Stabilization Technology to Deliver and Maintain Palatability Throughout Pet Food Shelf Life

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Des Moines, IA USA

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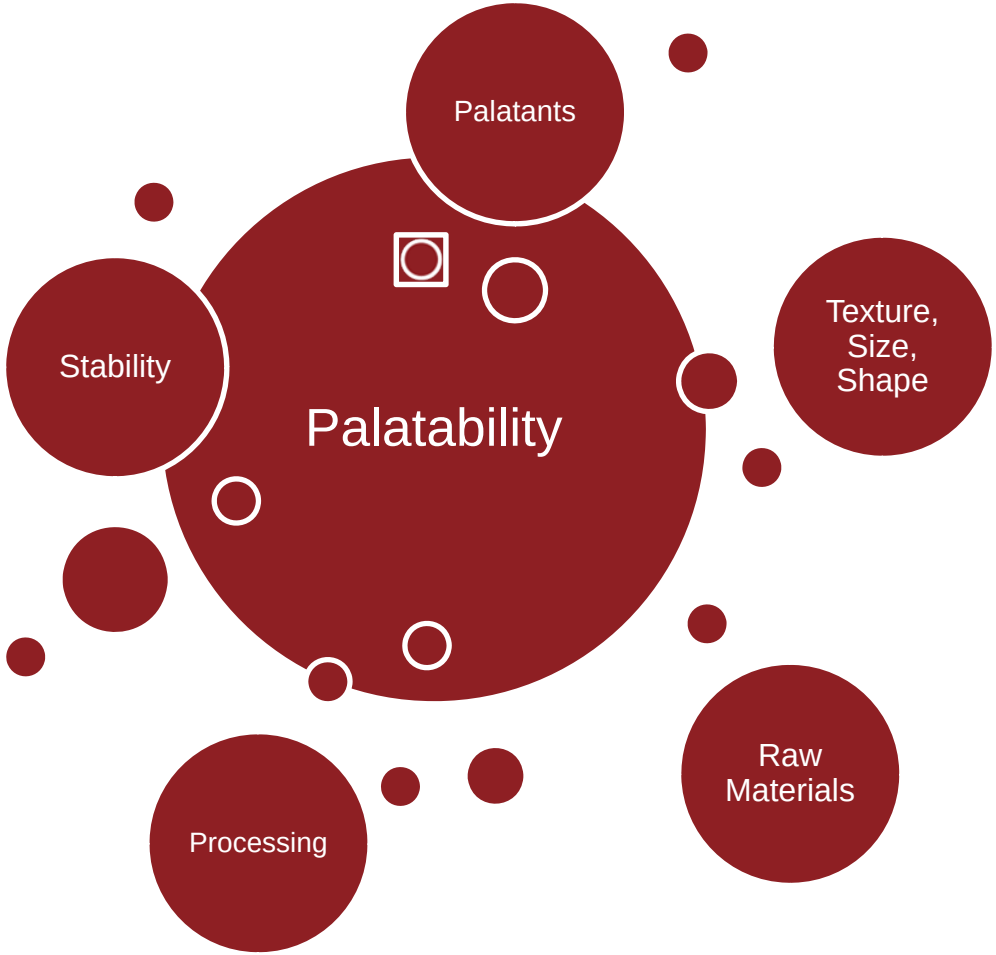
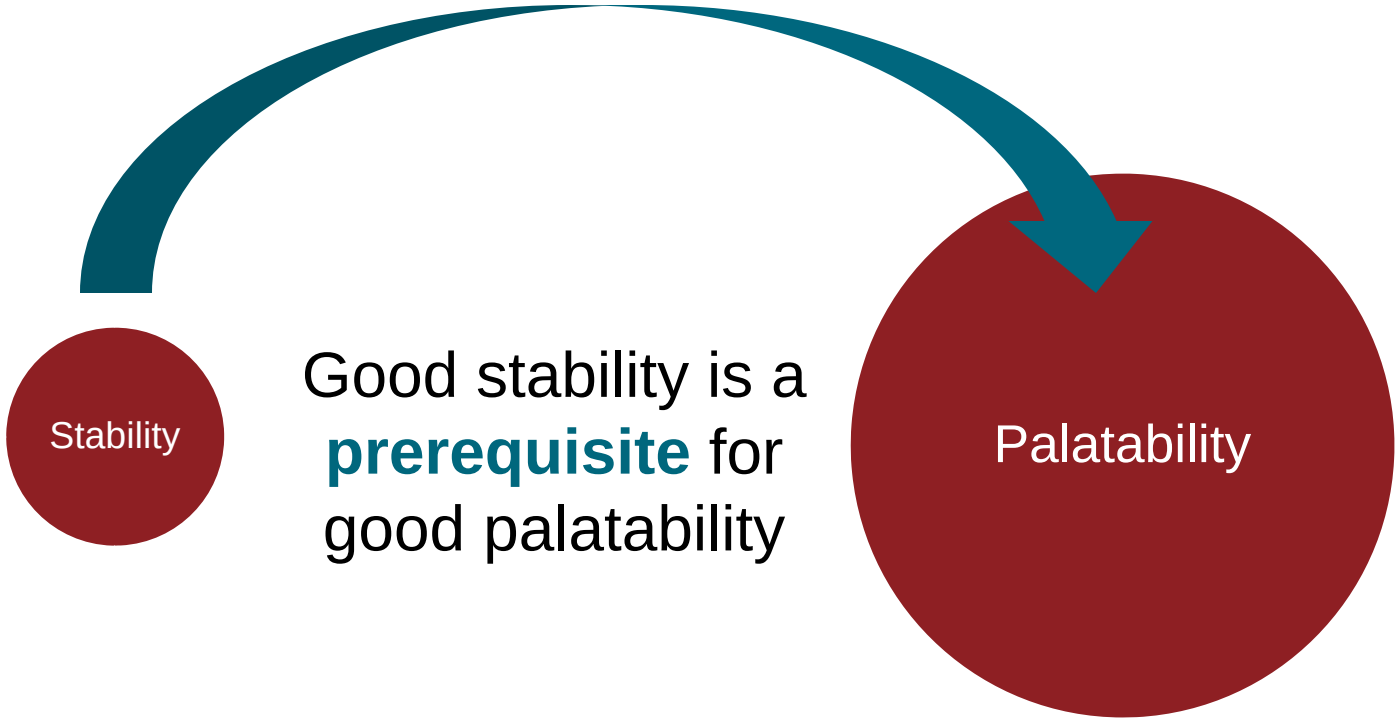
What Affects Palatability?



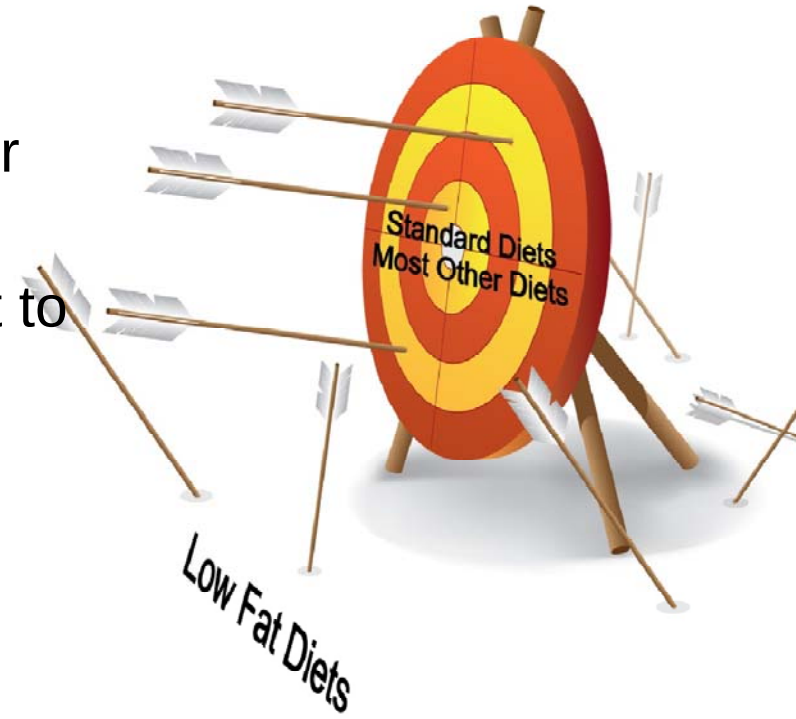
What Affects Palatability?



Natural stabilization technology is well understood and works well for a wide range of petfood diets

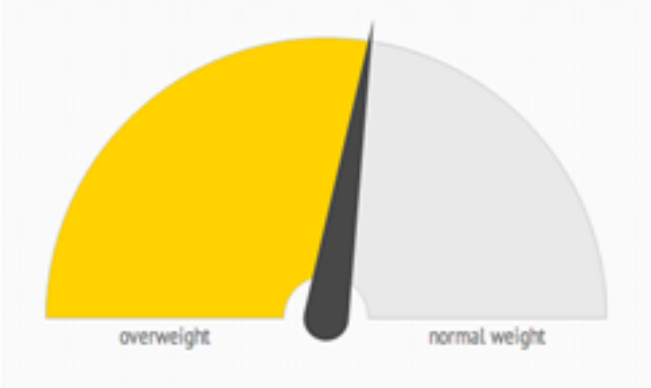
The Challenge

- Natural petfood stability programs are designed for standard diets and adapted for other diets
- Low fat diets are more difficult to stabilize
- Shelf life targets for Low Fat Diets may be shorter than for Standard diets



The Challenge

2012 Pet Obesity Survey



Pet obesity is the number 1 health threat for US pets.
Dr. Ernie Ward

Association for Pet Obesity Prevention, 2012.

The Challenge

Pet Obesity is a ***Key Market Driver*** behind growth in ***Weight Management Diets***

USA

- **Obesity & Other Chronic Diseases**
- Changing Demographics
- Increasing Health Awareness
- Consumer Preferences Toward Indulgent Products
- Humanization of Pets
- Health-Conscious Pet Owners

Europe

- **Rising Obesity**
- Changing Demographics & Lifestyles
- Decreasing Number of Pet Dogs
- Changing Consumer Preference Toward Pet Food
- Rising Health Care Costs
- Health Conscious Pet Owners

Evalueserve, 2007.

The Challenge

Low Fat Pet Foods have a unique stability challenge

Reason #1: Uneven Coating

- Low, uneven surface fat coating leave kibbles exposed to rapid oxidation (dyed fat used to show contrast)

1% topical fat

6% topical fat

The Challenge

Low Fat Pet Foods have a unique stability challenge

- **Reason #2: Reduced Dosage**

1% topical fat

- One-size-fits-all antioxidant dosage in topical fat delivers lower antioxidant dosage to low-fat diets.

The Challenge

Stability

Good stability is a **prerequisite for** good palatability

Low Fat Diet Palatability

1% topical fat

- Low fat diet palatability is generally lower than standard diets, as fat is a palatability driver
- Stability challenges compound any issues with palatability performance

The Challenge

- Impact of Unstable Low Fat Diets
  - Reduced Palatability
  - Shorter shelf life
  - Shorter, more frequent production runs
  - When storage exceeds recommended shelf life, there is risk of
    - Pet rejection / illness
    - Pet Parent complaints, bad reviews, social media posts
    - Returned product / disposal
    - Recalls
    - Brand damage
  - Loss of market share

A Different Approach

Low Fat Petfood Diets may need a different stability program than standard diets

- A Stabilization Approach Targeted at Low Fat Diets
  - Better Shelf Life
  - Better Palatability
  - Reduced Risk

Stabilization Technology that Improves Low Fat Pet Food Stability

- Key components of the technology

"…limiting the loss of antioxidant from a petfood diet coated with fat/oil and palatant…"

"…comprising adding an antioxidant containing non-polar antioxidants in combination with mid-polar antioxidants and / or polar antioxidants

"…antioxidant is delivered via the palatant."

Stabilization Technology that Improves Low Fat Pet Food Stability

Formulated to not have a pro-oxidant challenge in the palatant

Delivers target antioxidant dosage and stability for *Low Fat Diets*

- *Resolved Under-Dosing*
- *Resolves Uneven Coating*

Maintains better palatability through shelf life

Stabilization Technology that Improves Low Fat Pet Food Stability

Formulated to not have a pro-oxidant challenge in the palatant

- Current diets may have stability issues caused by the palatant
- Bench testing model developed for assessing palatant pro-oxidant effect
- Viscera and lamb based palatants are high risk for pro-oxidant effects

Minimize Palatant Pro-oxidant Effect

Bench model to test palatant pro-oxidant effect

Preheat fat and palatant separately to 49-54°F (120 – 130°F)

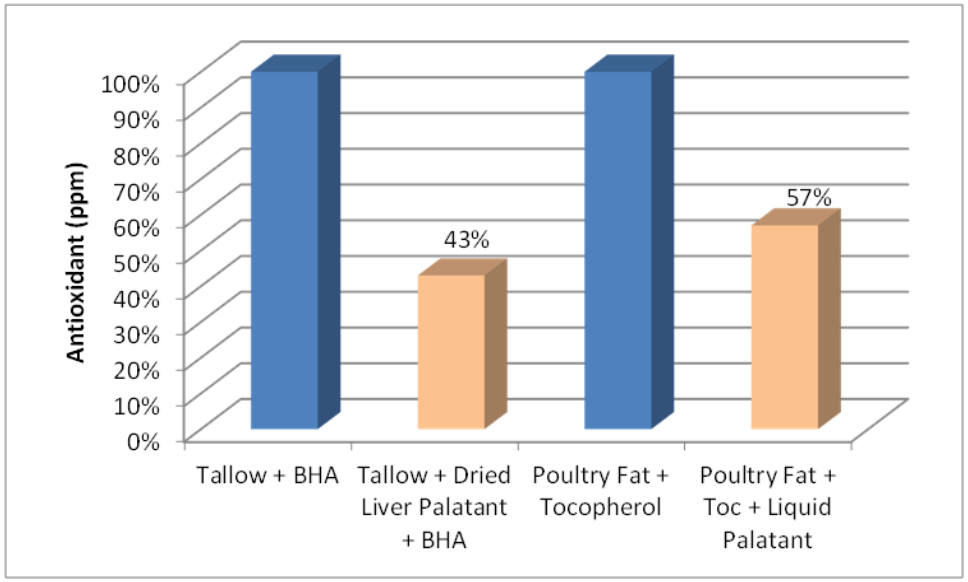
Weigh fat and palatant according to ratio applied to kibble (7% fat : 3% palatant = 70 / 30)

Mix fat and palatant in a blender at 7,000 rpm (medium speed) for 30 seconds

Measure antioxidant profile at time 0 and after 72 hours ambient storage

Minimize Palatant Pro-oxidant Effect

- The pro-oxidant effect of palatants can sacrifice either synthetic (BHA) or natural (tocopherol) non-polar antioxidants



Kemin. US 2012/0183654 A1

Minimize Palatant Pro-oxidant Effect

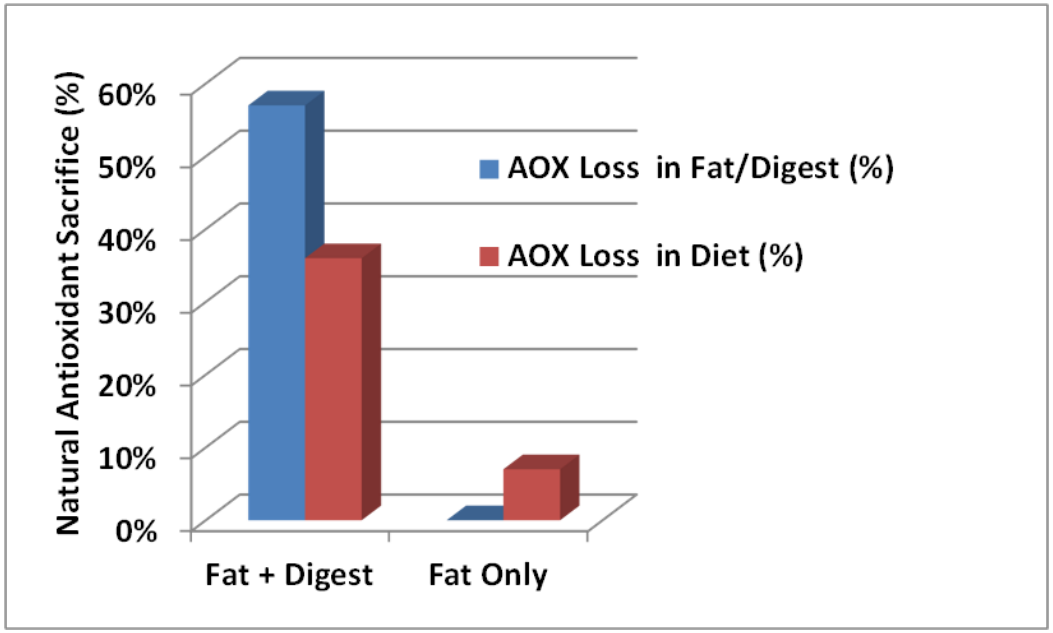
- Pro-oxidant effect of Palatants A, B and C was measured in the bench test

Fat : Digest Blend	Sample	Time 0	72 Hour	
		Tocopherol based Antioxidant (ppm)	Tocopherol based Antioxidant (ppm)	AOX Loss (%)
70 : 30	Fat / Digest A	3722	844	77.3%
70 : 30	Fat / Digest B	3660	2063	43.6%
70 : 30	Fat / Digest C	3980	2170	45.5%

- Pro-oxidant palatants sacrifice antioxidant needed for long term shelf life
- Antioxidant loss is especially critical in low fat pet foods

Kemin 2006. Study #06-841. Unpublished data.

Minimize Palatant Pro-oxidant Effect



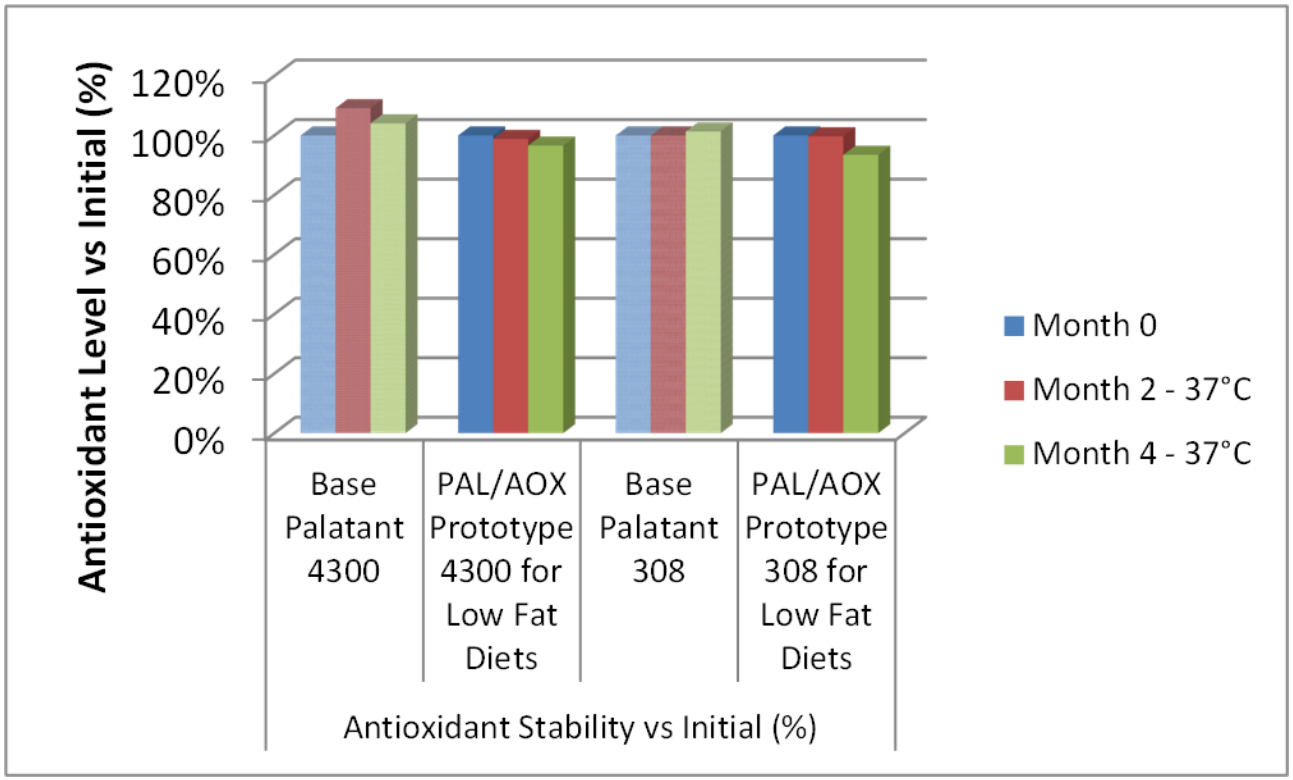
- Pro-oxidant palatants sacrifice antioxidant needed for long term shelf life
  - Fat / Digest blends
  - Finished Diets

Fat + Digest and Diet Testing

Kemin. US 2012/0183654 A1

Minimize Palatant Pro-oxidant Effect

- Absence of pro-oxidant properties confirmed, even during accelerated storage



Stabilization Technology that Improves Low Fat Pet Food Stability

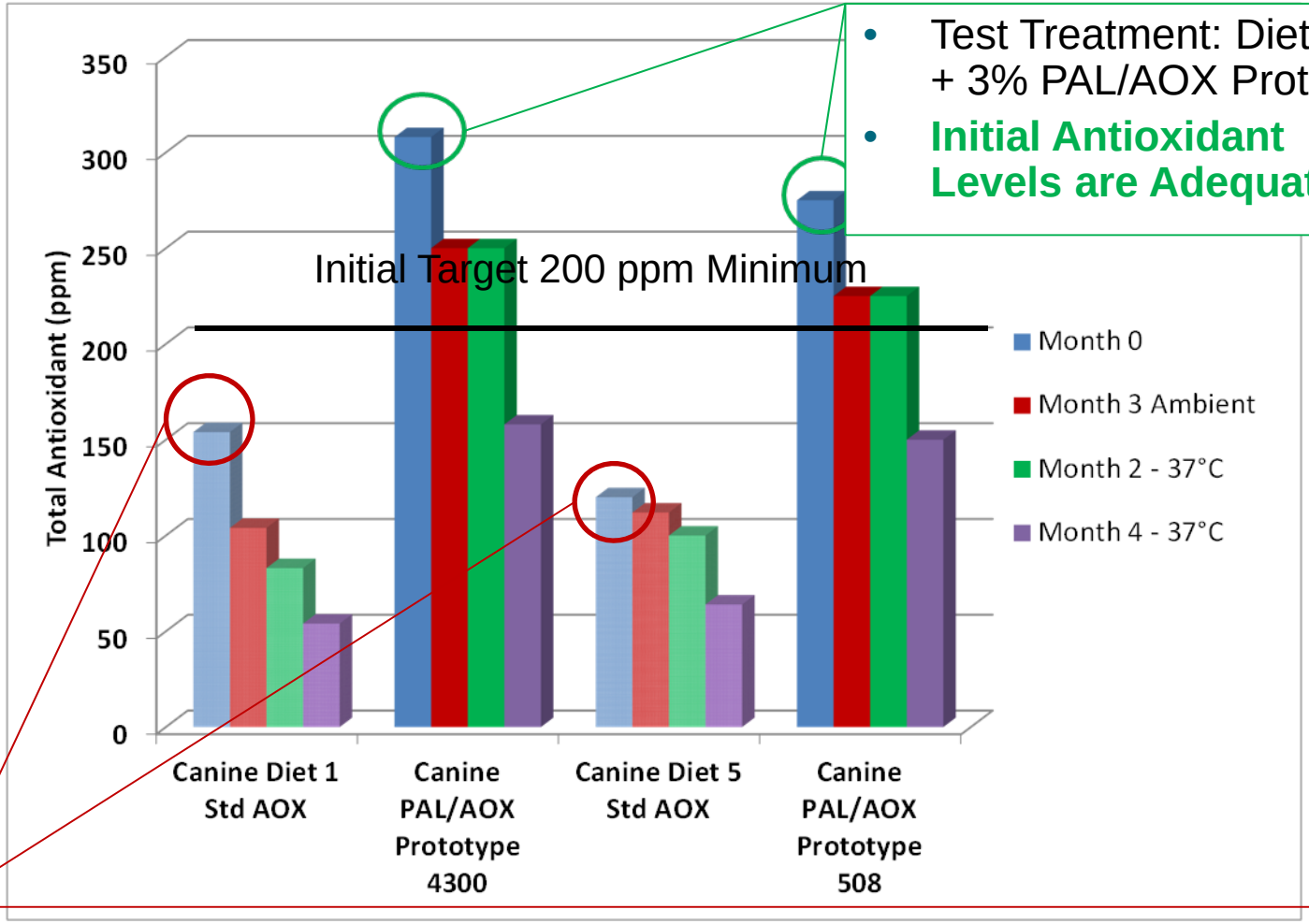
Delivers target antioxidant dosage and stability for

Low Fat Diets

- *Resolves Under-dosing*
- *Resolves Uneven Coating*

- Antioxidant type selected to work via a liquid palatant and compliments a natural stabilization program
- Contributes a minimum antioxidant level, reducing the risk of under-dosing the diet
- Liquid application rate provides even kibble coverage when topical fat does not

Provides Adequate Antioxidant to Low Fat Pet Foods



- Test Treatment: Diet, Fat + 3% PAL/AOX Prototype
- **Initial Antioxidant Levels are Adequate**

- Standard Treatment: Diet, Topical Fat (4000 ppm @ 3%) + Palatant
- **Initial Antioxidant Levels are Below the Target**

Kemin 2013. Unpublished Data.

Stabilization Technology that Improves Low Fat Pet Food Stability

Delivers target antioxidant dosage and stability for *Low Fat Diets*

- *Reduces reliance on one-size-fits-all antioxidant dosage to the bulk fat for low fat diets*
- *Alternative to incremental dosing to the low fat diet core*

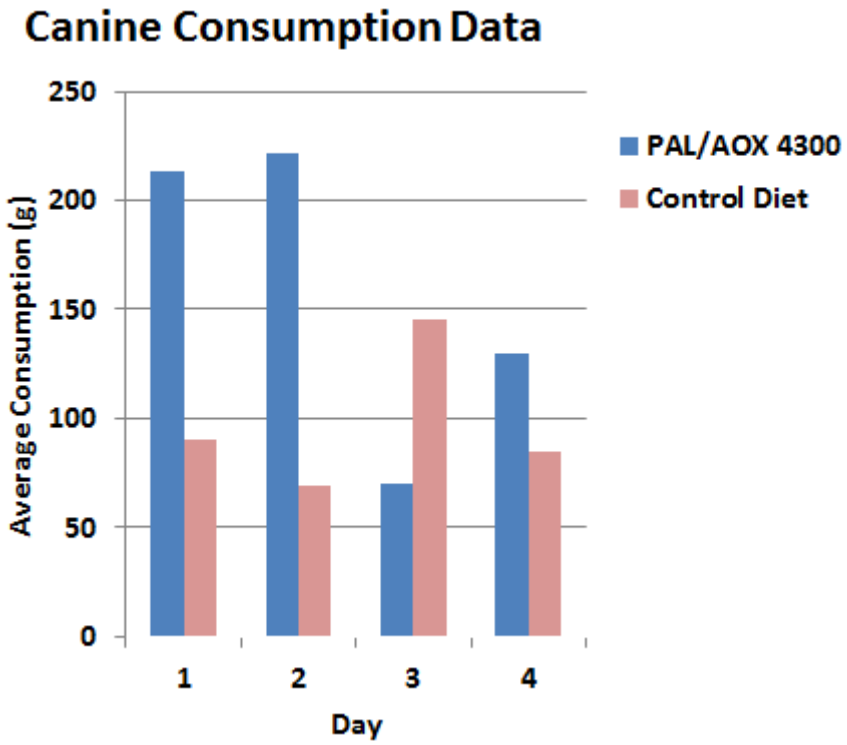
- Compliments the one-time bulk fat treatment designed for standard diets
- Incremental dosing to the core becomes less efficient at higher levels

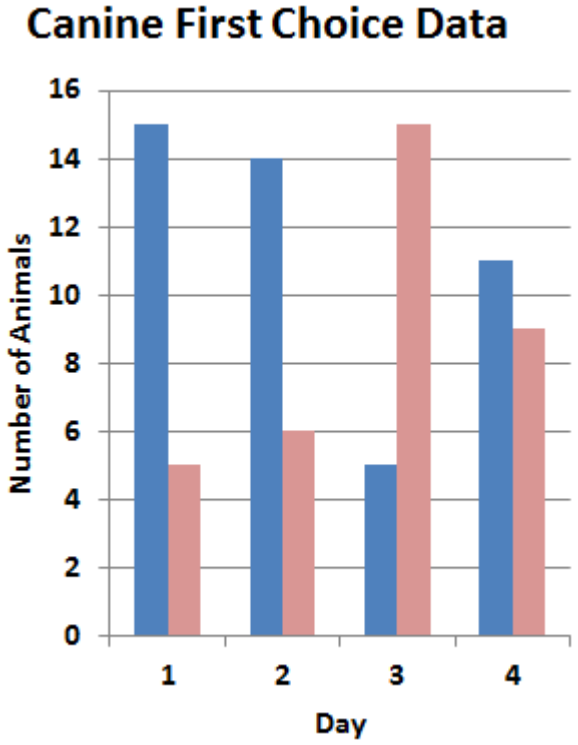
Stabilization Technology that Improves Low Fat Petfood Stability

Maintains better palatability through shelf life

Maintains Palatability – Initial

Variable	Antioxidant Treatment	Consumption Ratio	Intake Ratio	First Choice Ratio	C. R Significance	Sig.
Canine Test 1	Diet, Untreated Fat + 3% Prototype 4300	1.63	0.62	1.29	p = 0.0120	Yes!
Canine Control 1	Diet, Treated Fat + Palatant	1	0.38	1		





Kemin 2012. Study #392 Unpublished Data

Palatability of Liquid Digest During Shelf Life

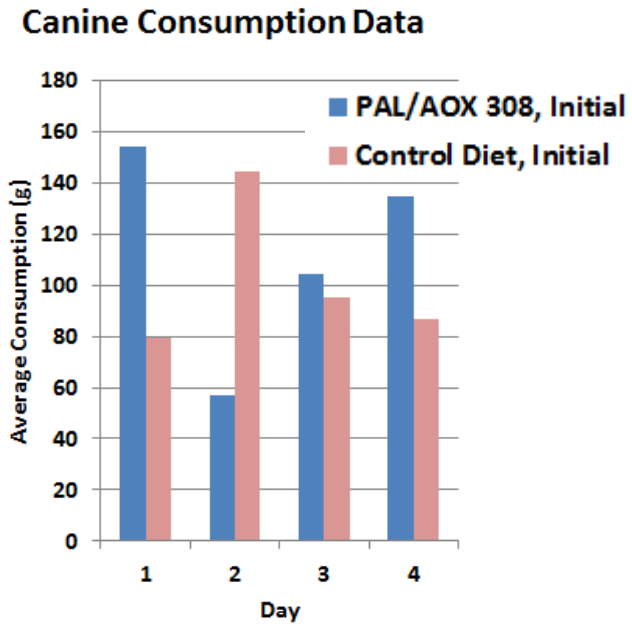
Digest Storage	Variable	Consumption Ratio	Intake Ratio	I.R. Significance	Sig.
2 Months Frozen	Test Diet with 3% Prototype 4300 Frozen	1	0.493	p = 0.8333	No
2 Months @ 37°C	Test Diet with 3% Prototype 4300	1.03	0.507		
4 Months Frozen	Test Diet with 3% Prototype 4300 Frozen	1.36	0.577	p = 0.1085	No
4 Months @ 37°C	Test Diet with 3% Prototype 4300	1	0.423		

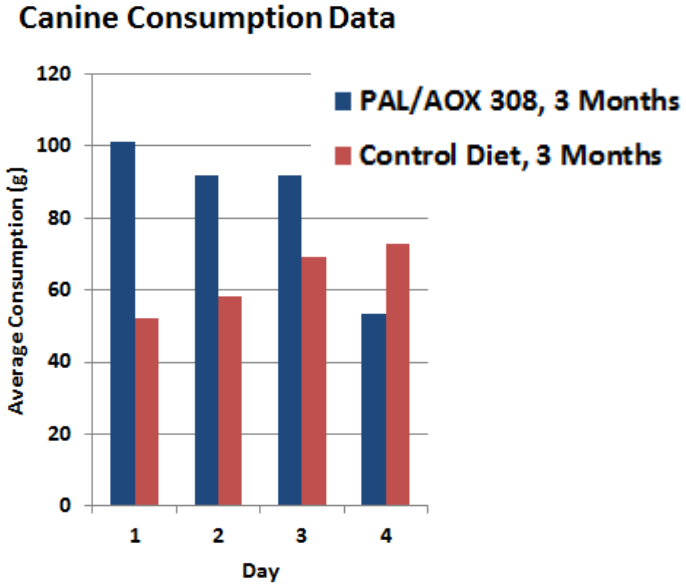
- Liquid Digest maintains PARITY palatability when stored in accelerated conditions.
- What is palatability of the test diet versus a traditional stabilization system + palatant during diet shelf life?

Kemin 2012. Study #392 Unpublished Data

Maintains Palatability – Canine Diet Shelf Life

Diet Age	Variable	Antioxidant Treatment	Consumption Ratio	Intake Ratio	First Choice Ratio	C. R Significance	Sig.
Initial	Canine Diet 3 Test	Core + Fat + 3% Prototype 308	1.11	**0.525**	1	p = 0.6209	No
	Canine Diet 3 Control	Core + Topical Fat (4000 ppm @ 3%) + palatant	1	0.475	1.11		
3 Months	Canine Diet 3 Test	Core + Fat + 3% Prototype 308	1.34	**0.573**	1.58	p = 0.0458	Yes!
	Canine Diet 3 Control	Core + Topical Fat (4000 ppm @ 3%) + palatant	1	0.427	1		

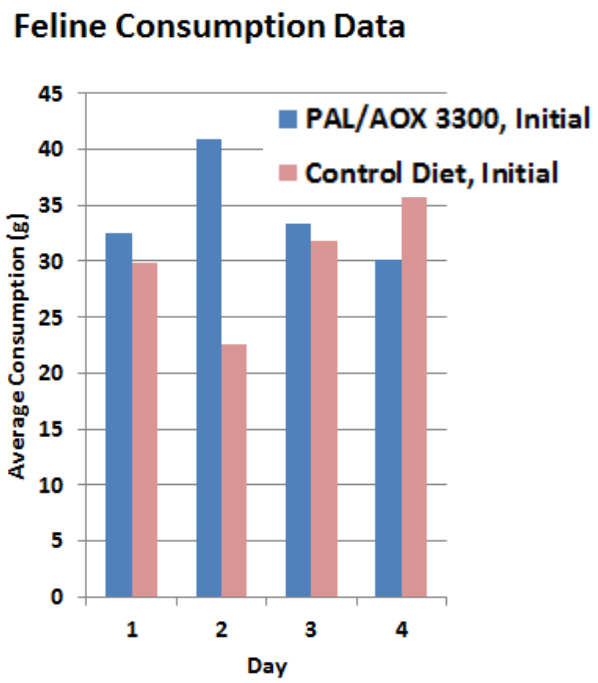


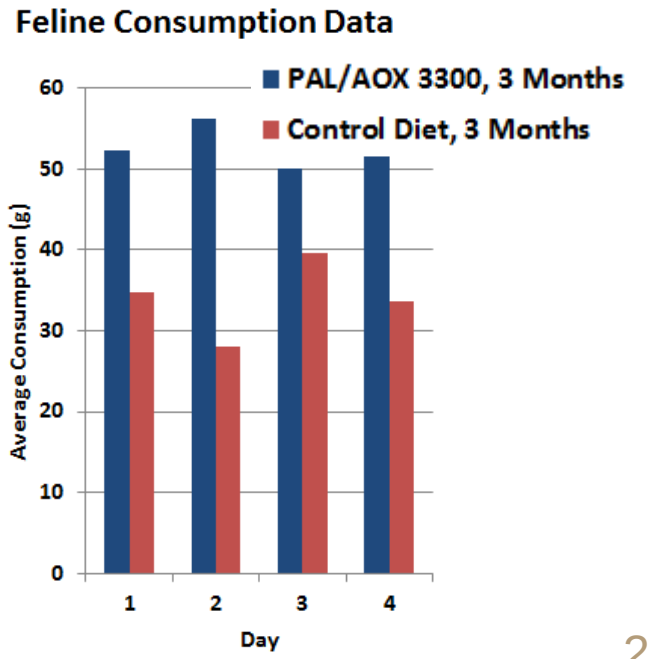


Kemin 2012. Study #258 Unpublished Data

Maintains Palatability – Feline Diet Shelf Life

Diet Age	Variable	Antioxidant Treatment	Consumption Ratio	Intake Ratio	First Choice Ratio	C. R Significance	Sig.
Initial	Feline Diet 3 Test	Core + Fat + 3% PAL/AOX Prototype 3300	1.14	**0.533**	1.35	p = 0.0117	Yes!
	Feline Diet 3 Control	Core + Topical Fat (4000 ppm @ 3%) + palatant	1	0.467	1		
3 Months	Feline Diet 3 Test	Core + Fat + 3% PAL/AOX Prototype 3300	1.54	**0.607**	1.45	p = 0.0201	Yes!
	Feline Diet 3 Control	Core + Topical Fat (4000 ppm @ 3%) + palatant	1	0.393	1		





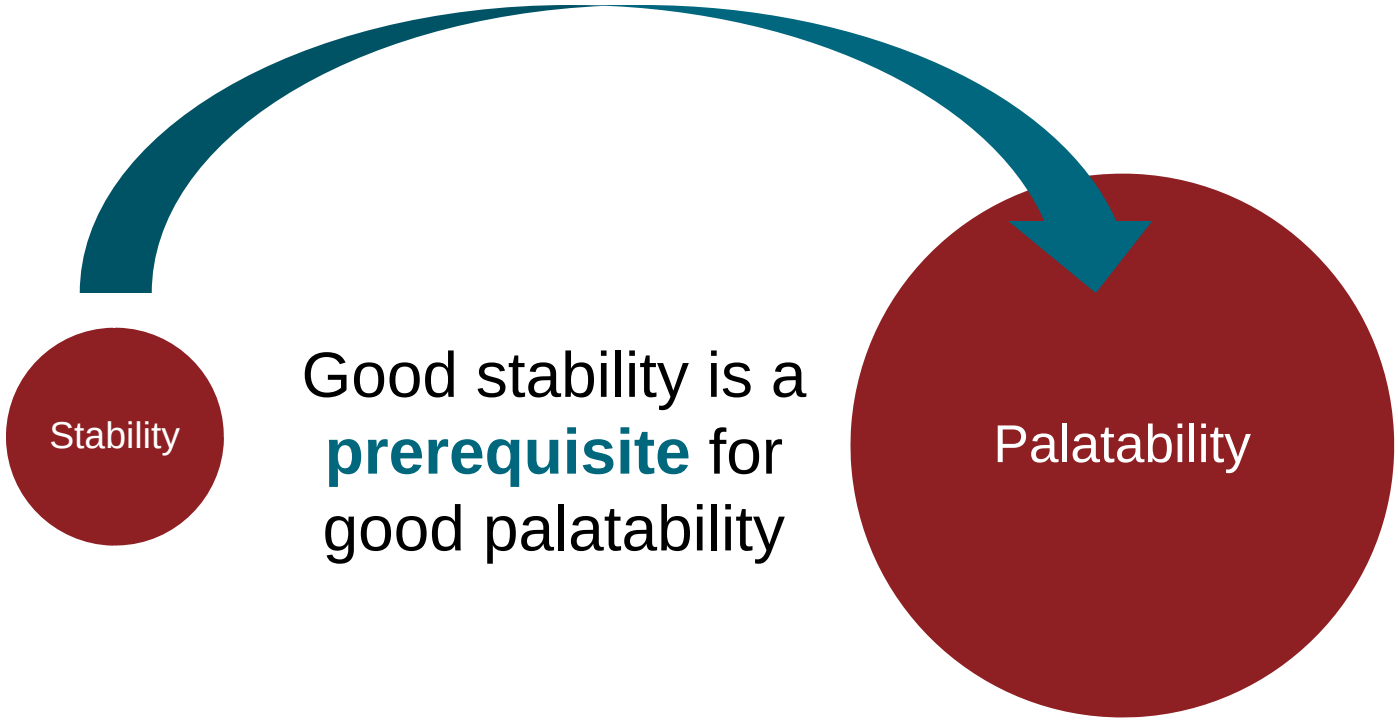
Kemin 2012. Study #258 Unpublished Data

Stabilization Technology that Improves Low Fat Pet Food Stability

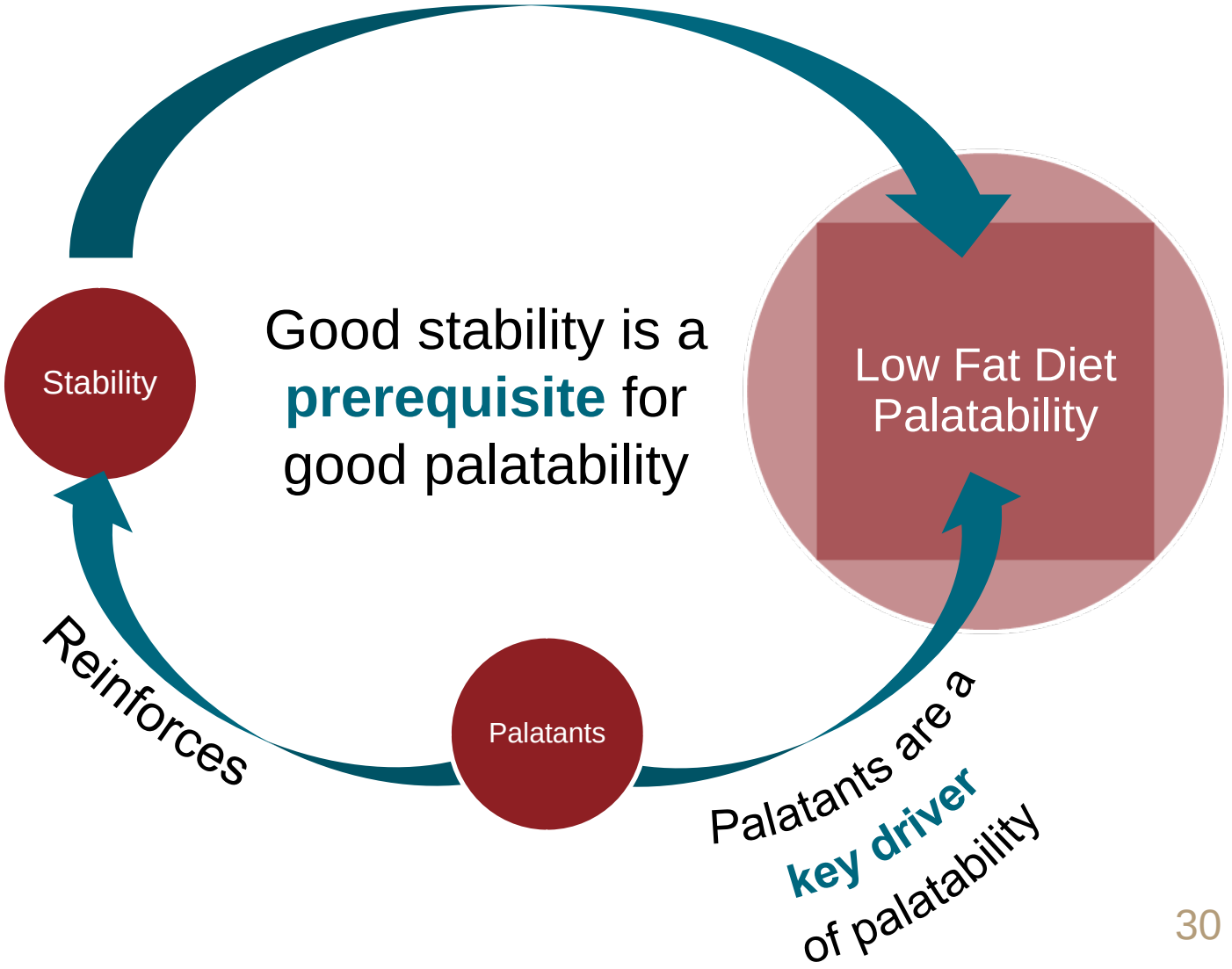
Practical application

- Liquid animal digest products
  - Designed for complete kibble coverage at 3% application rate
- Antioxidant requirement for low fat diet stabilization
  - Proprietary antioxidant blends that are compatible with the digest and provide efficacy for the diet
  - Provides minimum topical antioxidant to low fat diet to compliment 'normal' core antioxidant treatment
- Improved palatability
  - Maintains palatability throughout shelf life

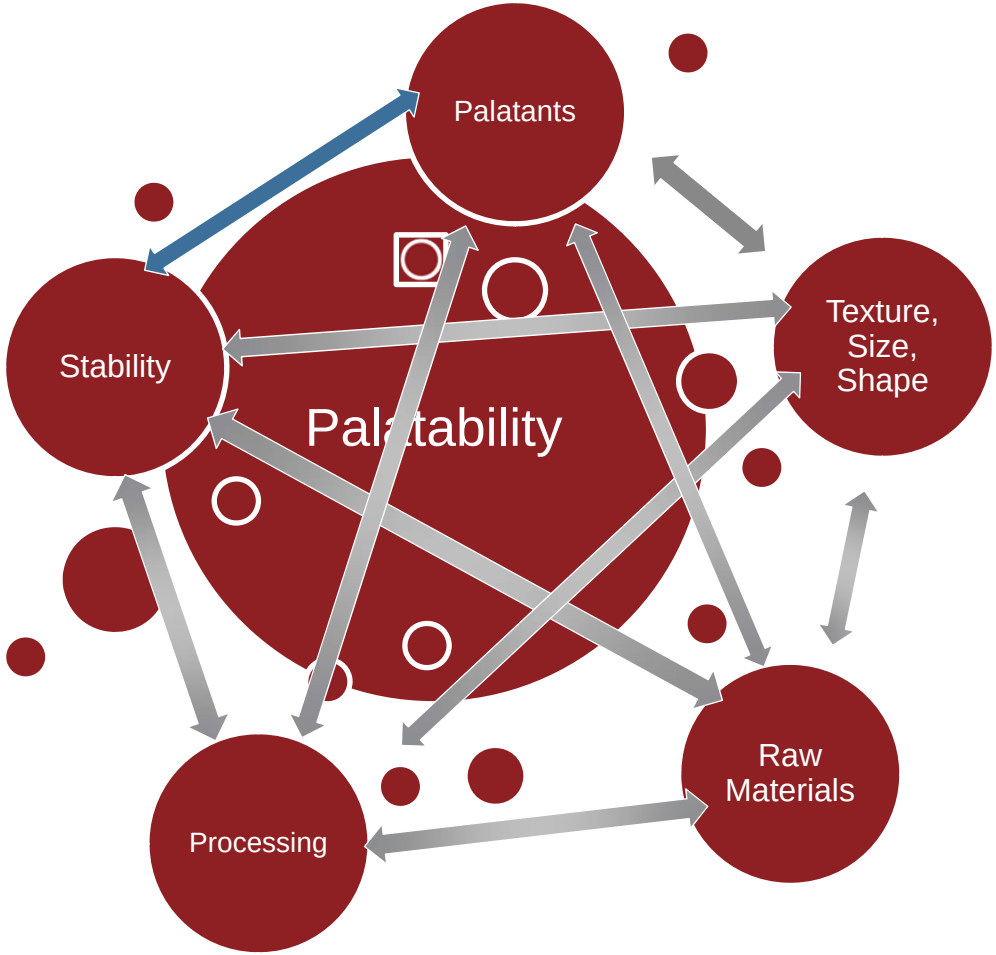
Stabilization Approach Targeted at Low Fat Diets



Stabilization Approach for Improving Stability Reinforces Palatant Performance



Stabilization Technology Opportunities



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Thank You

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