ADVANCES IN **NEW COMMERCIAL PET FOOD FORMATS** AND THE IMPACT ON **PET NUTRITION AND HEALTH**

GMASVM 2023

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SVP of Freshpet R&D

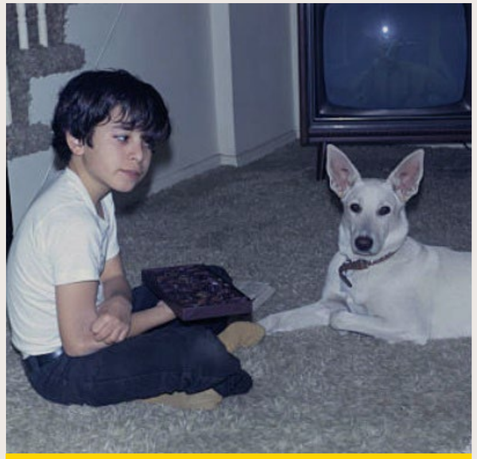
In the past I worked in several R&D and Product Development roles for:

- Pedigree Pet Foods, a division of MARS (7 years).
- Nestlé PURINA (18 years).

Currently I am SVP of Freshpet R&D, a publicly owned pet food company that manufactures cooked, refrigerated pet food.

THE PET'S STATUS IN OUR SOCIETY **HAS EVOLVED**

1940



1950

1990

2000's

2010
& beyond

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HISTORY OF PET FOOD IN US:
KEY GAME CHANGING EVENTS

1922

Chappel Brothers, Illinois, introduced the first canned Dog Food. By 1941 canned dog food had gained 90% share of the market.

1940’s

During WWII the US government began rationing tin and meat. Dry pet foods started to become popular.

1950’s

Ralston Purina, manufacturer of cereals began using an extruder to make Dog Chow.

2006

Freshpet starts to develop a distribution chain for fresh pet products. Currently there are over 25,000 chillers exclusively dedicated to retail fresh pet foods.

2023

There are numerous pet food formats: Dry, Can, Frozen, Fresh, Raw, Dehydrated…

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$40 BILLION INDUSTRY
stuck in 1950

TODAY'S **COMMERCIAL PET FOOD FORMATS**

FROZEN

Uncooked and preserved by freezing (below 0°C).

FREEZE DRIED

Uncooked preserved by low moisture.

FRESH

Pasteurized and preserved by refrigeration (0 to 5 °C), not frozen.

CAN

Processed, commercially sterilized, and sealed according to 21 CFR part 113 in hermetically sealed containers such as but not limited to cans, pouches, tubs, and trays (AAFCO, 2022)

FROZEN

Preserved by freezing (below 0°C).

EXTRUDED/DRY

Pressed, pushed, or protruded through orifices under pressure (AAFCO, 2022)

Cooked = "Heated in the presence of moisture to alter chemical and/or physical characteristics or to sterilize" (AAFCO, 2022)

Evaluation of **Different Pet Food Formats**

1. **Nutritional Composition**
2. Thermal Process
3. Nutritional availability for the pet
4. Impact on pet Microbiome
5. Water requirements for the pet

NUTRITIONAL COMPOSITION BY PRODUCT FORMAT

ADULT DOG AS IS	DRY KIBBLE	FRESH	CAN
Moisture %	12	62	82
Crude Protein %	21	14.5	8
Crude Fat %	10	10	3
Ash (estimated) %	6	1.5	1
Crude Fiber %	4	1.5	1
CHO (by difference) %	47	10.5	5
Kcal/100g (modified Atwater factors)	323	172.5	71

Reference: Commercially available information

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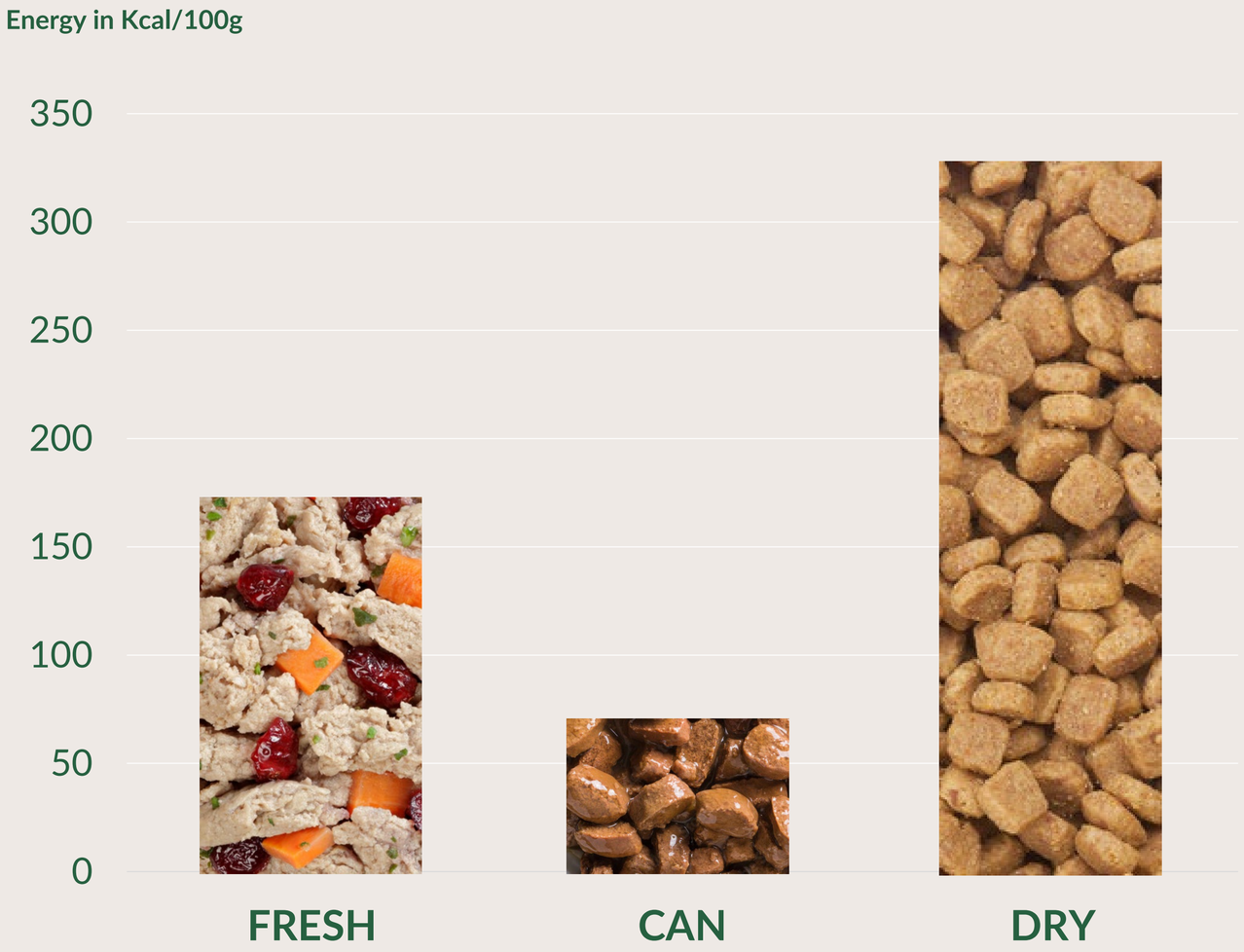
DIFFERENCES IN ENERGY CONTENT

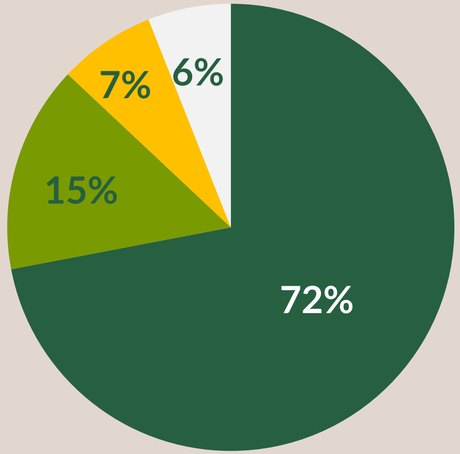


1. Dry pet food is the most energy dense format.
2. Cans tend to have the lowest caloric density.

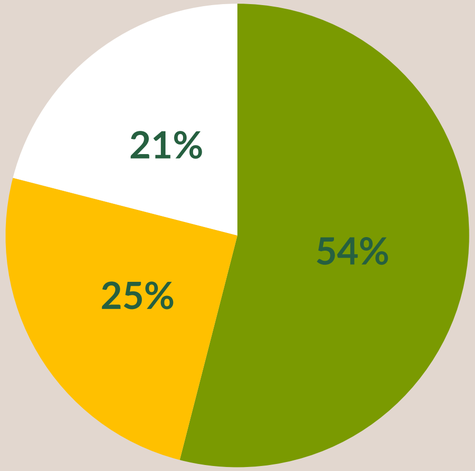
Reference: Commercially available information

NUTRITIONAL COMPOSITION BY PRODUCT FORMAT

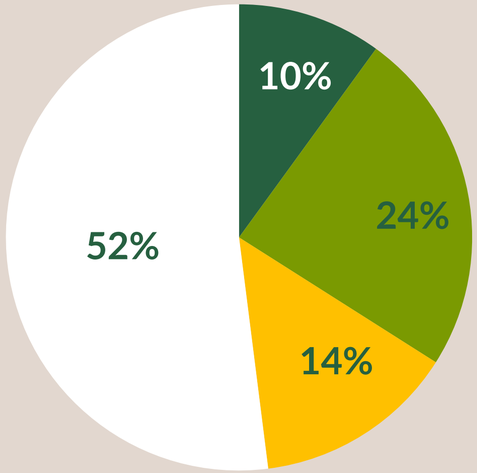
FRESH AS IS



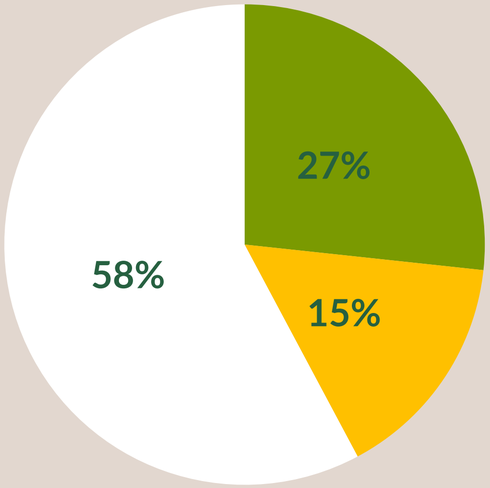
FRESH DRY MATTER BASIS



KIBBLE AS IS



KIBBLE DRY MATTER BASIS



MOISTURE
PROTEIN
FAT
CARBOHYDRATES

Reference: Commercially available information

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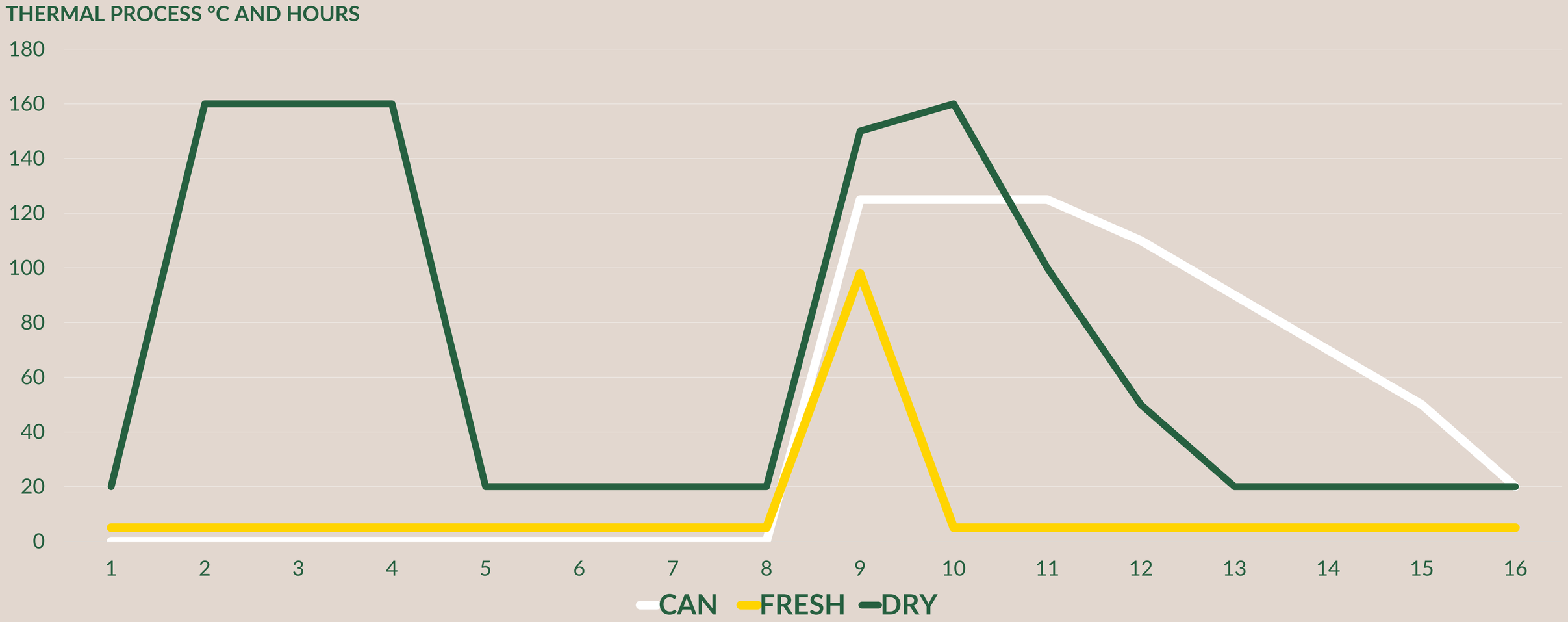
DIFFERENCES IN THERMAL PROCESS BETWEEN PET FOOD FORMATS



Source: R. Bras. Zootec., v.38, p. 432-440, 2009; R. Bras. Zootec., v.39, p. 510-518, 2010.

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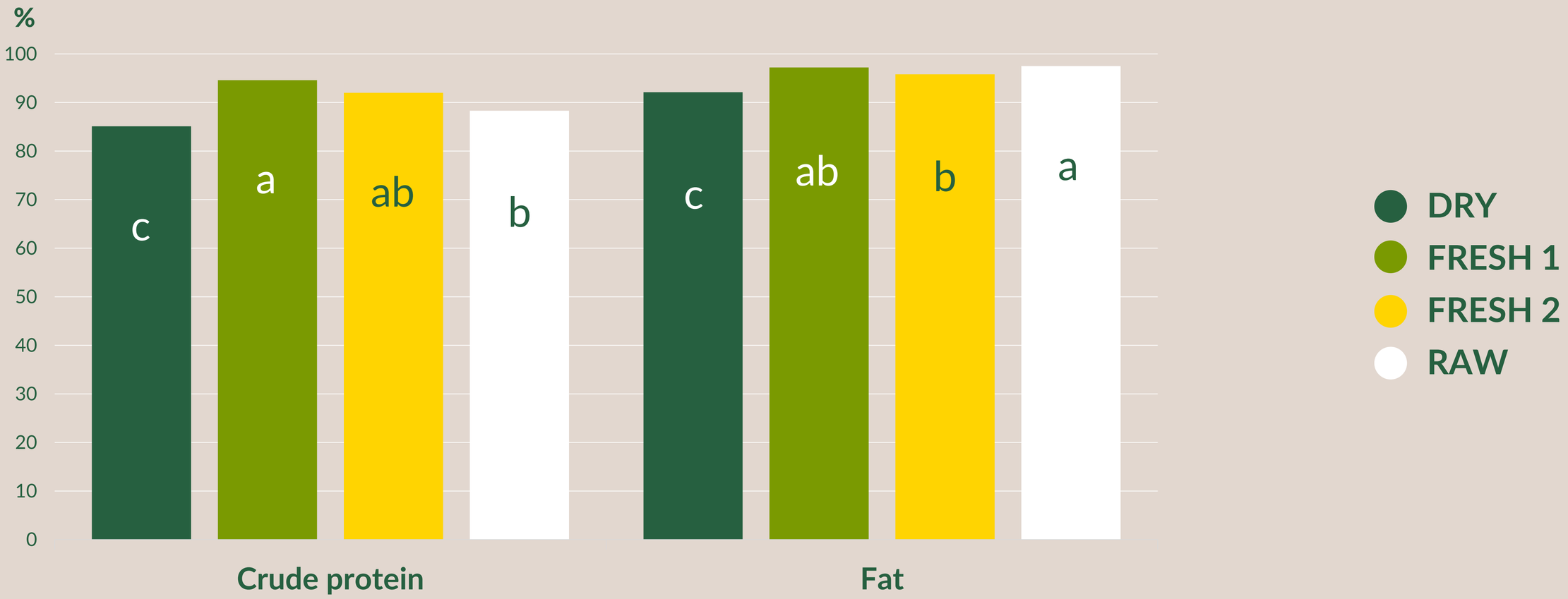
CRUDE PROTEIN AND FAT DIGESTIBILITY IN DOGS ARE **DIFFERENT BETWEEN EXTRUDED DRY KIBBLE, FRESH, RAW FOODS**



Source: Algya et al., 2018. J. Anim. Sci. doi: 10.1093/jas/sky235

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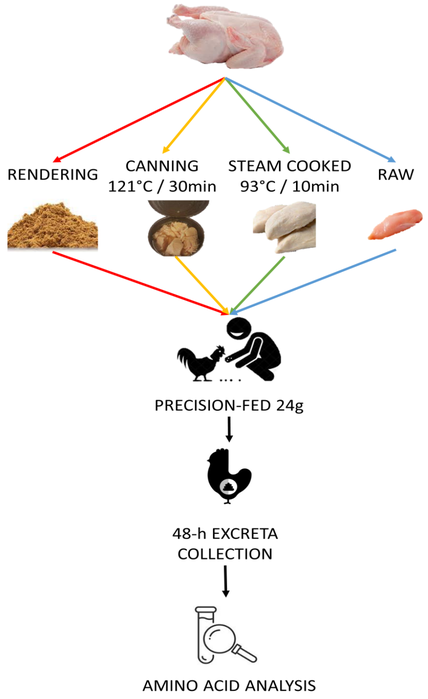
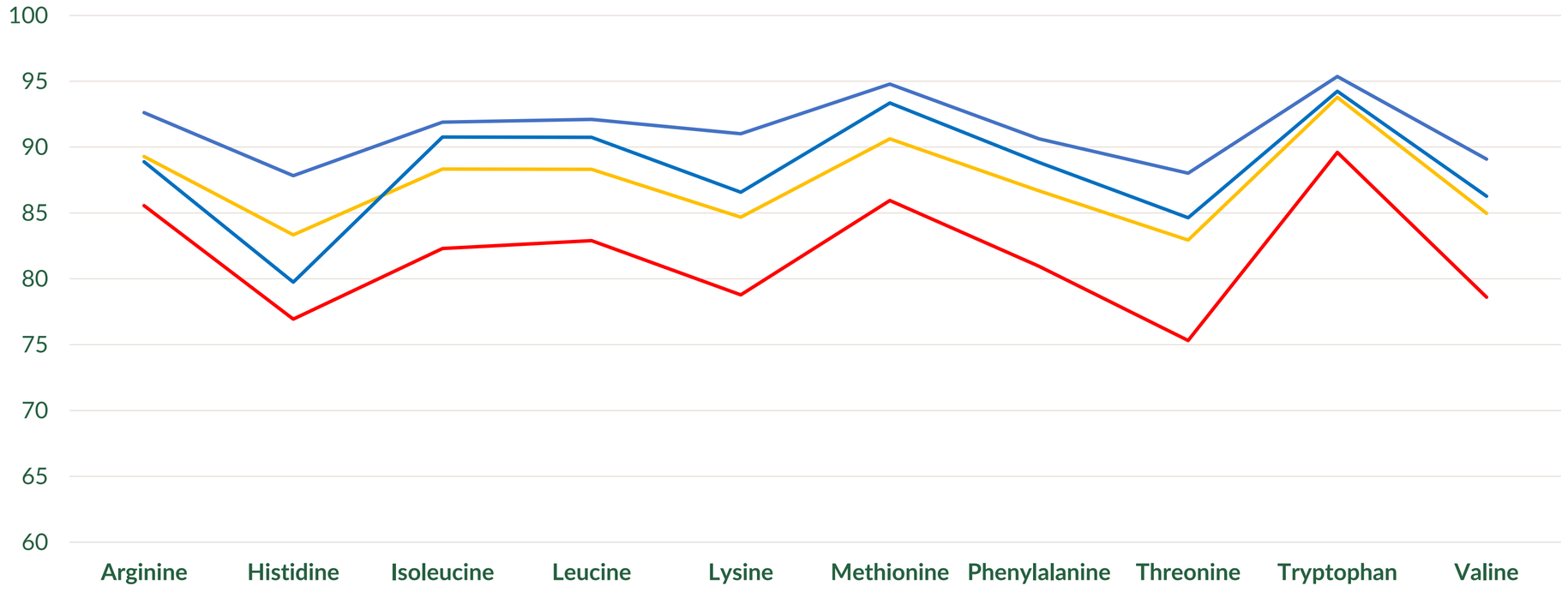
INGREDIENT TYPE AND PROCESSING METHOD AFFECTS AMINO ACID DIGESTABILITY

INTRODUCTION: Chicken-based ingredients are commonly used in pet foods. However, not all chicken ingredients are made the same. Different processing methods can input nutrient availability. The objective was to evaluate the amino acid digestibility of different chicken-based protein ingredients.

TAKEAWAYS:

1. Raw material and ingredient processing impacts amino acid availability.
2. Steam cooking chicken meat improved amino acid digestibility compared to rendering.





Source: Ingredient Type and Process Method Affects Amind Acid Digestibility, PM Oba, PL Utterback, MRC de Godoy, KS Swanson, University of Illinois Urbana-Champagne; sponsored by Freshpet

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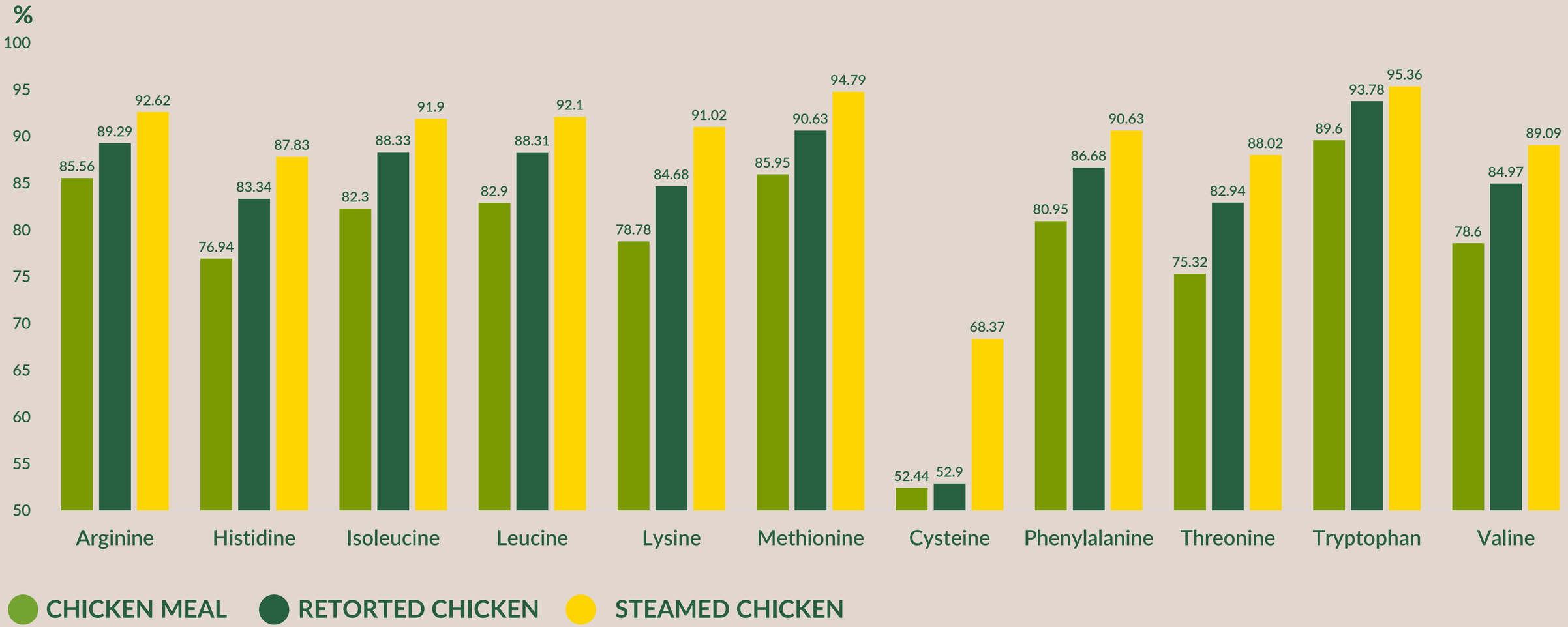
IMPACT OF PROCESS ON AA DIGESTIBILITY OF INGREDIENT

TRUE AA DIGESTIBILITY (%) OF NOVEL PROTEINS (N=4/TREATMENT)



Source: Ingredient Processing Affects Amino Acid Digestibility Study – June 2019, J. Anim. Sci. 2019. 97:998-1009 ***doi: 10.1093/jas/sky461***

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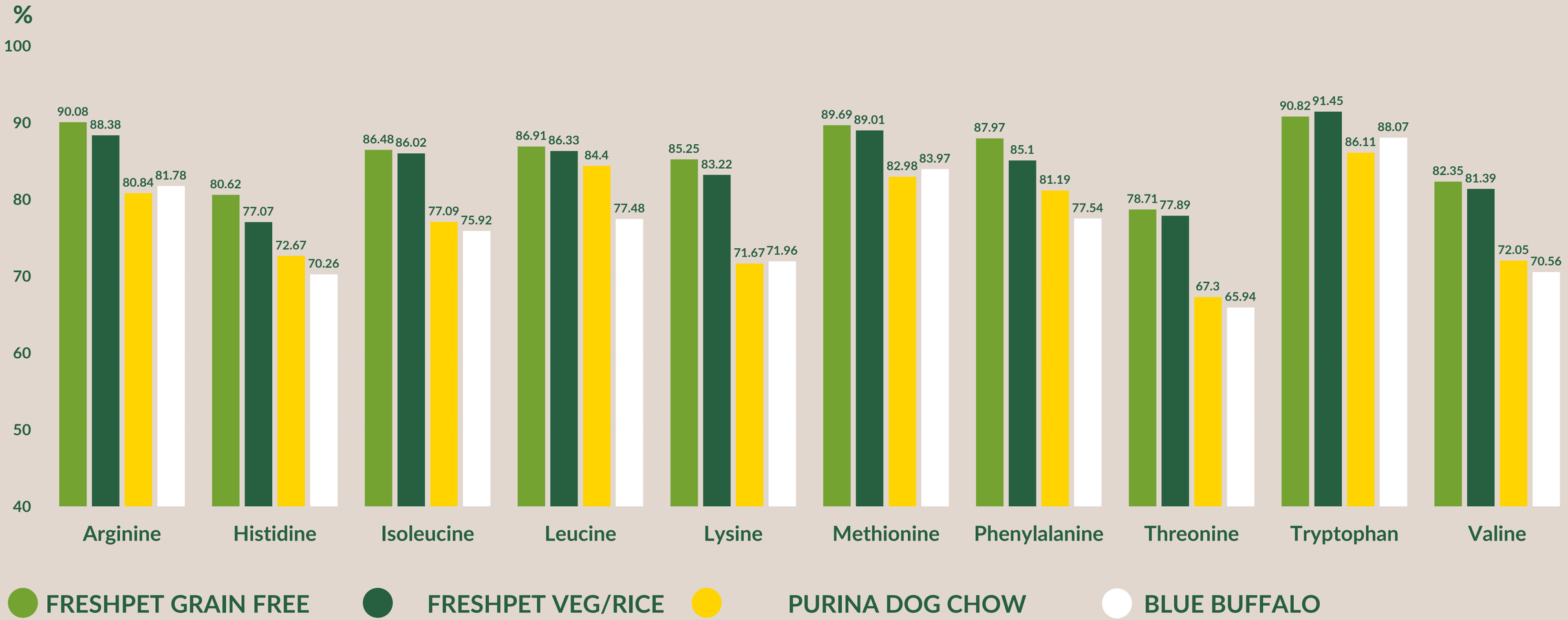
PROCESS EFFECT ON AA DIGESTIBILITY IN FINAL FOOD

STANDARD DIGESTIBILITY OF INDESPENSIBLE AMINO ACIDS IN CHICKEN BASED INGREDIENTS



Source: J. Anim. Sci. 2019. 97:998-1009 ***doi: 10.1093/jas/sky461***

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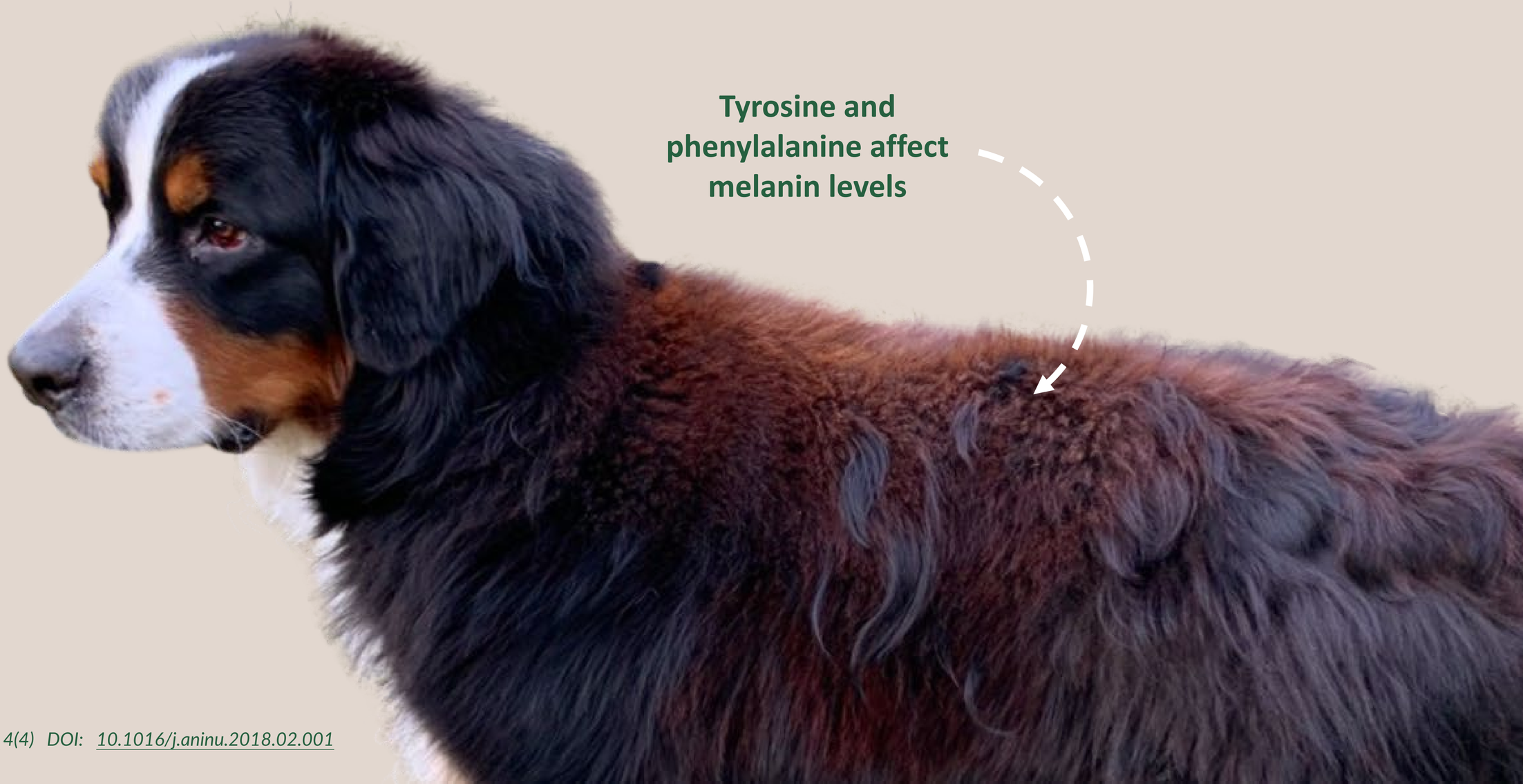
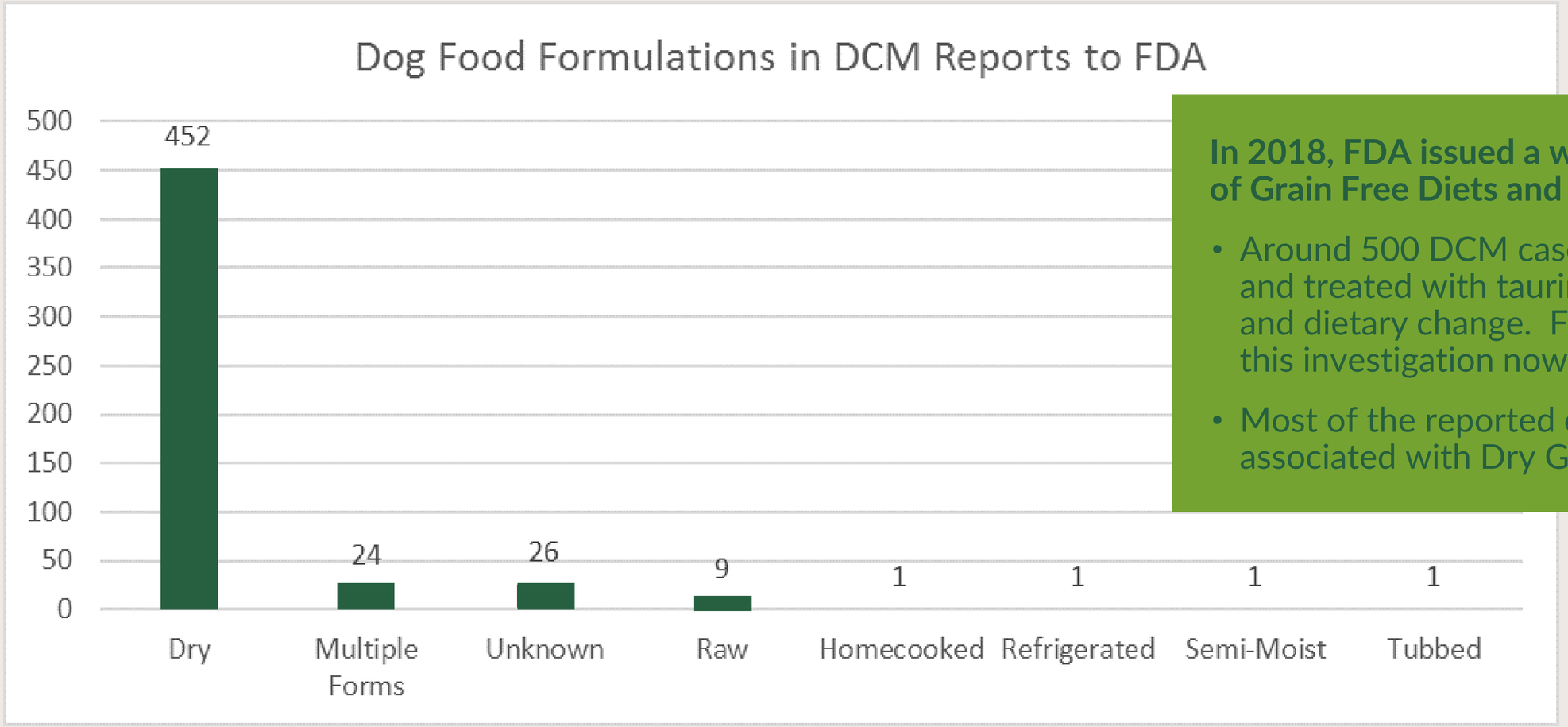
VISIBLE EFFECTS OF **AMINO ACID DIGESTIBILITY**



Source: Animal Nutrition 4(4) DOI: 10.1016/j.aninu.2018.02.001

DILATED CARDIO MYOPATHY (DCM) CASES REPORTED
TO FDA BY PET FOOD PRODUCT FORMAT



In 2018, FDA issued a warning about the link of Grain Free Diets and DCM

- Around 500 DCM cases had been reported and treated with taurine supplementation and dietary change. FDA/CVM is closing this investigation now.
- Most of the reported cases (99%) were associated with Dry Grain Free diets.

Source: FDA communication 2018.

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FRESH FOOD CONSUMPTION INCREASES SKIN MICROBIOME DIVERSITY

HYPOTHESIS: A dog's gut and skin microbiome are important organs to protect themselves from the environment. Different dog foods are known to influence the gut microbiome; however, little is known about the effects of different diets on the skin microbiome. The objective of this work was to evaluate how Freshpet Sensitive Stomach & Skin rolls impacts skin microbiome of pet dogs.

RESULTS: Dogs had a more diverse skin microbiome when fed Fresh. A diverse microbiome is better at protecting the dog.

Differences in nutrient composition of the diets contributed to the changes in skin microbiome: Higher omega-6 fatty acids content and Lower Insoluble to soluble fiber in Fresh versus Dry.

Nutritional modification of Skin Microbiome can become a novel approach to help manage skin diseases. Traditional nutritional management is based in allergen reduction or hydrolyzed proteins.

DIFFERENCES IN NUTRIENT CONTENT OF FOOD.

Nutrient %	FRESH	Average DRY
Moisture	76.3	8.5
---------- Dry matter basis ----------		
Fat	21.4	16.1
Linoleic acid	4.32	2.67
IDF:SDF	1.15:1	4.48:1

IDF = Insoluble Dietary Fiber SDF = Soluble Dietary Fiber

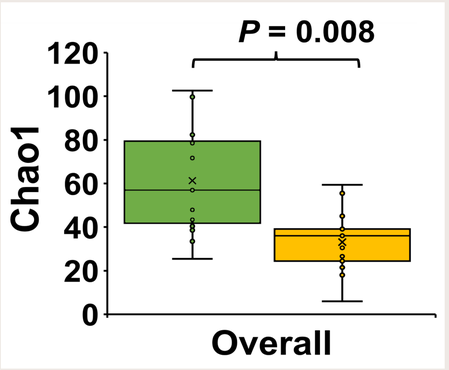

Figure 1. Skin microbiome of dogs fed Fresh or Dry dog food

*Source: Fresh Food Consumption Increases Microbiome Diversity and Promotes Changes in Bacteria Composition on the Skin of Pet Dogs Compared to Dry Foods. Animals. 2022; 12(15):1881. https://**doi.org/10.3390/ani12151881***

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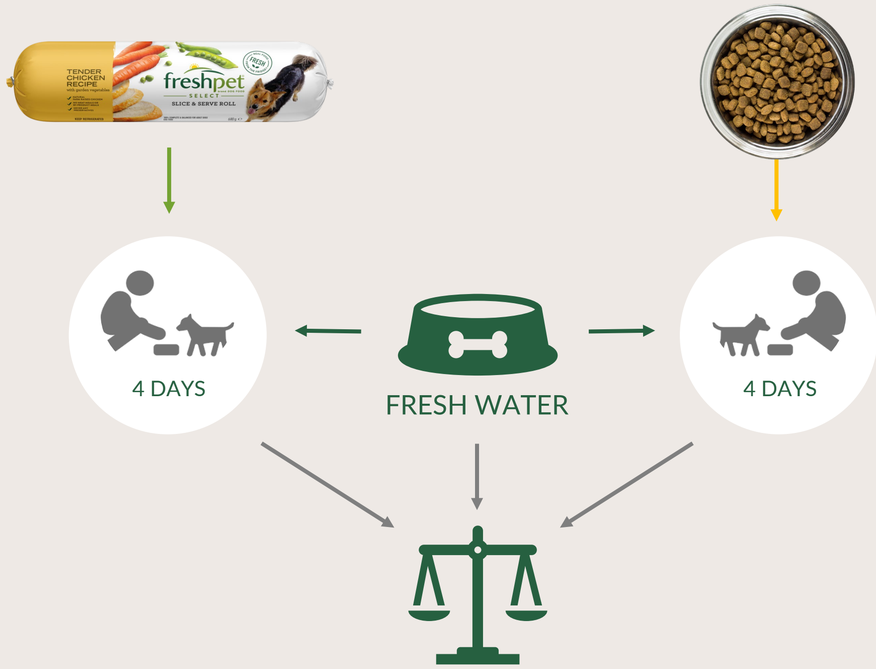
EFFECT OF DIET FORMAT ON CANINE WATER INTAKE

BACKGROUND: While a dog can lose 30% to 50% of its body fat and body protein, a loss in 10% of body water can be lethal, even though approximately 70% of the dog's body is water. The water lost can be replenished two different ways: drinking water, and water in the food. Research shows that feeding wet food reduces the need for drinking water by about 60% as compared to consuming dry foods (Ramsay and Thrasher, 1991). The goal of this research was to investigate the differences in water intake of dogs fed dry food and Fresh.

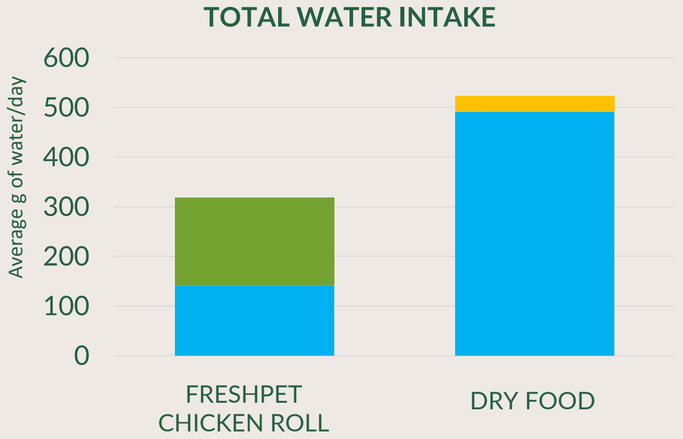
RESULTS: When dogs ate dry food, they drank more water than compared to when eating Fresh (blue bars) ($P<0.05$).

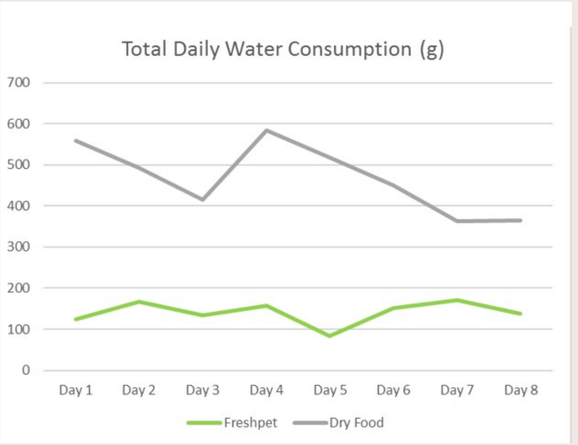
When combining the total water consumed throughout the day (food water + drinking water) dogs consuming dry foods had over 60% more water than dogs eating Freshpet Select Chicken Roll ($P<0.05$).



Macronutrient composition of test diets.

NUTRIENT, % AS IS (% DRY MATTER)	FRESH	DRY FOOD
Moisture	74.0	10.0
Protein	10.5 (40.4)	24.0 (26.7)
Fat	7.5 (28.8)	14.0 (15.6)
Carbohydrates	5.0 (19.2)	41.0 (45.6)





Source: Data from Internal Study by Freshpet company.

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Conclusions

1

All pet food formats can deliver complete and balanced conforming to AAFCO and FEDIAF guidelines.

2

Processes have a significant impact on the availability of essential nutrients. Formats like Fresh pet foods, with moderate cooking processes, provide higher delivery of essential amino acids than dry formats.

3

Moisture level in the diet does affect the drinking amounts in healthy adult dogs. Dogs need to drink ingest around 60% more water when fed on dry pet foods.

4

Dry extruded diets are the most calorie dense. This could make them more suitable for some life stages (Growth, Lactation, Gestation…) and less indicated for other indications (Weight Management, Senior dogs).

5

Nutritional modification of Skin Microbiome can become a novel approach to help manage skin diseases. Traditional nutritional management is based in allergen reduction or hydrolyzed proteins.

6

Although there are decades of research regarding traditional pet foods formats like dry and can, there is a need for novel research to evaluate the benefits of newer pet food formats.

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