PET FOOD SOLUTIONS LLC

Refined Chicken Fat:

A Multi-Benefit Ingredient for Improving Safety, Quality, Sustainability, and Efficiency for Pet Food Manufacturers

GOLDPAL

GOLD SHIELD®

Hi! I'm GUARDIAN! Read on to see why The Difference is CLEAR!

IMPORTANT NEEDS
for Pet Food Manufacturers:

Manufacturers face a multitude of challenges in the production of Pet Food. First is always safety, and this should be part of every ingredient and system involved in the production process. Brand and product quality are also key focal points and finding ways to improve key attributes that influence quality is a never-ending search. Finally, running the best operation and doing it in a predictable, dependable, sustainable, and profitable manner will determine the long-range success of the operation. We've heard of these needs from multiple pet food manufacturers, and we're happy to report that we have revolutionary products that can address them all.

WHO
is Pet Food Solutions?

Pet Food Solutions is a highly respected refiner of animal fats, serving unique industries including pet food production. Our processes and ingredients are driven by technology that is designed to provide multiple benefits which lead the industry in a clean and green approach, with zero waste. Our record of safety and quality is unmatched and we pride ourselves on providing service that aligns with the exceptional quality of our ingredients.

WHAT
is Refined Chicken Fat?

Refined Chicken Fat is a multi-benefit ingredient for use in pet food that has been designed to replace standard higher risk, rendered chicken fat. Pet Food Solutions Refined Chicken Fat will reduce the risk of Salmonella contamination, maintain product stability and quality, and improve plant operations. Refined Chicken Fat from Pet Food Solutions is a consistent high quality chicken fat from which most of the non-fat impurities found in standard rendered chicken fat have been removed.

HOW
is Refined Chicken Fat Produced?

Pet Food Solutions Refined Chicken Fat is produced using a highly automated, patented process which carefully balances four key variables: water, pressure, heat, and time. We currently produce large volumes of Refined Chicken Fat, and we can increase capacity as needed. Standard rendered chicken fat contains about 5% of non-fat components including inorganic salts, organic impurities, and insoluble particulates that form a sludge on the bottom of storage tanks. We remove these unwanted materials for better pet food and improved operations.

The extraction material (i.e. the non-fat components) is used for fertilizer, animal feed, or biodiesel production, so our process does not generate any waste. Pet Food Solutions Refined Chicken Fat provides the pure fat food value of chicken fat without the impurities that can cause problems in pet food production, and in the quality of the formulated pet food.

Our processing is the key to providing a high quality and safe ingredient. Beyond removing chemical impurities, our processing will also remove microbial impurities. To test this hypothesis, we inoculated standard rendered chicken fat in water with Salmonella, and then submitted the sample to simulated process conditions that are obtained during the production of Pet Food Solutions Refined Chicken Fat. Salmonella was killed in under 5 minutes, giving us a significant safety margin during our processing. If any Salmonella were to enter our process from the standard chicken fat, it would be quickly killed. Therefore, we are confident about the microbiological quality of our Gold Shield® and GoldPAL Refined Chicken Fat, and we have a specification of undetectable levels of Salmonella as tested by a third-party lab on every batch.

Experiments Conditions	Time (min)	CELL POPULATION CFU/mL	Log 10	Log Reduction
Salmonella newport	0	1.56E +10	10.19	-
Sample = CF 2018-56a	1	780	2.89	-7.3
Low Process Temperature	2	2	.3	-9.89
0.5 mL CF + 0.5 mL of cell is in TSB	3	0	-	-
	10	0	-	-
	30	0	-	-

The bird flu virus can also be inactivated with heat. A recent paper found that at 63°C, HPAI A(H5N1) virus was inactivated from initial titers of 106 TCID50 per milliliter to undetectable levels within 2 minutes[i]. Our process conditions provide a significant safety factor to those conditions insuring inactivation of any HPAI A(H5N1) virus that may be present in the standard rendered chicken fat.

Realize 5% more usable product with every Refined Chicken Fat shipment!

The Difference: Sustainability

Refined Chicken Fat is a sustainable ingredient, aligning with the international guidelines for an ingredient that minimizes carbon footprint and waste. Common measures of sustainability are as follows:

- Carbon footprint
- Waste streams including emissions
- Use of natural resources
- Impact on natural ecosystems and habitats
- Water usage

The production and use of Pet Food Solutions Gold Shield® and GoldPAL Refined Chicken Fat qualifies it as a cost-effective, sustainable ingredient by all these measures.

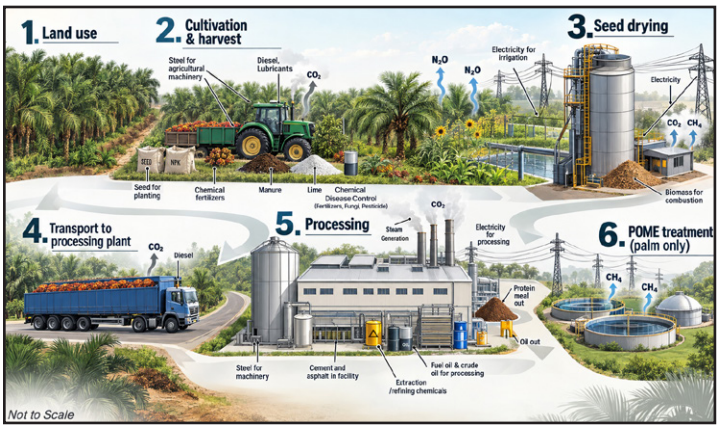
The sustainability of standard rendered chicken fat has been extensively researched.[ii] Americans only consume about half of a chicken. Rendering the parts of a chicken that are not consumed by humans is a sustainable way to recover the full value of a chicken and eliminate a waste stream from landfills. This ultimately leads to a reduction in carbon dioxide generation that would have resulted from decomposition of the chicken components if they ended up in a landfill.

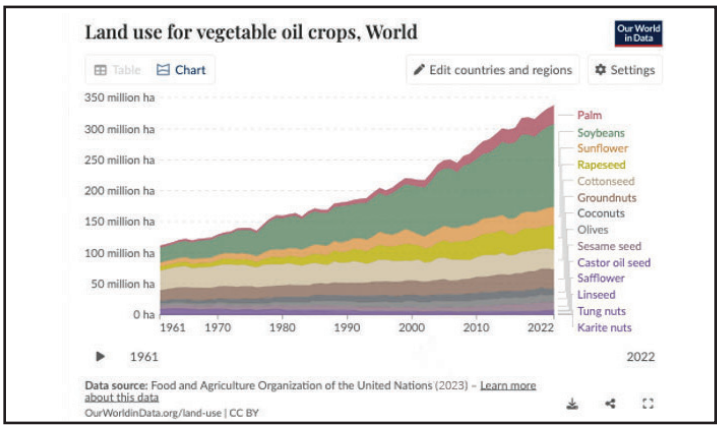
However, standard rendered chicken fat has risks that lead some pet food manufacturers to consider and ultimately incorporate alternative fat products into their formulated diets. The major risks include contamination by Salmonella, and quality issues about consistency and insoluble impurities.

Salmonella can be present in standard rendered chicken fat and then grow on non-fat impurities in the fat during shipping and storage. We have shown that Salmonella will not grow in Pet Food Solutions Refined Chicken Fat because we remove the non-fat impurities.

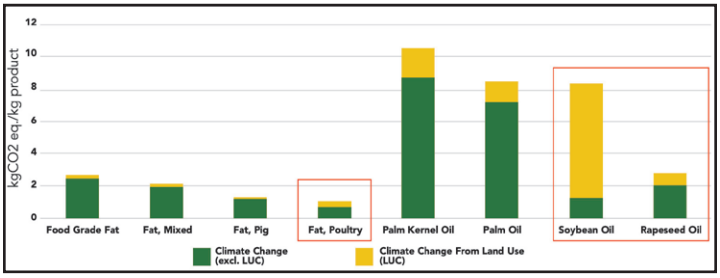
By removing the impurities from standard chicken fat, Gold Shield® and GoldPAL Refined Chicken Fat have consistent quality and low insolubles. The risk of clogged nozzles is significantly reduced. Analysis of insolubles in standard chicken fat (our starting material) showed variability with one lot at 3.0% insoluble. All lots of Pet Food Solutions Refined Chicken Fat are below 0.2% insolubles.

Plant-based oils (soy, canola, or coconut) are sometimes thought of as sustainable alternatives to chicken fat that avoid some of the risks of standard rendered chicken fat. In reality, the production of plant-based oils is comparatively resource intensive in production, processing, and transportation. Since 1960 there has been a dramatic increase in the land use from the production of the major plant-based oils which has led to deforestation and threats to biodiversity.[iii] Production of tropical oils like coconut oil has an even greater impact on the environment by altering especially sensitive ecosystems which causes an increase in extinction risks.[iv]





A comparison of the amount of carbon dioxide created from the production of different types of oils showed that poultry fat generated much less CO_2 than alternatives and is the most sustainable fat by this criteria.[v] The production of rendered chicken fat generates eight times less CO_2 than the production of soybean oil and three times less than the production of canola oil.



Gold Shield® and GoldPAL Refined Chicken Fat are produced from a clean process from standard rendered chicken fat without the addition of organic solvents or other reagents. The small amount of waste from our process is used either as animal feed or for bioenergy. The additional carbon footprint from the production of Gold Shield® and GoldPAL Refined Chicken Fat is minimal and mainly due to steam production and transportation. Even that can be reduced by utilization of rail instead of trucks for delivery.

Gold Shield® and GoldPAL Refined Chicken Fat are sustainable ingredients that can be used in pet food without the risks associated with standard rendered chicken fat. Gold Shield® and GoldPAL Refined Chicken Fat have significant advantages to alternative plant-based oils from both a sustainability and nutrition perspective.

A Clean, Clear Choice.

How Does Refined Chicken Fat Differ From Standard Chicken Fat?

Chicken fat is an important ingredient in a pet's diet to provide energy, help cells and organs function well, and support a healthy skin and coat. Gold Shield® and GoldPAL are some of the purest forms of chicken fat on the market. The benefits of chicken fat are obtained with Refined Chicken Fat without the problems associated with the non-fat components that usually accompany the standard grades of chicken fat. Because the fatty acid profile is not different from the standard grades, no labeling change is required to fully utilize Pet Food Solutions Refined Chicken Fat instead of standard chicken fat. As noted above, our customers use ALL of the product we ship them because we remove the impurities so you don't have to.

Pet Food Solutions Refined Chicken Fat is a translucent amber to light brown colored product that looks and performs differently from standard rendered chicken fat. The table below shows a comparison between our Refined Chicken Fat and standard chicken fat on a typical batch. Although the non-fat components in the fat have been significantly reduced, the fatty acid profile of our Refined Chicken Fat is the same as the standard chicken fat. For example, the linoleic acid content that is important for coat health is the same in our Refined Chicken Fat as that in standard chicken fat (about 20 wt.-%).

The benefits from the fat are maintained, but many of the problems associated with the standard chicken fat are eliminated. Most of the insoluble material that can cause clogs in lines and residue in storage tanks is removed from the standard fat. What this means for the manufacturer is far fewer unscheduled line stops, requiring maintenance and costing valuable production time.

Soluble impurities are also decreased. The soluble impurities include metals which are known to be catalysts for oxidation. Metal levels (e.g. iron and magnesium) are reduced from 2–4 ppm to less than 1 ppm. Levels of inorganic water-soluble salts such as phosphate and sulfates are decreased. The P content can decrease by over 95% (from 280 ppm to 6 ppm). Organic water-soluble impurities (e.g. nucleic acids, and amino acids) are also removed. These organic impurities can function as pro-oxidants that impact product stability and nutrients for microbial growth.

The use of Pet Food Solutions Refined Chicken Fat allows the production of a precisely formulated diet achieving all the benefits of chicken fat without the problems associated with the non-fat impurities in standard chicken fat.

Same product, better performance.

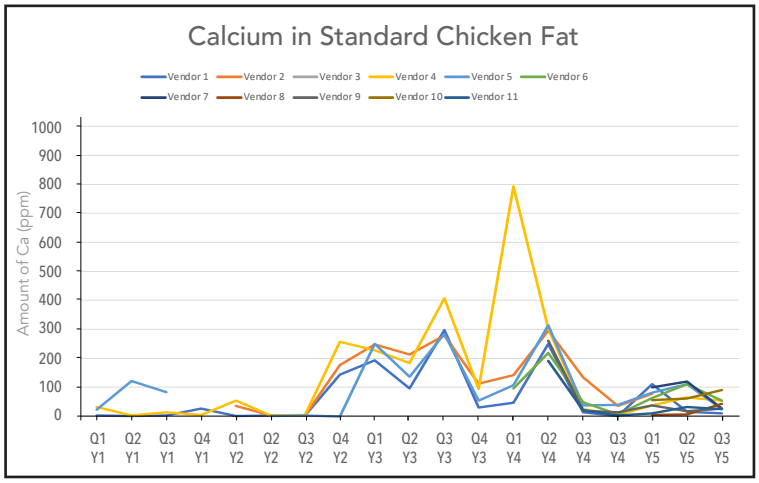
I can tell the difference is CLEAR.

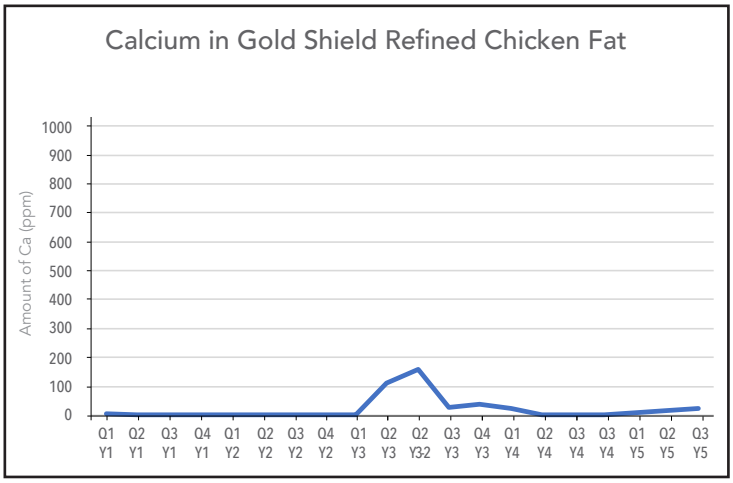
See why at
PetFoodSolutions.com

REFINED CHICKEN FAT: TYPICAL ANALYSIS VS. STANDARD CHICKEN FAT

	Refined Chicken Fat	Standard Chicken Fat
Moisture (Avg wt-%)	0.40	0.18
Insolubles (Avg wt-%)	0.08	0.24
Unsaponifiables (Avg wt-%)	0.99	0.92
Total MiU (Avg wt-%)	1.47	1.33
Free Fatty Acids (Avg wt-%)	2.75	3.15
Peroxide Value (meq/kg)	0.70	0.70
METALS AND SALTS		
Iron (ppm)	<1.0	1.8
Magnesium (ppm)	<1.0	4.2
Calcium (ppm)	5.1	15.9
Phosphorus (ppm)	6.4	280.9
Sodium (ppm)	2.0	48.0
Potassium (ppm)	4.6	82.4
Sulfur (ppm)	26.3	43.2
FAC Color	Translucent Amber to Medium Brown	
Physical Appearance	Mobile Liquid	
Flavor/Odor	Neutral/Bland	

Fatty Acid Profile (Avg wt-%)	Refined Chicken Fat	Standard Chicken Fat
C12 Lauric Acid	0.06	0.05
C14 Myristic Acid	0.56	0.63
C14:1Myyristoleic Acid	0.17	0.18
C16 Palmitic Acid	23.90	24.32
C16:1 Pamitoleic Acid	6.64	6.58
C16:2 Hexadecadienoic Acid	0.00	0.02
C17 Margaric Acid	0.11	0.09
C17:1 Maraoleic Acid	0.08	0.03
C18 Stearic Acid	5.83	5.99
C18:1 Oleic Acid	39.90	39.94
C18:2 Linoleic Acid	20.39	19.73
C18:3 Linolenic Acid	1.25	1.22
C20 Archidic Acid	0.06	0.08
C20:1 Eiscosenoic Acid	0.33	0.29
Fatty Acids	99.28	99.10





Higher Purity Fat Required to Facilitate Precision Diets

Pure ingredients are becoming increasingly important as pet parents want diets that are designed specifically for the breed, age, and health of their pet. To enable accurate supplementation of key macronutrients (e.g. calcium (Ca) and phosphorus (P)) and micronutrients (e.g. iron (Fe)) and to avoid any toxic metals (e.g. cadmium (Cd)), lead (Pb), mercury (Hg), and arsenic (As)), it is important that the purity of the other ingredients in the formulation are known and consistent.

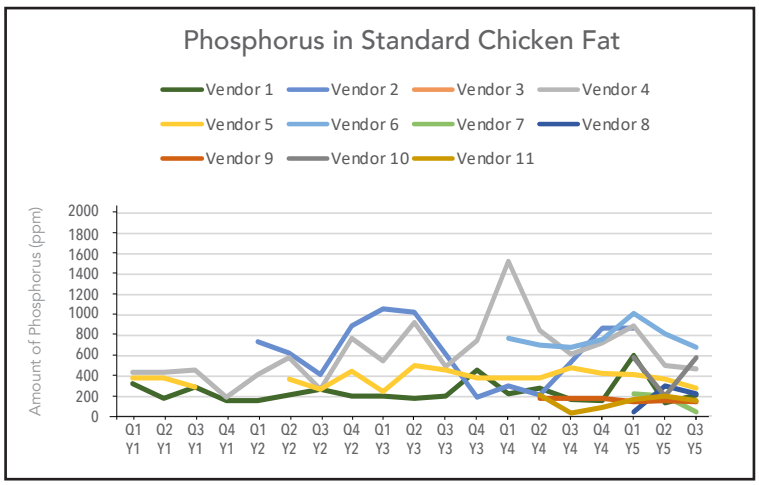
Past analyses of dry pet foods have shown that over half of the pet food was not compliant with government nutritional guidelines.[vi] Most often the findings showed that essential macro nutrients and essential trace nutrients were above recommended levels. In addition, some pet foods had high concentrations of toxic metals. Scrutiny of pet food composition by government agencies and independent researchers is expected to increase in the future.

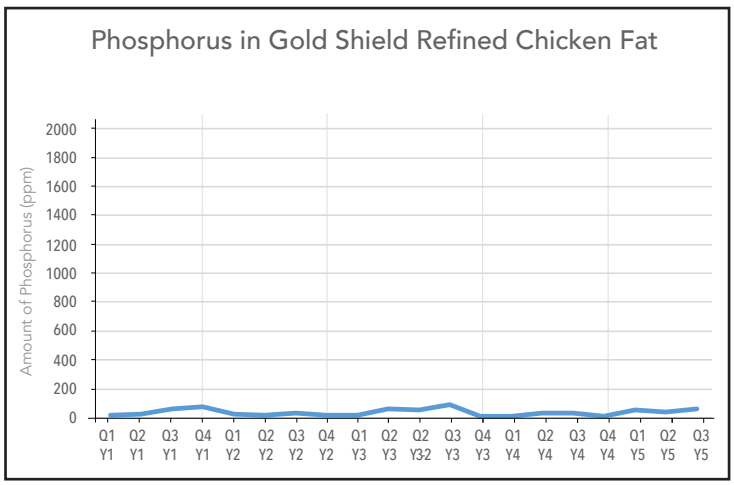
We have been testing standard chicken fat and Gold Shield® Refined Chicken Fat for over five years for a number of the key elements that are of concern. Our patented process significantly reduces the levels of many key elements in chicken fat resulting in pure chicken fat with a consistent profile.

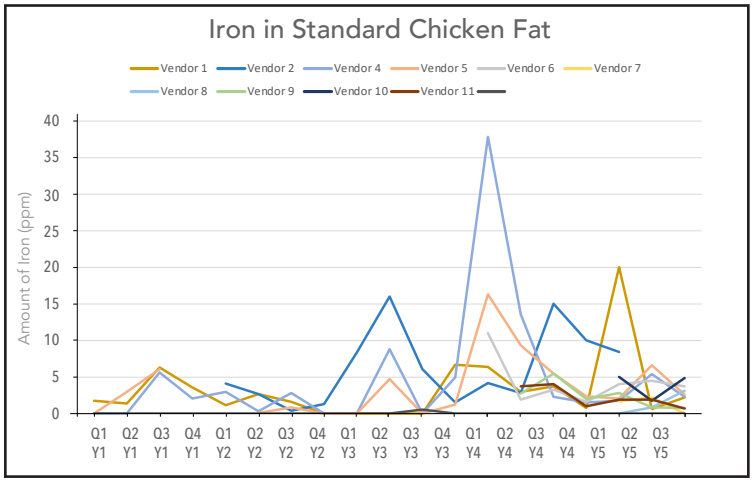
Ca and P are important macronutrients for teeth and bone growth and for many cellular functions for pets. Not only is the overall amount of each element important, but the ratio between Ca and P is important. However, an excess of either Ca or P can lead to kidney disease as well as contribute to the formation of bladder stones. As shown in the graphs, standard chicken fat can have significant levels of each element and there is variability based on the supplier and other factors. Our process removes variability, providing a fat with very low levels of both Ca and P allowing for accurate supplementation.

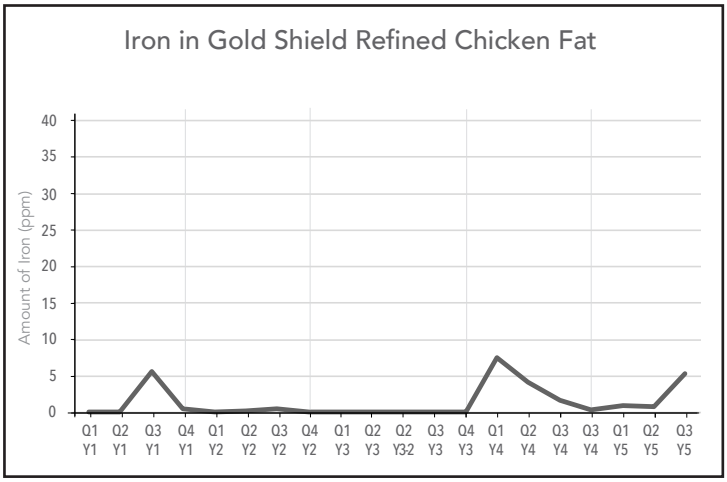
Fe is a key micronutrient for pets, utilized for key functions in almost all cells in the body. However, excess Fe can cause damage to the gastrointestinal, liver, metabolic, nervous, and cardiovascular systems. A recent analysis of pet food found that over half of the pet food tested had more than a ten-fold excess of Fe in the formulation compared to the minimum recommended level and 13% of the pet food tested had more than the maximum legal limit.[vii] We have been testing for Fe for over five years, and our process significantly reduces the amount of Fe in the fat. Variability is removed and accurate supplementation of Fe can then occur.

Lastly, we have tested Gold Shield® Refined Chicken Fat for toxic metals for over five years with undetectable levels of Cd, Pb, and Hg, as in our finished product. It has been reported in the literature that Cd can be present in some standard chicken fat samples,[viii] so the use of our Refined Chicken Fat in a formulation can be an important part of a program to keep toxic metals out of a pet's diet.









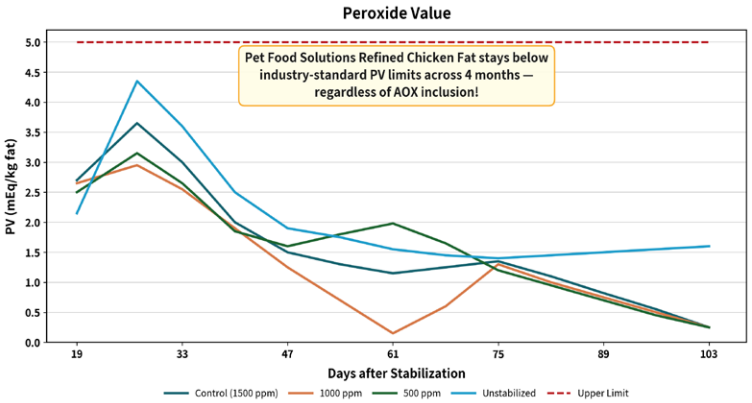
BENEFITS

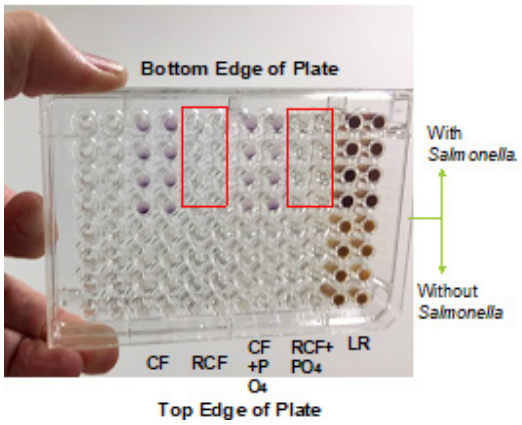
of Pet Food Solutions Refined Chicken Fat

SAFETY

Pet Food Solutions Refined Chicken Fat was designed to provide many benefits to the pet food manufacturer, pet food consumers, and ultimately to pets. It all starts with improved safety by reducing the risk of Salmonella contamination of pet food. The FDA has a zero-tolerance policy for Salmonella contamination in pet food and treats. In 2025, 65% of recalls were Salmonella-related — an increase from 47% in 2024.[ix] All manufacturers need to proactively reduce the possibility of Salmonella contamination in their products.

Salmonella contamination of pet food often occurs through Salmonella contamination of the chicken fat ingredient, since it is typically added to coat the extruded pellet after the high temperature kill step in the process.[x] Any Salmonella contamination of the chicken fat could result in contamination of the food itself.





Recently low water activity products like chicken fat were thought to not harbor Salmonella, but it is now known if water is present (and it is almost always present due to water in transfer lines and vessels used during transportation) Salmonella can survive and grow.[vi] A key to the growth is the level of nutrients in the chicken fat that can be easily metabolized by Salmonella. These key nutrients for Salmonella growth in chicken fat include water, essential metals, and organic materials (e.g. amino acids and nucleic acids).

Pet Food Solutions Refined Chicken Fat was designed to be bacteriostatic to Salmonella contamination. By removing the non-fat components in standard chicken fat, we remove the nutrients necessary for Salmonella growth. Even if water is present, Salmonella is unable to grow in Pet Food Solutions Refined Chicken Fat.

To prove this concept, we designed an experiment using a 96 well plate. The wells were charged with either standard chicken fat or with Gold Shield® Refined Chicken Fat. Some of the wells were challenged with Salmonella cells (others were maintained as controls), and all of the wells were monitored for growth over 24 hours. All the wells of standard chicken fat showed significant Salmonella growth and all the wells with Gold Shield® Refined Chicken Fat showed no growth. By removing the non-fat components from standard chicken fat, our Gold Shield® Refined Chicken Fat is proven to be bacteriostatic against Salmonella contamination. When Pet Food Solutions Refined Chicken Fat is used instead of standard chicken fat in a pet food formulation, the risk of Salmonella contamination of the pet food will be significantly reduced.

PFS Peroxide Value Gold Shield Refined Chicken Fat Stability					
Days after Stabilization	Control (1500 ppm)	1000 ppm	500 ppm	Unstabilized	Upper Limit
19	2.70	2.65	2.50	2.15	5.00
27	3.65	2.95	3.15	4.35	5.00
33	3.00	2.55	2.65	3.60	5.00
40	2.00	1.90	1.85	2.50	5.00
47	1.50	1.25	1.60	1.90	5.00
54	1.30	0.70	1.80	1.75	5.00
61	1.15	0.15	1.98	1.55	5.00
68	1.25	0.60	1.65	1.45	5.00
75	1.35	1.30	1.20	1.40	5.00
82	1.10	1.00	0.95	1.45	5.00
89	0.82	0.75	0.70	1.50	5.00
96	0.55	0.50	0.45	1.55	5.00
103	0.25	0.25	0.25	1.60	5.00

STABILITY

Pet Food Solutions Refined Chicken Fat maintains stability with oxidation below industry standard levels (PV < 5(mEq/kg) in excess of 100 days is more stable and resistant to oxidation than standard chicken fat. Peroxide value (PV) is a measure of oxidation that has occurred in a food or ingredient due to exposure to air.

The performance of Refined Chicken Fat maintained industry standard regardless of the antioxidant that was added (0 to 1,500 PPM). This, while considerable oxidation occurred in standard chicken fat even when antioxidants (standard mixed tocopherols) were added at various levels. Even with 3,000 ppm antioxidant, the PV increased from about 2 to over 14 mEq/kg over the 12 weeks in the standard chicken fat. The PV for Pet Food Solutions Refined Chicken Fat changed but did not exceed normal PV limits.

Oxidized fat has also been shown to have detrimental effects on canine health by reducing weight gain in puppies and impairing bone and immune functions.[xii] Pet Food Solutions Refined Chicken Fat is less susceptible to air oxidation because the catalysts for oxidation (e.g. metals and enzymes) are removed. Formulations with stable fat will lead to healthier pets and proper growth.

IMPROVED OPERATIONS

Current customer feedback has provided real world examples of the efficiency benefits for Gold Shield® Refined Chicken Fat. Because of the lack of impurities which can clog lines and nozzles, fewer unscheduled maintenance stops are required. Also, fewer tank cleanings are required with this product over time. The value of this extra benefit can be a material difference, resulting in tens or hundreds of thousands of dollars per year. Most manufacturing facilities put a high premium on materials that improve efficiency and save costs, and this has been reflected in the feedback from current users.

PALATABILITY

Pet Food Solutions GoldPAL Refined Chicken Fat provides all the noted benefits above, while significantly improving the palatability of dog food formulations. GoldPAL Refined Chicken Fat is a major step forward in palatability enhancement. This product has been tested by third party industry standard facilities, and development agencies with documented data. In all testing instances, this GoldPAL Refined Chicken Fat significantly outperforms the palatability of standard chicken fat 2.28 to 1.

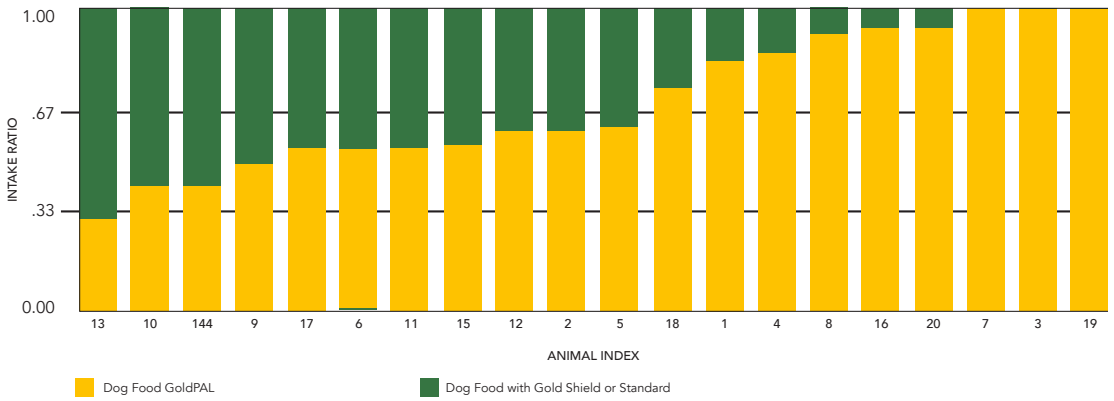
There is a 2.28 to 1 consumption ratio of pet food made with GoldPAL vs. pet food made with Standard Chicken Fat. First Choice was even more impressive with virtually all dogs choosing the food with GoldPAL.

In another independent study, we produced a fat-coated kibble with one of our customers. Everything in the formulation was identical except that some pet food was produced with standard chicken fat and some pet food with Pet Food Solutions Gold Shield®. We then compared the palatability of the food by presenting both foods to twenty beagles over two days and monitoring the total consumption and the first choice.

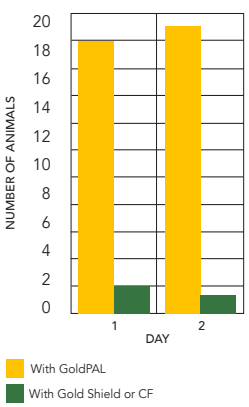
For this formulation, Gold Shield® Refined Chicken Fat was preferred, and the pets chose food made with Gold Shield® Refined Chicken Fat first.

Every formulation is different of course including ingredients, type and quantity of palatants, and other factors. Your results will depend on these variants, and we encourage testing to determine all our benefits.

Intake Ratio: 2.3 to 1



First Preference



VALUE

Pet Food Solutions Refined Chicken Fat: Value for Pet Food Producers

RCF TECHNOLOGY FEATURE	BENEFIT	IMPLICATIONS FOR MANUFACTURERS
Bacteriostatic Safety	* Free of Salmonella (verified by 3rd party test) * Inhibits future Salmonella growth	* Improved consumer food safety by eliminating Salmonella risk * Lowers plant worker exposure risk
Purity & Value	* Non-value waste removed, leaving pure chicken fat with consistent quality	* 5% more usable product with every delivery—less waste, more value
Operational Efficiency	* Non-fat compounds virtually eliminated; easier to handle and pump	* Less clogging, lower process maintenance, and reduced cleanup costs
Superior Palatability	* GoldPAL preferred 2.28:1 over standard chicken fat * Gold Shield is parity or better performance vs. standard higher-risk chicken fat	* Pets and pet owners prefer the product * Consistent quality manufacturers can rely on
Superior Stability *(Purity & Consistency)*	* Far better product quality and excellent shelf life * Lot-to-lot uniformity with tighter specs	* Potential cost savings on antioxidants and chemical additives * Minimized process variation * Higher nutrient density (pure fat)
Clean Label, Sustainability & Reduced Additives	* Labeled simply as "Chicken Fat" * No chemicals used in refining * Zero-waste, full-circle process	* No added labeling cost * Natural from start to finish * Scalable, environmentally friendly production
Export Value (EU Certification)	* EU certified for export	* Key benefit to serve markets beyond the U.S., no added labeling/regulatory cost
Potential Health Benefits	* Reduced salts and metals in the finished product	* Possible joint and kidney health improvement for pets

How To Contact Us

David L. Meeker, PhD, MBA
Head, Research & Development
David.Meeker@petfoodsolutions.com
(703) 785-1750

Kristen Neal
Business Development Manager
Kristen.Neal@petfoodsolutions.com
(708) 712-5329

PET FOOD SOLUTIONS LLC

www.PetFoodSolutions.com

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