Natural Antioxidants: Trends and Innovations
Petfood Industry Market Trends

- **Clean Labels**
  - Limited ingredient diets
  - Limited processing (raw, fresh, frozen, freeze-dried)
  - Environmentally friendly, Sustainable

- **Humanization**
  - Trickle down effect from human foods
  - “What’s good for me is good for my pet”
  - “Pet Parents”, “Fur babies”
  - Culinary experience

- **Growth of E-commerce**


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Petfood Industry Ingredient Trends

- Diets higher in unsaturated fats
- Natural, organic, holistic
- Vegetable oil substitution for animal fats
- Algal meals and flax as Omega 3 sources
- Corn alternatives (oat groats, flax, soybean, brown rice, other small grains, etc.)
- Fresh meats and novel protein sources

- Trends support higher oxidative risks
Meeting Consumer & Regulatory Demand

- Increased consumer and manufacturing concerns associated with the safety of BHA/BHT/EQ in food and feed ingredients.
  - Pet owners are focused on their own health, as well as their pets’
  - Negative consumer perception associated with synthetic chemicals
  - Increasing concern over animal safety to chemical additives
  - Concern associated with manufacturing employees chronic exposure to these ingredients

- Regulatory challenges
  - Reauthorization of BHA and Ethoxyquin
  - Safety concerns about BHA/BHT
  - Regulatory limits on use of natural flavors

Euromonitor, Natural Ingredients: A Sustained Push for Sustainable Options, Feb. 2014
Ethoxyquin
Mol. Wt. 217

Butylated hydroxyanisole (BHA)
Mol. Wt. 180

Butylated hydroxytoluene (BHT)
Mol. Wt. 220

Tertiary butylhydroquinone (TBHQ)
Mol. Wt. 166

Propyl gallate
Mol. Wt. 212

- **Endocrine disrupter effect.**
- **R40 hazard** (Limited evidence of carcinogenic effect)
- **R51/53 hazard** (Dangerous for the environment, very toxic to aquatic organisms and may cause long-term adverse).

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Future Challenges

• Growth in Natural demand in Food and Petfood
• Utilization of novel Petfood ingredients - impact on product stability
• Registration of new antioxidants
• Demand for Sustainability (supply chain and pricing)

No perfect antioxidant in every situation. Antioxidant selection should be based upon food matrix needs
Advantages of Natural Positioning

• Positive perception - Pets are family members
• Potential health benefits
• High consumer awareness
• Clean Label
• Consumer acceptance of “wholesome” products
• Higher margin potential in premium categories

UK Study – 99% of all pet owners viewed their pets as “part of the family

55% of American and French pet owners admit they would even sacrifice chocolate for their high-quality pet food.

Tier 0 Screening – What We Already Know

BHA  BHT  TBHQ  gallic acid  propyl gallate  ethoxyquin

α-tocopherol  carnosic acid  carnosol  rosmarinic acid

EGCG  ascorbic acid  ascorbyl palmitate  thymol  eugenol  carvacrol
New Natural Antioxidant Molecules/Extract

• **Objective**: Identify new natural antioxidant sources that can complement tocopherols and rosemary, to be used in liquid and dry formulations
  – Not a replacement for tocopherol, but complementary
  – Naturally sourced extracts
  – Plan to submit application for AAFCO and EFSA registration as an antioxidant if necessary
New antioxidant screening

Goal: Identify new, natural, antioxidant sources that can complement tocopherols and rosemary

- In 2018, nearly 100 molecules and extracts were screened for antioxidant activity in bulk oil and using the oxidative stability instrument.
- Species achieving 50% the activity (by weight) of positive controls were considered for further evaluation on a kibble surface and in cold stored chicken meal.
Natural Antioxidant Feasibility

Proof of Concept

Efficacy Testing

OSI, bulk oil, Oxipres

Activity

Literature Review

Patent search/FTO

Contact Procurement

Test 3 Lots

Toxicology

Supply/Cost

Contact SCI

Contact SCI
Tier 1 Screen – OSI in Canola Oil

Half the activity of carnosic acid

passes tier 1 screen
Tier 1 Screen – Bulk Oil Bench Model

untreated canola oil

Half the activity of carnosic acid

ROSEEN (250 ppm)
Tier 1 Screen - Oxipres Dry Mix Testing

- Induction period (IP) or end point (EP) of oxidation is determined
- Improvement (%) over the untreated control is calculated
Tier 2 Screen – Kibble Stability

New Molecules - Kibble Surface Study 40°C

Time (Weeks at 40°C)

Peroxide Value (meq/kg sample)

Carnosic Acid
Tier 2 Screen – Meal Stability

More active at lower temp – indication of kinetics of molecule / extract
Kemin is one of the most vertically integrated suppliers of many plant based products in the world.

Key Plants
- Marigold
- Rosemary
- Spearmint
- Oregano
- Potato
- Tea
Kemin’s Plant Breeding Program (SCI)

1. Search for Genetic Variation
2. Population Construction
3. Select Clonal Lines
4. Propagation
5. Agronomic Scale-up

- Screen

Target Molecules
Biomass
Winter Hardiness
Opportunities

• Meet growing business needs
• Improved sustainability
• Improved supply chain
• Develop broader range of activities
• Solutions for more challenging ingredients/formulations
• Address challenges along entire supply chain
• Regulatory approval of new ingredients
• Meet emerging consumer demands