

66% of dog and cat owners prefer natural ingredients.

Is your brand still using synthetic antioxidants for shelf life and preservation?

Solving oxidation challenges in pet food has become an increasingly important topic as consumers are demanding healthier, higher quality food without synthetic ingredients. This scientifically supported white paper covers important scientific developments along with practical application discussion for using natural, polyphenol-rich, botanical technological antioxidants for pet food shelf life and preservation to replace synthetics or tocopherols.



Oxidation: A Permanent Phenomenon in Pet Food

Lipids supply energy and essential nutrients to pets when added to foods. Fats are a necessary part of a balanced diet for pets, and cats and dogs require lipid fats in even greater amounts than humans. In addition to providing energy, ability to absorb vitamins, and proper metabolic and cellular function, fats also contribute to flavor and texture of pet food and maintain healthy skin and coats.

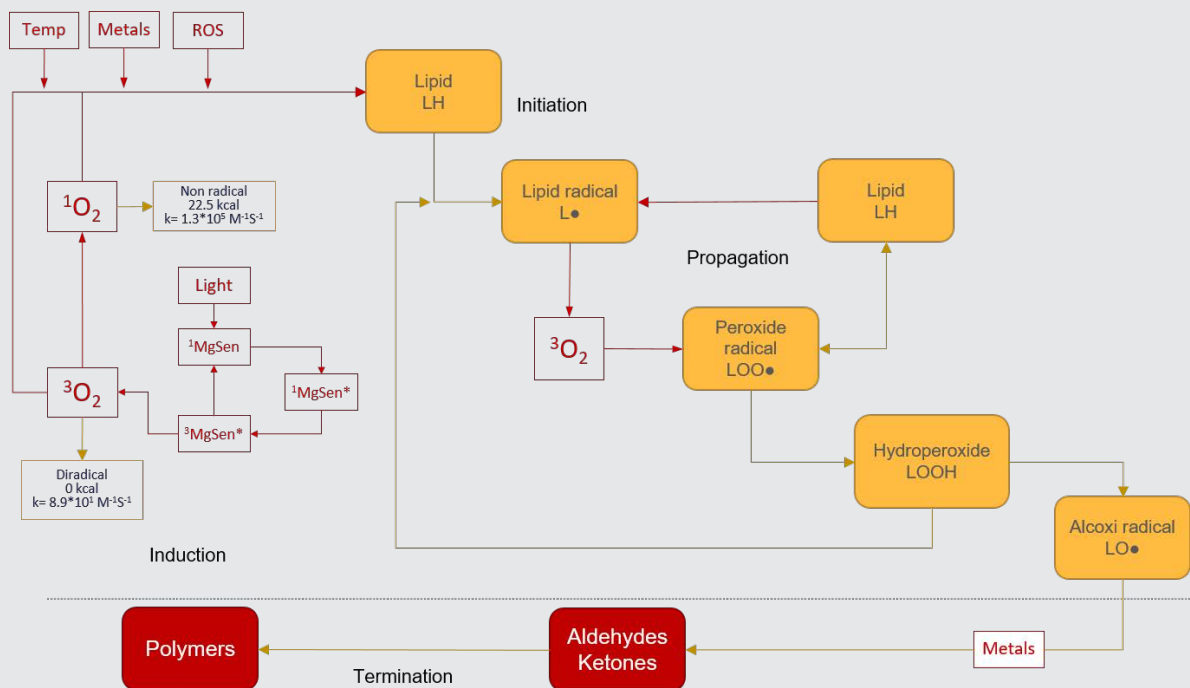
Unprotected, fats go rancid and develop objectionable flavors and odors. Oxidation is an inevitable process that can only be slowed.

Oxidation of lipid substrates is therefore a permanent phenomenon and challenge we must solve. Lipid protection is essential to avoid the loss of functional and nutritive properties of the fats themselves, and of the food they are added to.



The process of oxidation in pet food begins when catalysts such as light, metals or oxygen acting upon a double bond of fatty acid, make them losing an electron, or by secondary hydrogen abstraction reactions.

Hydrogen abstraction by free radicals occur preferentially at hydrogen between double bonds, where the C-H bond energies are lowest. These lipids become free radicals.



The formed free radicals react with oxygen producing peroxy radicals. These in turn react with hydrogen from susceptible substrates and transform into hydroperoxides. The fatty acid turned into a new free radical speeds up the oxidative reaction.

From peroxy radicals and hydroperoxides, primary and secondary oxidation products appear. Among these, carboxylic acids, aldehydes, ketones, furans, and epoxides are powerful odorant substances arising during the termination phase of oxidation.

The change in sensory profile cause food rejection by the pet, while the degradation of fatty acids reduces the nutritive value of pet foods.

The off-putting change in sensory profile is also often detected by consumers, thereby impacting consumer brand impression of pet food quality and suitability for pet health.

Substrates & Oxidation Rates

Catalysts such as light, metals, triplet and singlet oxygen, and high temperatures, initiate oxidation in susceptible substrate commonly used in pet food, including (but not limited to): chicken, tallow, SFO-HO, SFO-LO, fish oil, palm, rice, olive, soy and lard lipids. Pet food contains metals because trace elements are purposely added to them, as they are required for keeping the pet's metabolic functions.

The oxidation rate depends directly on how many double bonds the fatty acids possess. For example, the reaction rate constant of linolenic acid (three double bonds) versus oleic acid (one double bond) is about 77 times faster; that of DHA (six double bonds) is 400 times faster. Therefore, knowing these details from the fat blend used in the food is critical, especially when one wants to extend pet food shelf life for a very long time.

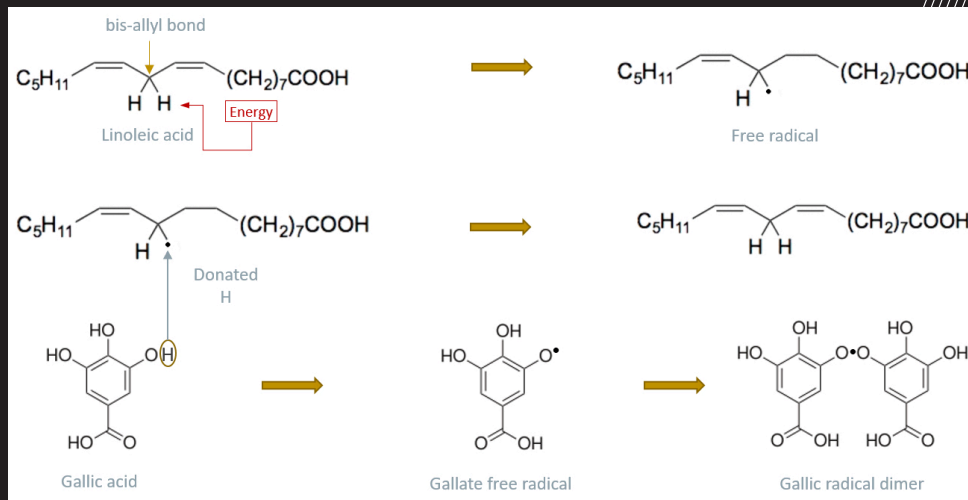


Purpose of Antioxidants

Left to their own devices, fats and oils will unavoidably go rancid and degrade the nutritive content and palatability of pet food, along with consumer confidence. The purpose of any antioxidant is to extend the initiation period of auto oxidation, keeping the lipid fresh and thereby extending the shelf life, allowing its use in pet foods before it enters the termination phase of oxidation.

Antioxidants protect lipids by donating hydrogen, or electrons, to stabilize these double bonds missing one. Through this process, antioxidants themselves become free radicals.

Antioxidant free radicals do not participate in the oxidation cycle due to various mechanisms. These prevent antioxidants behaving as catalysts, safely removing them from the reaction.



Natural Technological Antioxidant Alternatives

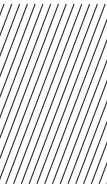
The main purpose of botanical antioxidants is to generate efficient anti-oxidation in lipid-rich substrates without the regulatory burden and consumer restrictions imposed by synthetic antioxidants such as BHT, BHA, TBHQ, or propyl gallate.

Most natural alternatives to synthetic antioxidants rely on tocopherol, or rosemary extracts containing variable amounts of carnosic acid/carnosol and rosmarinic acid. Often, manufacturers associate these two ingredients in market formulations.

These ingredients are efficient alternatives; however, they have limitations such as requiring large doses in certain circumstances, and a high price tag usually associated with these solutions.

Alternatives to synthetic antioxidants exist beyond tocopherols and tocotrienols, or diterpene rosemary derivatives. Other polyphenol-rich natural extracts also contain ingredients with high antioxidant capacity.

Catechin or gallic acid derivatives, as monomers, dimers or short-chain polymers have shown antioxidant properties, and scientific literature contains many reports of such capacity. However, testing these polyphenol-rich ingredients as antioxidants in lipid substrates for pet nutrition requires using sufficiently sensitive measurement to reveal their differences. Read on.



TruGro[®] by layn[®]

Research Design

OSI and Rancimat. The standard stability indicator in fats and oils is OSI (Oxygen Stability Index). A common way to determine this index is the Rancimat procedure. The ISO-6886:2016 - Animal and vegetable fats and oils — offers a determination of oxidative stability (accelerated oxidation test) applied to a Rancimat device and serves as a serial method for determination of lipid stability when polyphenol-rich combinations are added as preservatives to a specific lipid.

Temperature and Time. The system adds high temperature and aeration to lipid samples and compares the time it takes to reach the end of the procedure, then comparing the time of the added polyphenol-rich combinations, synthetic antioxidants, or control group (no antioxidant). The longer the time to reach the end of the procedure, the higher the lipid stability.

Sampling Spectrum of Substrate Saturation Indices. Substrates of interest are vegetable oils and animal fats, and the choice of such lipids should cover a wide range of unsaturation: from beef tallow with an unsaturation index of 1.0, to high oleic vegetable oils, with an unsaturation index of 11.7, and also, lipids rich in DPA, DHA, and EPA, such as fish oil.

Polyphenol-Rich Botanicals vs. Synthetics. Effective research compared formulations based on polyphenol-rich botanical extracts, with ingredients from the groups of catechins, gallic acid, ellagic acid, and rosemary diterpenes. The reference antioxidants consisted in hindered phenols currently used in many food systems, including synthetic BHT, BHA, TBHQ, and tocopherol-based natural antioxidants.

Proven Performance: The Power of Polyphenols



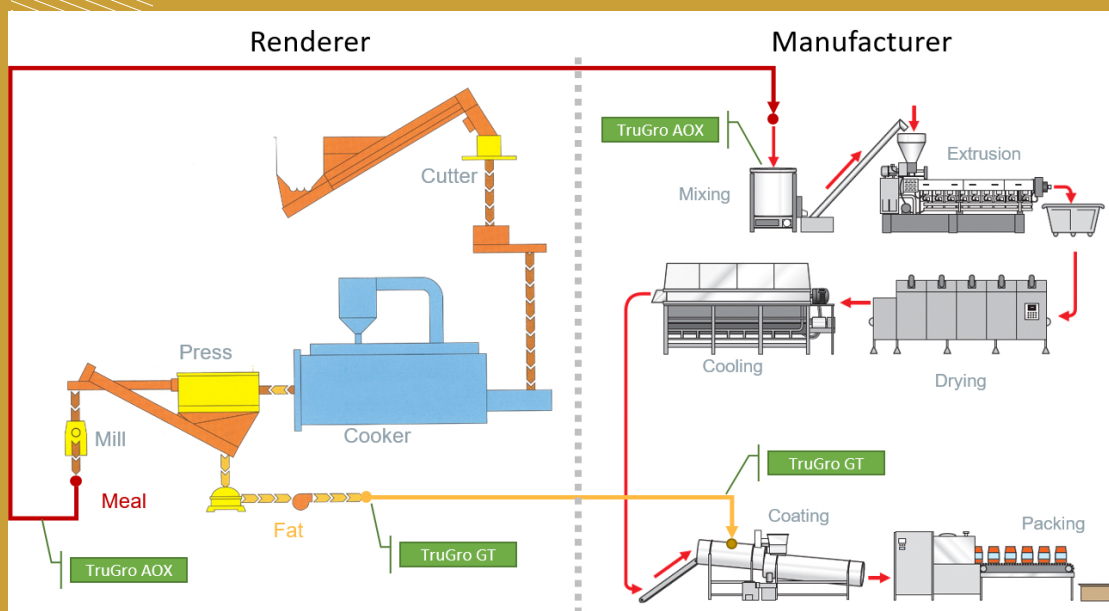
The result? Natural, polyphenol-rich botanical extract antioxidants demonstrated compelling protection activity of lipids vs. other products tested, synthetic or natural.

Tru-Gro[®] GT OS, a lipid-dispersible natural antioxidant based on catechins and gallic acid derivatives from nature, and intended for long-term protection of energy-supplying fats and oils, demonstrated exceedingly high capacity for protecting even the most sensitive lipids.

TruGro[®] AOX, a powder antioxidant intended for lipid and vitamin protection in solid matrices, containing an antioxidant core based on rosemary diterpenes and other natural extracts, and a metal chelator combination that protects the lipids from the catalytic activity of these ions, also demonstrated high oxidation protection.

Together, polyphenol-rich natural botanical solutions TruGro[®] GT OS and Trugro[®] AOX form a powerful antioxidant system scientifically proven to protect pet foods against oxidation, offering high performing, cost effective preservation support and extending shelf life as manufacturers and consumers require.

Practical Application of Polyphenols



The practical application of antioxidant use in pet food has to consider protecting fats and oils, or lipid-containing meals, and also the final food.

Bulk lipids are sensitive to oxidation and should be protected right at the renderer, as a substantial time may lapse from obtaining the oil or fat to its final use.

Complete food also requires protection. The recipe may include untreated raw materials that contain lipids, and this may constitute a starting point of oxidation.

Additionally, trace elements added through the premix add oxidation catalysts. One factor to take into account is the resistance of the antioxidant molecules to both the extrusion process, and to the high temperature drying of pet foods. This double addition will insure the manufacturer reaching the required shelf life for pet food matrices.

The logo for TruGro by Layn, featuring the word "TruGro" in a bold, sans-serif font, followed by "by" in a smaller font, and "Layn" in a stylized, cursive font. The entire logo is in a golden-yellow color.

TruGro[®] by *Layn*[®]

A decorative graphic consisting of a series of parallel, diagonal white lines on a dark background, located to the left of the section header.

TAKE-HOME MESSAGES

- Fats are essential to pet health and nutrition and all fats oxidize.
- For use as technological antioxidants, polyphenols are natural, botanical substances with proven high antioxidant capacity to protect pet food fats and oils to meet shelf life and preservation requirements.
- Consumers are demanding natural ingredients for their pets. Polyphenol-rich botanical extracts can meet these expectations.
- Polyphenol-rich extracts work more efficiently than other natural antioxidant options currently in the market at a more competitive cost of inclusion.

INTERESTED IN MORE DATA?

Receive a comparison table comparing antioxidant performance of synthetic antioxidants, tocopherols, and natural, polyphenol-rich TruGro[®] by contacting trugro@layn-usa.com.

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About Layn Natural Ingredients and TruGro® by Layn

Layn Natural Ingredients is one of the world's largest innovators of natural botanical extract ingredients and solutions serving the biggest brands in food, beverage, flavor, nutraceutical, personal care, animals and pets for over 25 years. TruGro® by Layn is Layn's speciality business unit providing botanical ingredients and solutions for pet and animal nutrition.

Truly vertically integrated, Layn offers nearly three decades of experience in providing a fully secure, manufacturer-direct, transparent and scalable supply chain. From seeds and agronomy, to extraction and formulation, Layn is committed to quality, innovation and sustainability.

Its world-class R&D operation processes more than 120 million kilos of biomass annually and includes global innovation centers throughout the world to conduct research, ensure quality, and provide formulation and application guidance to customers.

Botanify Your Pet Brand Product Portfolio Now With TruGro® by Layn
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