# PETFOOD FORUM

Where the GLOBAL PET FOOD INDUSTRY does business Is It Time to Reconsider NRC and AAFCO Guidelines for Amino Acid Requirements in Dogs?

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**#petfoodforum** 

## FOUR RIVERS KENNEL & CANINE SENIOR CENTER





## **Current State of Requirements**

- Dogs have an amino acid requirement, not necessarily a protein requirement
  - Limited by the least available nutrient
    - Methionine Lysine
- High protein foods not doing any good if the amino acid requirements are not met









#### **Current State of Requirements**

- AAFCO is main source referenced for nutrient requirements
  - Much of AAFCO data derived from NRC requirements
- AAFCO values typically greater than the NRC values to try

and account for differences in bioavailability

Amino Acid	AAFCO minimum (g/1000 kcal ME)	NRC Minimum Requirement (g/1000 kcal ME)	NRC Recommended Allowance (g/1000 kcal/ME)
Methionine	0.88	0.65	0.83
Lysine	2.25	0.70	0.88
TSAA (Methionine + Cysteine)	1.75	1.30	1.63



## **Age-specific Canine Nutrition**

• AAFCO & NRC guidelines provide nutritional recommendations for only two categories of dogs:

Adult Maintenance Growth and Reproduction

- Senior dogs represent increasing percentage of pet population
- Varieties of breeds and sizes available, while most research done on a select few
- Older, less efficient research methods used in previous studies





#### **Age-specific Canine Nutrition**

• Recent studies from our lab and others have reported the amino acid requirements of dogs at different life stages and in various size breeds.

# Is it time to update AAFCO & NRC guidelines?





## **Indicator Amino Acid Oxidation**

- Based on concept of limiting amino acid
- Measuring oxidation via breath samples for indirect measurement of tissue incorporation
- <u>Pros</u>: Applicable to all breeds, sizes, and species;
- <u>Cons</u>: costs, requires indirect calorimetry equipment and isotope, and multiple sampling days







#### **Indicator Amino Acid Oxidation Technique**







#### FEEDING

#### ISOTOPE

Feed control diet 2 days (adaptation), test diet 1 day. Six total test diets (3 excess; 3 deficient)

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All dogs receive priming dose of <sup>13</sup>C L-Phenylalanine after 2hr of feeding, then smaller bolus dose every 30min for 4hrs

#### **CO<sub>2</sub> PRODUCTION**

Breath sample collected every 30 min via respiration mask and calorimetry

#### ENRICHMENT

<sup>13</sup>C enrichment of breath CO<sub>2</sub> samples determined by isotope ratio mass spectrometry (IRMS)





Adapted from Elango et. al, 2012





Adapted from Elango et. al, 2012





	AAFCO	FEDIAF	N	IRC	Mini Dachs.	Ве	agle	Labı Retr	rador riever
			Min. Req	Rec. Allow.		Min. Req	Rec. Allow.	Min. Req.	Rec. Allow.
Lys g/100 g DM	0.63	0.46	0.28	0.35	N/A	0.46	0.55	0.44	0.53

\*4000 kcal/kg ME

Adapted from Sutherland et al., 2020





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NRC Minimum Methionine Recommendations (g/1000 kcal ME)

Puppies 10-14wks	Puppies > 14 wks	Young Adults	Seniors
0.7	0.53	0.65	NA

FRK Methionine Minimum Requirements (+ 2 SD) (g/1000 kcal ME)

Puppies 10-14wks	Puppies > 14 wks	Young Adults	Seniors
0.84 (+ 0.05)	0.78 (+ 0.16)	0.68 (+ 0.19)	0.62 (+ 0.17)





NRC Minimum TSAA Recommendations (g/1000 kcal ME)

Puppies 10-14wks	Puppies >14 wks	Young Adults	Seniors
1.4	1.05	1.3	NA

FRK TSAA Minimum Requirements (+ 2 SD) (g/1000 kcal ME)

Puppies 10-14wks	Puppies >14 wks	Young Adults	Seniors
1.55 (+ 0.07)	1.53 (+ 0.21)	1.4 (+ 0.30)	1.27 (+ 0.23)





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- Amino acid metabolic availability from different protein sources adds an extra layer of complexity to formulating dog foods
  - Requirement may be met from an analytical perspective, but is it fully utilized?
- Must be digestible can be taken up in the intestines during digestion
- Must also be bioavailable after digestion, it can be utilized by the tissues





- Much of the available data is from digestibility studies, but there are some issues:
  - Can't perform cannulated dog studies
  - Cecetomized rooster assays
  - Total tract digestibility involves colonic fermentation/microbial digestion and can skew data
  - These don't investigate beyond digestibility
- IAAO can provide better insight into AA bioavailability





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Human	Food	Amino Acid	Population	Metabolic Availability (%)	
studies finding highly	Soy protein isolate	Methionine	Young adult males	71.8	
bioavailability in foodstuffs	Casein	Methionine	Young adult males	87.4	
III IOOUSLUIIS	White rice	Lysine	Young adult males	97	
Adapted from Paoletti et al., 2024 review	Lentils	Lysine	Young adult males	80	
TFOOD	Chickpeas	Methionine	Young adult males	63	RS
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- Potentially some unexpected findings in pet food ingredients:
  - Decreased availability of chicken meal compared to peas



Crosbie et al., 2024





Ingredient	Slope	% Bioavailable
Soy protein isolate	-0.065	82.3%
Crystalline Leu	-0.079	100% (assumed)





#### Conclusions

- Data is very limited for amino acids using the IAAO technique in companion animals
  - The little data presented would suggest AAFCO is meeting at least some requirements for adult animals (2 – 7 years old)
- More research on bioavailability of ingredients and food types is needed
- However, requirements may also be overestimated, especially with our senior animals





## **Implications for Pet Food Industry**

- Optimizing diets for senior dogs to improve longevity and quality of life
  - Lots of marketing for it, not a lot of published data available yet
- Sustainability Consideration
  - More precise formulations reduce waste and over-supplementation
  - Need to be careful in how this is approach and how much we can extrapolate across breeds, sizes, and ages
- Alternative proteins
- Research funding opportunities needed





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