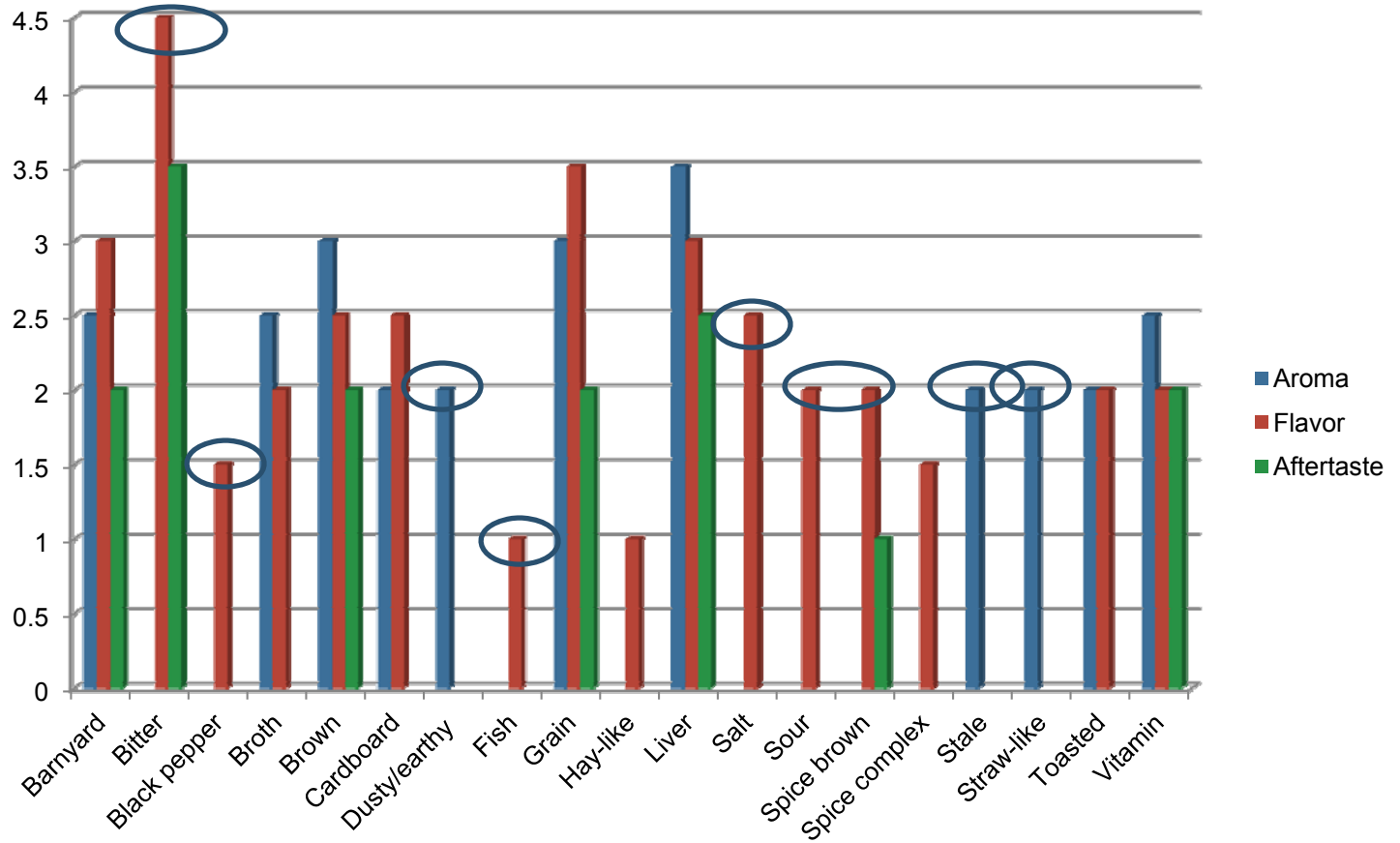
Aroma and flavor dynamics

Sample	Order of impression	Aroma	Flavor
C	1	Barnyard	Cardboard
	2	Oxidized Oil	Barnyard
	3	Brown	Liver, Bitter
T	1	Grain	Sour
	2	Straw-like	Barnyard
	3	Barnyard	Bitter
O	1	Brown	Liver
	2	Vitamin	Fish, Oxidized Oil
	3	Broth	Bitter

Dog food aromatics

- Aldehydes most abundant
- Pyrazines, ketones, alcohols present in most samples
- Overall grain-free samples less aromatic than grain-added samples

- Koppel et al., 2013

Volatiles content variation

Group	Grain-added (µg/kg)	Grain-free (µg/kg)
Alcohols	0.36-4.66	0.18-0.97
Aldehydes	6.64-21.07	6.21-10.40
Ketones	0.20-5.43	0.15-3.27
Pyrazines	0.00-4.17	0.00-2.16
Total	10.60-30.35	8.24-17.37

CLT samples

The consumers

	<25K	25-49K	50-74K	75-100K	>100K
Income	3	14	26	33	24

	18-24	25-34	35-44	45-54	55-64	>65
Age	2	25	22	35	12	4

- 66% single-dog households, 29% 2-dog, and 5% 3-dog
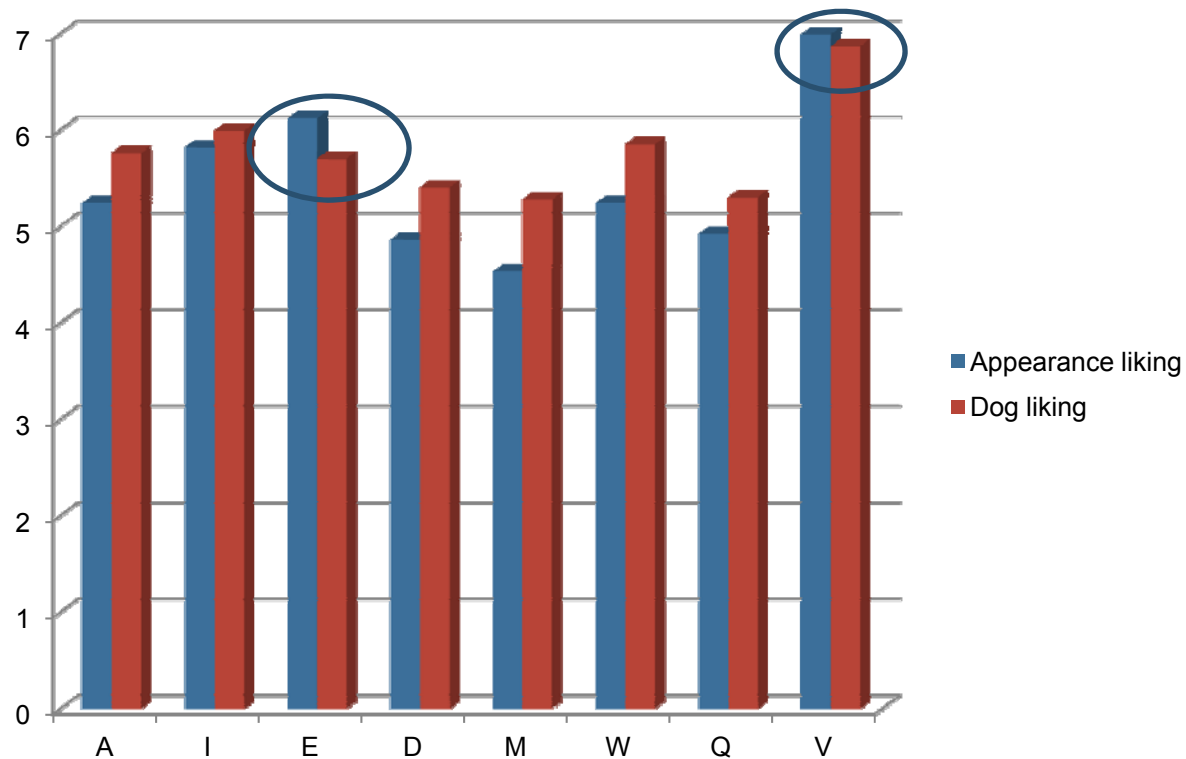- Most fed brands: Science Diet, Purina, Kibbles'n'Bits, and others
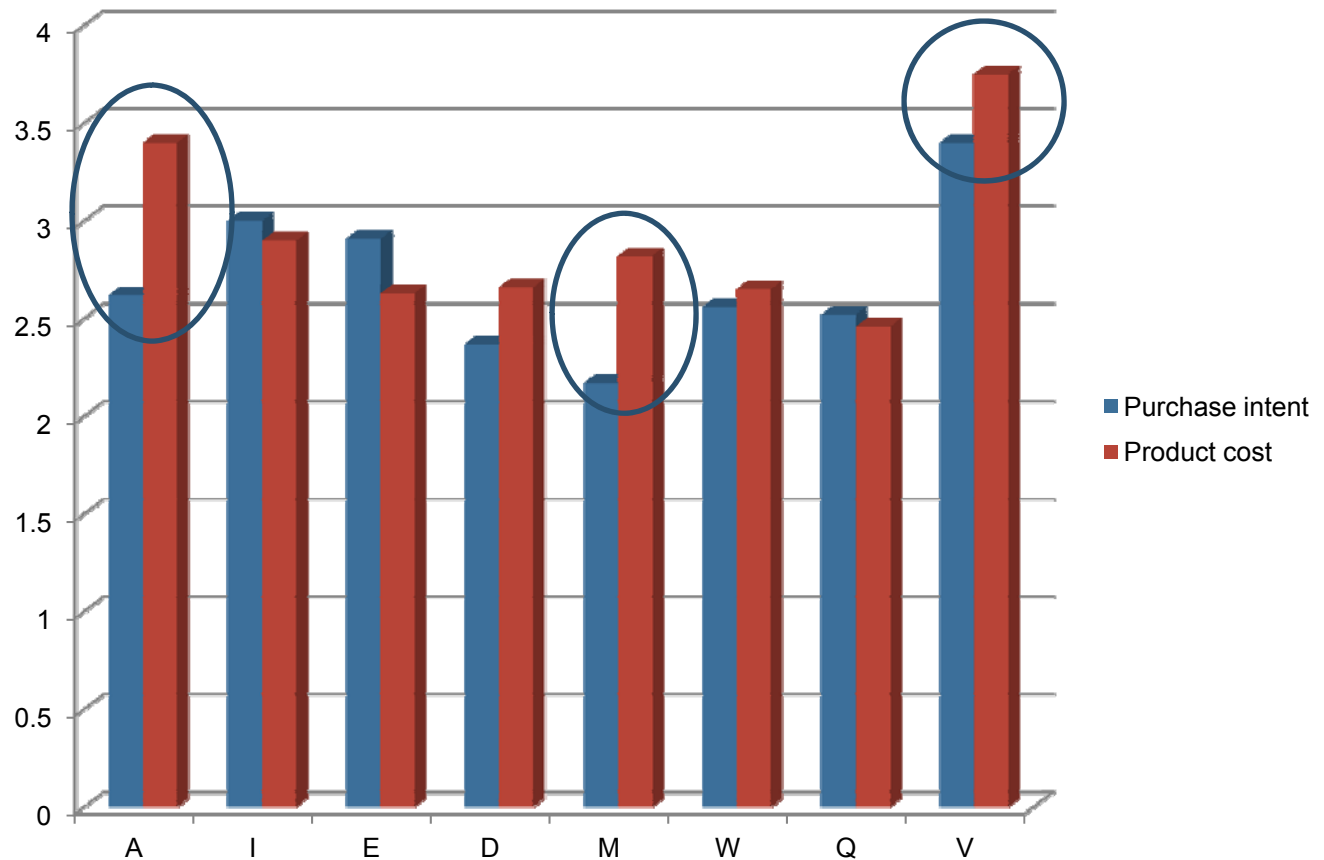
Consumers expect dog to like food

Purchase intent does not depend on assumed cost alone

Open-ended questions

- A: resulted in abundant comments on likes (~40) and dislikes (~50) of meaty bits

- I: concerns about crumbs leaving a mess after eating

- W: consumers thought it looked like cheerios cereal and that their children would eat it

- V: liking comments ~40, disliking ~30; some were concerned about added cost of variation of colors and shapes

- Overall it seemed shapes different from traditional cylinder are considered weird

Consumer clusters

- 6 clusters

- Few relations with income

- Age, gender, and education not significant for liking in clusters

Overall liking in clusters

	1 (N=19)	2 (N=17)	3 (N=15)	4 (N=21)	5 (N=10)	6 (N=18)
A	3.7 d	7.8 a	4.8 c	6.0 b	7.3 a	2.8 d
I	6.8 a	5.6 bc	3.6 d	6.3 ab	6.6 ab	5.2 c
V	7.7 ab	7.8 ab	7.0 bc	6.3 c	8.1 a	4.4 d
W	6.2 a	4.0 c	5.9 ab	6.5 a	4.5 bc	3.3 c
E	6.2 ab	5.3 bc	4.1 d	6.9 a	4.5 cd	6.7 a
M	3.7 cd	3.2 d	5.3 b	6.6 a	3.0 d	4.6 bc
D	3.8 b	4.6 b	4.7 b	6.5 a	1.4 c	6.2 a
Q	5.8 a	5.5 ab	4.3 b	5.8 a	2.5 c	4.8 ab

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Conclusions

- Aroma analysis cannot predict flavor of product
- Appearance drives consumer liking

Next steps

- Studies with dogs and cats: develop methods to look at preference issues

Preliminary test

- 2 competing canned cat food products, same flavor
- 2-bowl preference test at home
- Subjects: Didi and Umpsu

HUT

HUT continues

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Thank You

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