



PET FOOD MAGAZINE

■ Issue N° 18

INTERNATIONAL MAGAZINE ABOUT THE PET FOOD INDUSTRY

Volume VI-January 2024 ■

**WHAT FOOD CATEGORY
DOES MY PET NEED?**

**TWO ESSENTIAL PARAMETERS
FOR PET FOOD LAUNCHING**

**PET-TECH: CUTTING-EDGE
TECHNOLOGY AND STARTUPS
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EDITORIAL

Happy New Year, and prepare yourself for success in 2024!

Welcome to 2024, and congratulations to the entire pet food industry for keeping growing steadily during recent years, facing global inflation and other challenges.

2024 seems to be a complex but promising year, so let's see what we can do to make it a year of success in our industry. Our regular readers look forward to this January edition to be updated on industry trends for the rest of the year, and, without a doubt, this edition will not only bring the trends but also add new nutritional and technological perspectives for the sector as well.

Technology is becoming increasingly common in the pet food industry as consumers seek convenience, efficiency, and, above all, treating their furry companions like family members. From nutritional science enhanced by technology and retail to the use of artificial intelligence (AI), pet owners today are more knowledgeable than ever about their pets' specific needs, and smart industry members are prepared to capitalize on these emerging demands.

As a leading industry expert commented, "AI could be used to automate food formulations and treatments or design new products. Precision fermentation will be used to produce nutritionally complete, natural-identical meat proteins from chicken, beef, fish, and other proteins intended for pet foods."

The shift from traditional proteins to plant-based, cultured, fermented, and insect proteins continued throughout 2023, driven by growing consumer acceptance of alternative protein sources.

According to different market consultants, approximately a third of pet owners who have changed their food in the last 12 months have opted for a lower-priced alternative, which indicates that inflation persists worldwide.

But as we always find a way to face these challenges, our industry in 2024 shares different trends that will be in the spotlight. This first edition of All Pet Food Magazine focuses on pet food types and categories, with articles such as Pet-Tech Breakthrough Technology, valued at \$5 billion in 2022 and expected to show annual growth of up to 15% between 2023 and 2032.

Another fascinating topic is upcycling or creative reuse, which addresses the use of ingredients from recycled human food and helps pet food manufacturers in their sustainability efforts.

These and other articles, like Pet Food Revolution, show us the way to new trends in technology and nutrition.

We do not want to end without first inviting all our readers to participate in our Congress of the Pet Food Industry in Latin America, CIPAL 2024, which will take place on September 25 and 26 in Buenos Aires, Argentina, with the presence of producers, suppliers, and industry experts from across the region, as well as Europe and the US.

Editorial team

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THE INNOVATION REVOLUTION IN PET FOOD

In the constant quest to understand and adapt to the dynamics of the pet food industry, knowing the trends and behavioral changes that shape the decisions of both producers and consumers is essential. In this article, we focus especially on dog and cat food manufacturers.

By All Pet Food

Animal food manufacturers are constantly immersed in a process of product renewal to provide food that is in line with the values and expectations of consumers.



Business challenges

Nowadays, one of the main challenges for producers and manufacturers is the availability of labor. We are not the only market dealing with this problem. However, it represents a significant obstacle for pet food manufacturers to achieve their

goals of meeting the growing pet owners' demands. **The need for trained workers and the responsibility to maintain safe manufacturing practices and work environments are today, in an increasingly demanding and demanding context, fundamental issues.**

But not all is lost! In contrast to this problem, we know that the industry is experiencing an increase in demand driven by the growth of pet ownership. This represents an important opportunity for manufacturers to take the opportunity to develop new products and offerings for those new to the market.

Product innovation

Meeting the changing needs and demands of pet owners is of great importance. **Animal food manufacturers are constantly immersed in a process of product renewal to provide food that is in line with the values and expectations of consumers.**

We have known that, for some time now, sustainability is one of the main factors owners have in mind when selecting food for their pets. **Awareness, both personally and for their pets, regarding the ecological impact of the products they purchase is increasingly high, and that is why they look for alternatives in pet food that promote environmentally friendly practices, focusing on the reuse of plastics and the sustainability of the production chain.** This reflects a mentality that is more friendly to the natural environment and more ecology-oriented.

Additionally, consumers are paying more attention to the ingredients that contain the products they choose. Pet owners carefully scrutinize ingredient lists, seeking transparency and opting for natural, healthy ingredients that contribute to their beloved pet's well-being and health.

The push for development

Lately, research has ceased to be the only factor driving the development of new products, beginning to share its space with unique ingredients and human food trends. Nowadays, it is easy to predict that when we see a new product gain popularity on human plates, it will not take long to reach the pet food shelves.

The biggest difference between these two markets is, without a doubt, their palatability. For instance, there have already been cases of companies that, following human trends, have sought to develop snacks or supplements for pets in the form of chewable candies, also known as "gummies," and they have not worked since they stuck to pets' teeth. We already know having the best product in the world is useless if no animal is willing to eat it.

Customization in production

Product customization has been increasingly creeping into our industry. At first, in a more superficial way, such as personalizing large feed bags with the pet's name or putting together product packs for a specific animal. As people seek increasingly personalized paths to well-being,

we find new proposals such as specially formulated foods, personalized probiotics, and the use of precision-based production.

Technology

Using HPP to improve production

As pet food manufacturers look to meet the demand for safe, clean, and nutrient-dense products, High Hydrostatic Pressure (HPP) technology is emerging as a viable solution. Its ability to achieve food safety goals, offer clean labels and produce pet foods with a similar profile to raw foods makes it a technology with immense potential in the future of the industry.

The data suggests that HPP technology could find applications in products like kibble, freeze-dried foods, and wet foods. This technology appears to be a compelling alternative to traditional high-temperature methods. Its advantages, such as maintaining nutritional integrity and obtaining the "raw profile" preferred by pets, are increasingly attracting industry attention, not only from large companies but also from medium-sized ones, which are already showing significant growth in their plans to use this technology.

Technology for everyday life

Technology is not only being used to improve production and the final product, but it is increasingly impacting the small actions and everyday objects of pets' routine, such as automatic feeders, smart toys, GPS collars, and physical activity trackers.

Innovation: a topic on everyone's agenda

The industry's challenges in terms of innovation arise from the pet food-producing field and extend to all the ecosystems that make up the industry. If we use our intelligence, knowledge, and technology to our advantage, we will be able to find new and innovative alternatives to answer the demands of both food and supplements, considering the trends, needs, and owners' lifestyle changes.

The companies at the forefront that can quickly identify the new underlying human needs and wishes with respect to their four-legged animals will be those that, this year, will be able to gain a prominent place in their market and sector.



PET SUPPLEMENTS ON THE RISE

The impact of the pandemic reverberated across all industries and altered market dynamics, size, and trends (and yes, even today, in 2024, we can see the consequences of this global event). Despite the challenges, adaptation, and innovation emerged as key drivers for the recovery of the pet food market and even for the continued development and growth it has experienced since.

By All Pet Food

Over time, as countries have gradually eased restrictions and fear, pent-up demand and fiscal stimulus measures facilitated market growth in various sectors. Currently, we are witnessing a fusion of pre-pandemic strategies with the accelerated adoption of digital technologies, shaping a new era of market

dynamics. Among the products that are developing the most, we find the pet supplements sector, so much so that an analysis by Grand View Research predicts it will reach 1,050 million dollars by 2027.



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Current market situation

When we talk about supplements, we are talking about vitamins, minerals, herbs, botanicals, enzymes, amino acids, or other dietary ingredients. **Although the pandemic already seems like something of the past for many, the truth is that some sectors or markets, as is the case with this one in particular, owe a lot to it for the boom they experienced.** Free time, little social life, the adoption of more pets, and the increase in time spent with them have made people not only more aware of the health of their animals but also have time to inform themselves about how to sustain it and enhance it over time. This is when the word supplements appears for many owners, and they begin to consider these products as an alternative to adding to the diet of their dog and cat children.

The pet food supplementation industry primarily works with vitamins, nutritional supplements production, storage, and distribution among other nutritional supplements that may be critical to a pet's health and growth, including birds, dogs, cats, and other domesticated animals. Products are extensively researched and quality-checked before they are available on the commercial market with the goal of ensuring animal welfare and promoting healthy growth throughout their lives.

Some supplements have generic applications, while others address specific problems, such as digestive problems, joint pain, or skin conditions. And while the industry is facing tremendous growth, it is also facing new challenges and complications.

Microbiome health ingredients, such as prebiotics, probiotics, and postbiotics, are of an ingredient category where the most research is being done these days. Prebiotics, probiotics, and postbiotics generate significant interest in both humans and animals. Specific research is very important in this class of ingredients because the intestinal microbiome of different animal species can vary considerably.

Investigation and development

The increasing rate of pet ownership drives market demand.

Several reasons, including personal decisions and medical factors, are causing a growth in the number of people who choose to have pets, such as remaining child-free by choice, the impossibility due to advanced age, and the economic instability that threatens more than an international population.

Some of the most common side effects due to supplement consumption include allergic reactions, overdoses, and digestive problems. Some of them may be more serious than others. However, it is one of the main restrictions on the industry's growth.

One of the key opportunities to pursue development is the investment obtained for study, development, and innovation. Currently, there is a significant lack of innovation in product development in the supplements

sector at an international level.

And, if we observe how people's lifestyle and eating consumption habits (and, consequently, their pets) change, it is expected that this will impact the needs, problems, and diseases that arise or disappear with the passing of time. Therefore, **more investment is necessary to obtain more resources in understanding the segment to achieve generalized and specific product development without side effects.**

More investment is necessary to obtain more resources in understanding the segment to achieve generalized and specific product development without side effects.

The importance of knowing pet supplement consumers

Knowing the humanization process that has been strongly impacting the entire pet market, it is not surprising that, with the increasing attention paid to product labels, many ingredients that appear in human supplements have moved into categories of pets.

If we talk specifically about supplements, we can already identify in the industry that consumers of pet supplements have stronger or more pronounced tendencies and preferences than the average pet owner. These owners (and those in charge of the pet food purchasing decision) who buy supplements are characterized by proactively seeking information about nutrition. The most reliable source for them is their known veterinarians and, secondly, Internet sites: the same sources for seeking advice and information on human nutrition. Other very reliable sources for pet owners when it comes to obtaining information about any product type or service for their pets (veterinarians, toys, food, exercise) are their friends and family. This is a key factor for all those companies that want to retain customers because they are the ones who, free of charge, share and recommend (and, therefore, spread) the brands they trust.

Conclusion

The supplements market has a lot of potential today if we analyze and consider all the trends that reach the pet food industry due to the demands and needs imposed on human industries. To achieve sustained growth, it is essential to promote development, research, and innovation.

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PET-TECH: CUTTING-EDGE TECHNOLOGY AND STARTUPS FOR THE PET INDUSTRY

Technology at the service of pets is a booming market. **If a dog is a man's best friend, these days, we can say the dog's best friend is... technology!** So much so that the so-called global pet tech market was valued at \$5 billion in 2022 and it's expected to show a compound annual growth rate of up to 15% between 2023 and 2032.

By All Pet Food

In turn, the pet universe seems to become the best friend of investors looking for new technological opportunities. **More and more startups are entering the market with innovative game-changing offerings.** As the trend of treating pets like family members gains momentum, the pet tech industry is growing significantly, and venture capital firms are quickly recognizing the potential of this industry.

Today, the pet industry is witnessing a rise in business initiatives aimed at the diverse needs of today's pet owners. Areas such as health and well-being, food and nutrition, technology, and pet services, and much more are the areas that attract all attention.

Recently, startups in the industry have multiplied, and new ones continue to appear, mainly those of the DTC (Direct-To-Consumer) style.

Why join the pet-tech sector?

Pet humanization

Digital natives spend more time searching for online solutions for their pets. They are spending more and more money on personalized solutions that fit their pets' needs. Today, it is not uncommon to see that owners buy more expensive products if they are ecological, organic, or kinder to the environment or the natural pets' growth.

Just as in human nutrition, the boom in personalized food packages continues according to the consumer's requirements, tastes, or eating plans. In the pet food industry, this trend is only growing. The startup Butternut Box,



Recently, startups in the industry have multiplied, and new ones continue to appear, mainly those of the DTC (Direct-To-Consumer) style.

for instance, has received £280 million in funding to continue its project to prepare and deliver healthy meals and snacks for dogs, according to TechCrunch.

Other sectors attracting funding are the design of personalized meals by weight and needs of each pet and alternative proteins with vegan, cellular agriculture, precision fermentation, and insects.

Disruptive healthcare models

The high costs of veterinary care have always been a problem and, in many cases, an impediment when it comes to adopting or acquiring a pet or not. This is being addressed by the emergence of new comprehensive and lifetime insurance plans that are expanding the available and accessible options.

The case of Get Joy, for example, has already expanded beyond food and has entered on-demand veterinary services after generating an initial round of funding in January 2022. There are also other successful cases, such as pet friendly, which promises personalized “human-safe” subscription boxes for flea and tick medications and supplements with custom packaging featuring pets' pictures.

Additionally, we are increasingly finding telemedicine platforms that connect owners with veterinarians, subscription delivery services, and wearable health monitors to track vital signs and detect early signs of potential health problems.

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A new pets' well-being era

Human trends such as gut and mental health, immunity, oral and skin care, and anti-aging through supplements and other products have also extended to pets. A simple search online will yield pet spa-like salons with services like manicures and pedicures, body treatments like massages, and more.

Toothbrush wipes, new products to clean tear stains, and ear cleaning products of natural origin are other products on the rise. Witch hazel, for example, has historically been used for skin care in humans and is now beginning to be seen in skin care and cleaning products for the face, eyes, and ears of pets.

Apps and digital products

The pet health app segment is expected to account for more than 25% of this market share by 2032. Many smart devices are already being developed to monitor pet health, such as the Dearbuds PE technology, launched in February 2023 by Linkface, which, through a digital device, controls the humidity levels of the ears of dogs and cats to avoid and prevent infections. Even the company behind the famous GoPro cameras is already thinking about this market. The Fetch Dog

Harness model allows you to capture images from different dogs' perspectives while they run, play, or dig holes in the ground.

Conclusion

In the current macroeconomic environment, offering unique products or services that work to add real value and solve consumer problems is essential to establish yourself and gain market share. The industry is already clear that owners now demand the same for their pets as they would for themselves or any other family member. The trends we have invested in for years in consumer brands are transforming the pet industry at an even faster pace, and investors are increasingly interested in participating in the capital allocation of innovative projects.

The pet startup ecosystem is driven by a passion for pets and a commitment to innovation. Hand in hand with these emerging ventures, it will be possible to reinvent pet care, combining technology, personalization, and social impact to provide a comprehensive and enriching experience for both pets and their owners. With each new venture, the industry grows and offers more possibilities to improve the lives of man's best friends.

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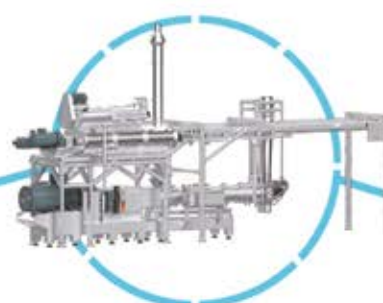
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UPCYCLING IN TRADITIONAL PRODUCTS



Around 40% of all human food produced globally ends up in waste, according to a report by WWF and Tesco. Other related studies conducted on food waste estimate that global garbage of baked goods, such as bread, represents between 7% and 10% of global production, which is equivalent to almost 100 million tons per year.

By All Pet Food

Faced with these numbers, **the upcycling technique becomes increasingly relevant in industries such as the food industry, which absolutely needs to take measures regarding raw materials and waste treatment.**

What is upcycling?

Upcycling, known as upcycling or creative reuse, consists of the use of products, waste materials, or waste to manufacture new ingredients or products of higher quality, ecological, and economic value. Thus, through recycling, healthy, and nutritious foods and ingredients are prevented from becoming waste, giving them a second chance to be consumed.

Ingredients that can be recycled help pet food manufacturers improve their efforts to build sustainability. The products of this type most used in the industry have been, at least until now, those made from extracted meat by-products. Although converting meat by-products into

protein-rich sources instead of throwing them away is something positive, nowadays, the most innovative ingredients and materials are those capturing the attention of pet food consumers concerned about the planet's sustainability. Many certified recycled elements can be easily integrated into any recipe, giving the new product a competitive advantage in sustainability. The main challenge is that these usually have the same nutritional properties as other more conventional, but not the same appearance. To work with them, it is essential that the processing and control systems take these variations into account, as well as formula design. Rescuing these ingredients not only helps eliminate food waste throughout the supply chain but also reduces demand for "virgin" crops.

But, when we talk about the inclusion of new ingredients and by-products, we must also talk about education and awareness. In the case of pet food and its relationship with cereal ingredients such as wheat, corn, and rice, commonly used as sources of carbohydrates, there is debate about how much of these nutrients are necessary for pet feeding. Although the pet nutrition industry struggles to eradicate

misconceptions about these ingredients, the challenge still exists and, consequently, affects the use of these new proposals in food formulas.

The truth is that recycled products prevent nearly one billion pounds of food waste worldwide each year, and this number may continue to grow as consumer demand for recycled products increases, which, Obviously, will be achieved through information and awareness.

Currently, you don't have to look hard to find proposals from entrepreneurs or small manufacturers who, instead of working with large suppliers and processing plants, choose local farms and suppliers as they trust the quality of their raw materials, especially when we talk about those considered waste or by-products.

The good point is that most of these elements can be easily integrated into any recipe, making a product (and its entire chain) more sustainable by reducing greenhouse gasses and using waste from other industries or chains in pet food formulas without risking quality, as may be the case of pumpkins used for decoration at Halloween or apple pulp from a cider factory.

According to the UFA (Food Upcycling Association):

"Recycled foods use ingredients that otherwise would not have reached consumption. They are sourced and produced through verifiable supply chains and have a positive impact on the environment."

This entity has already certified more than 200 ingredients as recyclable in the food sector, many of which have applications in pet food and treats.

Examples of materials and ingredients used in upcycling:

- Sweet potatoes or other types of tubers that come from local organic farms and that have rare shapes that are not as aesthetic as those hypermarket chains seek to sell.
- Ends and pieces of meat and seafood that have not been sold in the supermarket.
- Fruits that, like tubers, are bruised or with amorphous shapes.
- Alternative proteins such as cricket, spirulina, or silver copi, an overpopulated fish.
- Used barley from local breweries.
- Eggshells.
- Salmon oil, produced from fresh salmon trimmings, such as the head, spine, and skin.
- By-products from the production of french fries or potato starch are applied in formulas to gain texture, shape croquettes, and improve digestion.

Conclusion

Recycled ingredients have revolutionized the pet nutrition landscape as a way to add value to elements that would otherwise go to waste while also supporting pet health.

Various agricultural products and wheat-based ingredients, including blueberries, sweet potatoes, flaxseeds, carrots, and various flours, are currently used in the North American pet food and treat industry to capitalize on sustainability as a consumer priority.

Converting by-products into pet food ingredients reduces food waste and makes more efficient use of the resources needed to produce human food. Renaming these recycled products could help pet owners accept them.



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(PART 1)

SPRAY DRIED PLASMA IN PET FOOD: THE MULTIPLE FUNCTIONS OF A UNIQUE INGREDIENT

Pet food represents less than 5% of the total animal feed produced in Brazil, however about 25% of rendered animal proteins produced in the country are used in pet food.

By Ricardo Souza Vasconcellos—Universidade Estadual de Maringá (UEM—Brasil)

The connection between human and pet food production is very important to optimize the use of by-products and minimize environmental impacts. Practically all by-products generated from the processing of meat for human consumption are properly used in the production of rendered animal protein ingredients and other applications in various industrial areas, thereby strengthening the application of a circular economy. Despite its relevance, advancements in the qualitative aspects of ingredients for use in pet food are needed because the quality is still very variable. Furthermore, the development of high nutritional standards for the food segment, such as food

safety, high nutritional quality, and the use of ingredients that have functional properties have been a major challenge for the pet food sector today. In this respect, fresh ingredients, enzymatically hydrolyzed and dehydrated by more refined processes, such as lyophilization or spray drying have shown a growing increase in their use in formulations by the Pet Food industry.

The spray-drying process consists in drying liquid products in a spray drying tower, equipped with hot air circulation that generates a hot air circulation that, when in contact

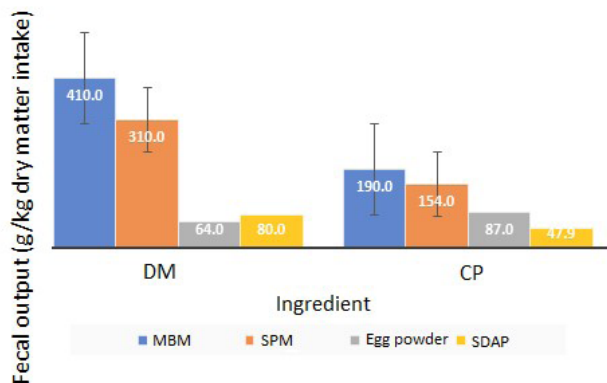


Image 1: Estimated excretion of dry matter (DM) and crude protein (CP) for each kilogram of ingredient ingested, considering the digestibility of the ingredients (Table 1).

with micro-drops of the liquid sprayed in the system by the atomizers, makes the dehydration of the product, keeping its solubility characteristics and better preserving the nutrients and functional properties of the ingredient. Some animal by-products are commonly processed this way, such as egg powder, plasma, hydrolyzed protein sources, milk, and whey, among others. This form of processing provides digestibility coefficients that can be higher than 95% (Song et al., 2015), when compared to digestibility coefficients between 80-90% found in ingredients dehydrated by conventional processes. In addition to reducing the excretion of nutrients into the environment, for dogs and cats, in practice, since fecal volume is a relevant aspect, this means an extremely significant reduction in the amount of stool produced by animals when consuming foods with high digestibility content. In Table 1 some comparisons of digestibility coefficients of conventional ingredients such as egg and plasma produced by spray-drying are presented and in Figure 1 a simulation of the amount of dry matter excreted by animals with each of these ingredients is presented, in order to show how much in practice these differences in digestibility can reduce the fecal output of animals. It can be observed that fecal excretion can be reduced up to 75% with the consumption of highly digestible ingredients.

Table 1: Dry Matter Digestibility (DMD) and Crude Protein Digestibility (CPD) of conventional (Meat and Bone Meal; Standard Poultry Meal) and spray-dried (Egg powder and Animal Plasma, SDAP) ingredients.

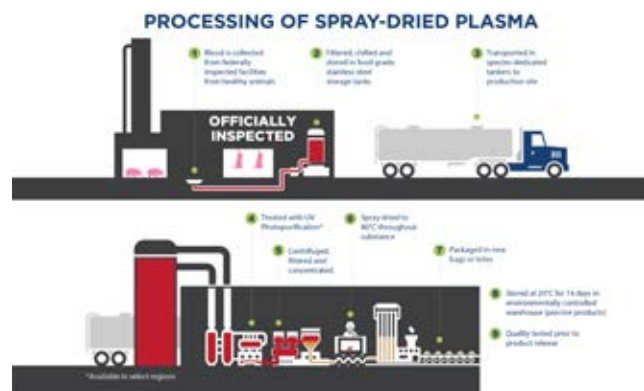
	Meat and Bone Meal	Standard Poultry Meal	Egg powder	SDAP
	Carciofi et al. (2008) ¹	Carciofi et al. (2008) ¹	Andrade et al. (2019) ¹	Song et al. (2015) ²
DMS, %	59,0	69,0	93,6	92,0
DPC, %	81,0	84,6	91,3	95,2

¹Studies in dogs; ²Studies in pigs

Plasma is a by-product of pork and beef slaughterhouses, obtained from the bleeding process of animals considered safe for human consumption, followed by the addition of

anticoagulants, and subsequent centrifuging of the blood, to separate the plasma and cellular fraction (red blood cells and platelets), followed by decontamination with ultraviolet light and drying, usually by the spray-drying process. This production process maintains the solubility of the ingredient and its functionality to be used in extruded and wet pet food for dogs and cats. Image 2 shows a schematic diagram of the production process of this ingredient.

Image 2: Summary production schematic of porcine or bovine spray drying plasma production (SDAP). Courtesy APC LLC, Ankeny, IA.



Spray-dried Animal Plasma (SDAP) is used in human, animal feed, and in pet food and can be used for various purposes, as shown in Table 2.

Function	Parameter	Observed Result/
Technological	Wet Texture Emulsification	<ul style="list-style-type: none"> Increases hardness, water retention and juiciness in wet Prevents the separation of phases in wet foods Possible improvement in processing in extruded products
	Palatability Digestibility Biological value	<ul style="list-style-type: none"> Palatable for dogs and cats Highly digestible Essential amino acid profile superior to conventional sources
Functional	Cognition Prebiotic	<ul style="list-style-type: none"> Reduces the decrease in cognitive function in aging Regulates the intestinal microbiota Improves gut integrity Improves gut defense mechanisms Improves passive immunity
	Immunomodulator	<ul style="list-style-type: none"> Increases immunomodulatory cytokines Reduces the effects of inflammaging

Table 2: Major functions and effects of Spray-dried Animal Plasma (SDAP) observed in pet food.

In wet pet foods, due to the high content of moisture, fat and the possibility of phase separation, the main technological application of SDAP is as an emulsifying and binding agent to improve water retention in the product, texture, juiciness and homogeneity (Polo et al., 2005; Polo et al., 2007; Polo et al., 2009). In dry pet foods processed by extrusion, its technological properties have not yet been studied, but it is likely to have action as a structure-forming agent and emulsifier, due to high solubility and composition.

Regarding the nutritional composition, the SDAP, as a blood component, it is a very nutritionally rich ingredient, with emphasis on the levels of amino acids and minerals, presenting higher levels of essential amino acids, even when compared to the egg, which is a protein source reference in quality. In addition to this, the SDAP has bioactive components that provide its biological functionality.

The SDAP's high amino acid concentration also represents other functional aspects associated with this ingredient, achieved due to the presence of immunoglobulins, bioactive peptides, growth factors, enzymes and metalloproteins, which confer immunomodulatory properties (Balan et al., 2021; Kanagaratham et al., 2020; Hammer et al., 2003), prebiotic (Miró et al., 2017; Moretó et al., 2020; Perez-Bosque et al. 2016), anti-inflammatory (Pérez-Bosque et al., 2016; Moretó et al., 2020) and neuroprotective (García-Dust et al., 2020; Miró et al., 2017; Rosell-Cardona et al., 2021).

Because of these multiple functions of SDAP in animal and human nutrition, which match the current demands for quality, nutrition, functionality, and sustainability, the next issues of Pet Food Brazil Magazine will present the other chapters of this article, which will discuss separately the role of SDAP in dry and wet pet food processing (Part 2), nutritional value (Part 3), and functional properties (Part 4), showing the main practical applications of this ingredient, based on information available in the literature.

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WHAT FOOD CATEGORY DOES MY PET NEED?

Humans have fed dogs and cats for thousands of years. Being “members” of the family, they were even fed with food scraps until 1860, when the first dry dog food designed by the Englishman James Spratt was born. He observed that dogs ate leftover wheat biscuits that were supplied on ships to feed sailors on long voyages. Spratt improved the biscuit by including a mix of meats and vegetables in the recipe, and his business idea was a success, as it aimed at sporting dogs as well. Perhaps this was the first pet food categorization.

By MVZ. Armando Enríquez de la Fuente Blanquet

Years later, the well-known “Ken-L Ration,” canned horse meat, was born in the United States, and thus the first wet diet appeared. Later, in the 1940s, nutrition programs for life stages began. In the fifties, the first therapeutic diets came out, and in the seventies, we saw the first personalized diets

by race. It was not until 1980 that the National Research Council published nutritional requirements for dogs and cats. Thanks to this, the nutritional bases are established, along with other guides such as AAFCO or FEDIAF, to provide balanced nutrition to pets.

The following are, in very general terms, some examples, since the specific amounts may vary depending on the food formulation:

1 – Dog nutritional requirements:

- Proteins
 - ◇ Puppies: Minimum 22%
 - ◇ Adults: Minimum 18%
- Fats
 - ◇ Puppies: Minimum 8.5%
 - ◇ Adults: Minimum 5.5%
- Fiber
 - ◇ Varies depending on the specific formula needs.
- Vitamins and trace minerals
 - ◇ Specific to the dog's needs and life stage

2- Cat nutritional requirements

- Proteins
 - ◇ Puppies: Minimum 30%
 - ◇ Adults: Minimum 26%
- Fats
 - ◇ Puppies: Minimum 9%
 - ◇ Adults: Minimum 9%
- Fiber
 - ◇ It varies depending on the specific needs of the food.
- Vitamins and trace minerals
 - ◇ Specific to the cat's needs and life stage.

Over the years, a wide variety of foods have emerged. With this, the market has had to organize into types or food categories to provide the consumer with the nutrition they are looking for to meet the needs of each pet.

In many countries, pet foods are subject to regulations and standards set by authorities. This includes ensuring that foods meet certain nutritional standards and clear labeling. An important point to consider with any food type is to follow the manufacturer's recommendations for the appropriate daily amount based on your pet's age, size, and specific needs.

Currently, there is a clear definition of food for dogs, cats, birds, rodents, reptiles, etc. However, the nutritional requirement varies depending on factors, such as age, size, activity level, and specific pet needs. So, in addition to species, pet food should be classified by these subcategories.

Within the wide variety of pet food categories, there is one established with the economic capacity of each pet parent (in addition to the digestibility of its nutrients): Economy, Standard, or Premium, in very general terms.

Within each segment mentioned above, there are other more complex subcategories. Let's talk about some of these:

Dry food

This type is the most widely sold in the world and usually contains a balanced mix of essential nutrients. It is produced under the extrusion process to achieve certain physicochemical characteristics. Some nutrients, especially micronutrients, can

degrade with processing and time, so it is important to follow the manufacturer's recommendations regarding expiration date and storage.

Wet food

This type has a high-water content. Some pets prefer it because of its texture and flavor. It is recommended as a diet supplement of dry foods to promote dental health, as wet food may not be as abrasive.

- **Semi-moist food**
- **It is a combination of the above.**
- **BARF food (an acronym for "Biologically Appropriate Raw Food")**

It consists of raw foods such as meat, bones, organs, and vegetables. It is based on the idea of being more like the one an animal would find in nature. The raw diet may lack some essential nutrients, so it is important to consider supplements, as well as make sure to maintain high hygiene standards to avoid bacterial contamination.

- **Breed-specific foods**
- **Foods formulated to meet the particular needs of certain breeds.**
- **Foods for specific life stages**
- **These can be for puppies, adults, or seniors.**
- **Foods for pets with special dietary needs**
- **We can mention, for example, grain-free, hypoallergenic, or foods for pets with weight problems.**
- **Snacks and treats**
- **These are small portions of tasty foods for training or as a reward. They are not substitutes for the main meal.**
- **Nutritional supplements (vitamins and minerals)**

They are designed to ensure that the pet receives all the necessary nutrients. Not all animals need supplements.

We should remember that a pet will eat the food their owner selects for him and, usually, it will be the same for long periods of time. This food must be balanced and provide all the nutrients so that a pet remains in good health and well-being.

Pet parents now have access to more food options and information, and research on pet nutrition has become more advanced and available. As we have seen, there is a category designed by years of research for each specific pet. These foods are prepared to cover each and every one of the nutritional requirements of a dog or cat, considering various factors, including the species, life stage (puppy, adult, senior), size (small, medium, large), breed, activity level, and any special dietary needs.

It is important to note that food choice should be based on the specific needs of each individual pet, as today, food categories that nourish the pet 100% are available for everyone.



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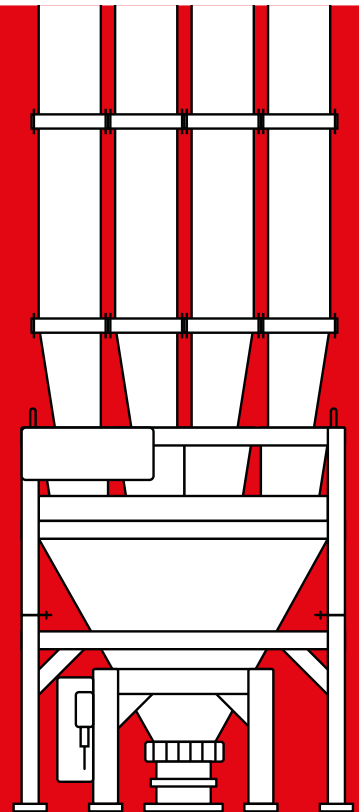
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THE IMPORTANCE OF TOTAL DIETARY FIBER (TDF) AND ITS APPLICATION IN DOGS AND CAT'S NUTRITION

The benefits of dietary fiber on the intestinal health of dogs and cats have the support of various scientific studies and clinical monitoring in veterinary practices.

TDF has shown positive effects on gastrointestinal functioning through fiber consumption such as beet pulp, Psyllium, sources of cellulose, and resistant starches. There's proof that affirms that fibers positively influence various gastrointestinal functions (for example, digestion and absorption, intestinal transit time, and stool formation, among others) and intestinal microbiome modulation (changes in intestinal microbiota composition and metabolites production via fermentation as volatile fatty acids) that are immunomodulators and improves of gastrointestinal function. This paper explains the main physicochemical and functional properties of fiber, its characteristics, and its importance in the nutrition of dogs and cats. Currently, the physicochemical properties of different dietary fibers are known (such as solubility, viscosity, and fermentability), which vary greatly due to their origin and processing. In addition, they are key determinants of their functional characteristics and usefulness in pet health. Although advances in understanding these relationships have shed light on potential prophylactic and therapeutic opportunities for dietary fiber sources, many questions remain unanswered, such as clarity regarding the minimum and optimal dietary fiber requirements, as well as fiber source types needed for intestinal disorders prevention and management. New fiber source usage or their co-administration could become a prophylactic and therapeutic approach which will require thorough investigation. This review's goal is to analyze the concepts of dietary fiber and its impact on pets' health and well-being.

By Luis-Miguel Gomez Osorio

Total Dietary Fiber (TDF) is a fairly broad term that requires knowing and considering several points of view, such as chemical, microbiological, and nutritional. What is undeniable is that it plays a fundamental role in intestinal health.

Defining TDF is quite complex due to the different fiber types, classifications, and their varied effects on digestibility, intestinal transit, and nutrient absorption. Fiber has been functionally known to "aid" digestion, moderate glucose levels, and help reduce cholesterol levels. Structurally, it has been classified into major cell wall components such as cellulose, hemicellulose, pectic substances, gums, mucilage,

and non-carbohydrate molecules such as lignin. But recently, a new classification has been given to fiber as non-starch polysaccharides (NSP) or non-starch polysaccharides. However, every day, new effects derived from the consumption of TDF and its effect on fermentability are known, mainly in the large intestine, and its impact on health, the immune system, and the microbiome. Also, TDF effects have been demonstrated on insulin sensitivity, cardiovascular risk reduction, and colorectal cancer, intestinal motility improvement, and large intestine general health. In general, fiber has been strongly associated with decreased mortality.

Codex Alimentarius defines TDF as those carbohydrates not hydrolyzed by endogenous enzymes in the small intestine and have a degree of polymerization (DP) of 10 or more monomeric units. Some countries are more flexible in definition and agree to add polysaccharides with a DP between 3-9, as accepted by the European Food Safety Authority (EFSA). TDF is classified according to chemical structure and physicochemical properties such as viscosity, solubility, and fermentability.

Despite all the scientific studies on pet nutrition and fiber impact, the minimum nutritional requirements for fiber in foods for dogs and cats are not yet defined. Additionally, in homemade diets, formulating specific TDF requirements is difficult.

Fiber classification

Fiber classification has evolved over time, considering several factors such as chemical composition, analytical method, and physiological effects. The American Association of Cereal Chemists (AOAC) defined TDF as plant parts or carbohydrate analogs resistant to digestion and absorption in the small intestine, which undergo partial or complete fermentation in the large intestine.

Historically, fiber has been classified as soluble and insoluble. Solubles dissolve in water and can lower blood glucose and cholesterol levels. Insoluble fibers, on the other hand, do not dissolve in water and are effective in aiding digestion and preventing constipation.

Most dietary fibers are structural polysaccharides that, in turn, belong to the components of plant cell walls (Figure 1). Insoluble fibers, such as cellulose and hemicellulose, not only aid in laxation but can also impact mineral and vitamin absorption. Sources of these fibers include wheat bran for hemicellulose and vegetables for cellulose (Table 1).

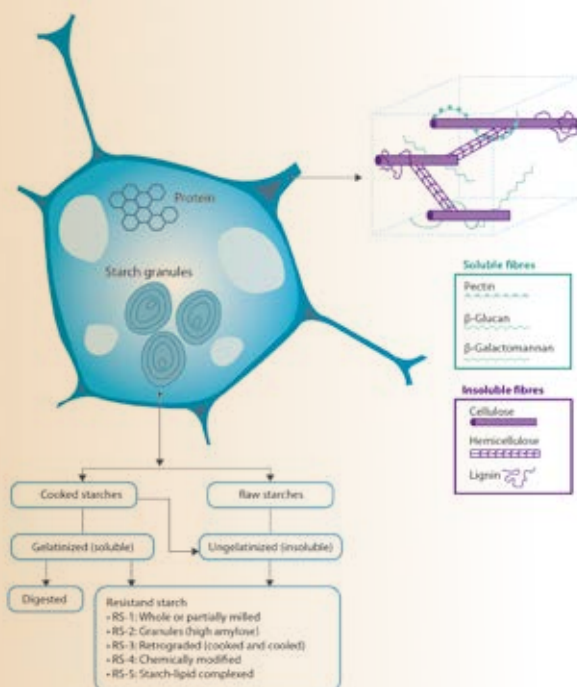


Figure 1: Physicochemical characteristics of dietary fiber and its location in the plant. The polysaccharides that are part of the definition of dietary fiber can be classified into two categories: PNAs (mainly cell walls) and resistant starches. On the other hand, there are molecules that serve to store energy in the plant, and as the main carbohydrate source, such as starch. Its chemical structure, interactions with other cell wall components, thermal processing, and digestion can influence solubility, viscosity, and fermentability.

type	sources	Physicochemical characteristics		
		Solubility	Viscosity	Fermentability
Cellulose	Green Plants (cell wall)	Insoluble	Non-viscous	Low
Lignin	Green Plants (cell wall)	Insoluble	Non-viscous	Low
Arabinoxylans	Wheat, Psyllium	Low to Medium	Medium	High
B-glucans	Oats, barley, fungi	Low to Medium	Low to Medium	High
GOS	Guar gum, fenugreek	Medium to high	Medium to high	High
Pectins	Fruits, vegetables, legumbres	High	Medium to high	High
Inulin	Fruits, vegetables, vegetables	Medium to high	Low to High	High
GOS	Vegetables (peas, lentils)	High	Low	High
Dextrins	Cereals (wheat)	High	Non-viscous to low	High
Alginates	Seaweed	High	High	Low
Methylcellulose	Synthetic	High	High	Non-fermentable

GOS: Galacto-oligosaccharides. Adapted from Gill et al, 2021 (10).

Table 1: Physicochemical characteristics of the most common fiber sources in pets.

The modern classification of dietary fibers is quite broad as they consider several aspects, such as source, polymer structure, ion exchange capacity, sorption, and physiological effect. This approach reflects the diverse nature of dietary fiber and its varied impact on the health of dogs and cats. Additionally, TDF is classified for its potential prebiotic effect with various categories, which reinforces the understanding of its role in stimulating the beneficial microbiota.

Importance of Dietary Fiber in dogs and cats

TDF plays a critical role in dogs' and cats' health and nutrition, even more so than in humans. The gut microbiome, a super-functional organ in pets, responds to the diet's nutrient composition, including fiber type and percentage. TDF, including cellulose, hemicellulose, lignin, pectins, and gums, are not digested or absorbed in the small intestine of mammals, although they have notable effects on microbiome composition (13).

The clinical implication of TDF in dogs and cats is closely linked to its properties, such as fermentability, solubility, and viscosity (Figure 2). These properties affect intestinal health and are considered key when managing pet enteropathies. For example, rice bran or mogolla is an excellent fiber source for dogs due to its characteristics, such as high palatability,

functional fiber content, and low price, compared to other fiber sources. Fiber works similarly in cats, although taurine dietary levels and requirements in a total diet must be considered.

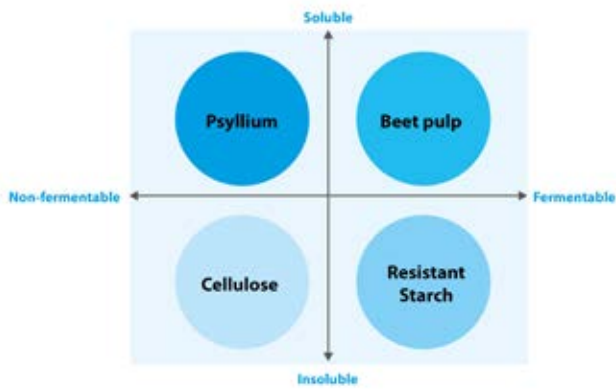


Figure 2: Solubility and fermentability variety of complex carbohydrates and fibers. Fiber sources used in pet foods can vary in terms of solubility and fermentability. In the upper quadrant, they are more soluble, and in the lower quadrant, less. The left quadrants represent less fermentable fiber sources, and the right quadrants are more fermentable (adapted from Wernimont et al, 2020).

Pet food nutritional components have a profound effect on gastrointestinal microbiome composition and function and, therefore, dramatically influence both the health and disease of dogs and cats. Gums and pectins are clear examples of sources of dietary fiber in addition to their use as thickening agents, gelling agents, water capturers, and stabilizers.

Fiber digestibility in pet food shows quite variable and low values compared to other species. These values depend, in turn, on the species. For example, in cats, the digestibility

of FDT is 31%, while in dogs, it is slightly higher (37%). The above shows that much of the fiber passes through the gastrointestinal tract without being changed or modified.

TDF is also key in overweight and obese patients' management, especially due to the satiety effect when calories are reduced in weight loss programs due to caloric restriction.

In cats specifically, both the amount and type of TDF in the diet impact intestinal health and function. For example, the beneficial effects of the use of dietary fiber have been reported in several diseases and disorders, such as diabetes mellitus, diarrhea, constipation, hypercalcemia, and hairball formation. However, more studies are required to understand the importance of FDT, both in maintaining homeostasis and in the prevention and treatment of various disorders.

Conclusions

TDF is a fundamental nutrient in pets' nutrition and health. However, there are no minimum or optimal requirements for dogs and cats. Some scientific works show the impact of the functional characteristics of TDF based on its solubility, viscosity, and fermentability, which are discussed in this review. TDF, therefore, manages to keep homeostasis and prevent dogs and cats from suffering from gastrointestinal, skin, and systemic disorders, among others.



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PET FOOD DEFINITION, ACCORDING TO CATEGORIES

In this era in which dogs and cats form part of the family as much as children, with such a strong trend, we must be responsible for meeting all their needs, including the quality of the food we offer them. Food is fundamental because pets eat every day and incorporate all the formula ingredients into their organism. But nowadays diet comes to fulfill more than just a nutritional function to cover the requirements.

By [Dra. Bonaura M. Candela](#)

Diet is a fundamental part of health, life quality, and slowing down physiological processes such as aging, prevention, and even treatment of multiple illnesses. And even though nowadays we have plenty of information on the nutritional requirements of pet animals, it is difficult to reach a consensus.

In this article, we discuss some concepts based on my analysis study and experience with my patients, considering that dogs and cats are carnivorous and, as such, require a greater supply of protein and ingredients of animal origin in most of their stages and states.

Food categories

1. **Depending on their degree of processing:** We will have **ultra-processed foods** (UP = dry or canned food or any other food intended for consumption by pets that is manufactured by carrying out a thermal or pressure processing step) or **minimally processed** (MP = fresh, frozen or any other food intended for consumption by pets, manufactured without thermal or pressure processing or one of them).

2. **By the % of water**, we can divide them into dry (8-12% water), semi-humid (15-30% water), and humid (around 70% water).
3. **Depending on their function**: complete foods (which cover a pet's whole nutritional needs) or supplements (for example, snacks or treats).
4. **Depending on its manufacturing type**: they can be commercial or homemade foods (cooked, BARF, or raw).
5. **Depending on their age**:

Puppies (age will depend on animal size, up to 12-16-24 months) mainly focused on learning, immunity, development, and growth.

Adults (from 12-16-24 months to 6-7 years of age), depending on animal size, whose main objective is balance and maintenance.

Gerontes (+ 6-7), who seek a quality of life, promoting health by slowing down aging and the appearance of typical age-related diseases (kidney, heart, joint care, intestinal balance, nervous system health, etc.).

6. **Natural foods**: They lack artificial colorings, flavors, and antioxidants while having a lower degree of processing. This represents a better life quality, greater digestibility, and use of certain nutrients.
7. **Functional foods**: They include the so-called nutraceuticals or functional ingredients in their formula, which exert different functions or purposes in the body, such as joint protectors, immunomodulators, probiotics, antioxidants, anti-inflammatories, etc. These give the food added value beyond what is strictly nutritional.

8. **According to its quality: Ultra-premium, super-premium +, low super-premium or super-premium, premium, standard, or Economy.** To enter a category, a food must meet most of its characteristics (beyond what a label says).

Ultra-premium or super-premium +

- Purchased at veterinarians or pet stores
- Foods with high-quality ingredients
- High nutritional density and greater digestibility
- Extensive portfolio that answers pet needs at different stages, sizes, and special requirements.
- With the greatest nutritional innovations on the market (functional ingredients +++)
- Size differential with kibble differential (in size and composition)
- Less fecal matter production
- Very digestible elements (a higher proportion of ingredients of animal origin and in the first orders)
- Greater benefits for the individual, such as shinier hair, more vitality, and better health
- Minimum digestibility of 80-90%
- Average protein and fat: 35-40/15-17, respectively
- Minimum animal protein of 70%
- Nutrient range with the highest industry standard
- Smaller portions needed
- No artificial colors, flavors, or preservatives
- High technology to take advantage of all ingredients' biological value

Super-premium

- Found at veterinarians or pet stores
- High-quality ingredients
- High nutritional density and digestibility
- Extensive portfolio that answers pet needs at different stages, sizes, and special requirements
- Nutritional innovation (functional ingredients)

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- Size differential with kibble differential (in size and composition)
- Less fecal matter production
- Greater benefits for the individual, such as shinier hair, more vitality, and better health
- Very digestible elements (large amounts of ingredients of animal origin)
- Minimum digestibility of 80%
- Average protein and fat of 30-40/14-16, respectively.
- Minimum animal protein of 60%
- High industry standard nutrient range
- Smaller portions needed
- No artificial colors or flavors

Premium

- May contain artificial colors and flavors
- More fat and calories
- Made with animal or vegetable flour
- A mix of flavors, variety, and croquette shapes.
- Ingredients that protect joints, improve intestinal health and facilitate digestion
- Digestibility of 70-80%
- Average protein and fat of 24-34/10-15, respectively
- Animal protein is close to 40-50%
- Usually have an average price
 - o Standard-mainstream
- Low density (provided by proteins and fats)
- Low fat and protein content
- Digestibility less than 75%
- Target of consumers concerned about the price
- Protein source mixture of meat meal and other non-animal sources
- Low-quality ingredients
- Smaller portfolio (no size differentials, sometimes even stages, no special care products)
- Artificial colors, flavors, and preservatives
- Average protein and fat of 20-30/10-12, respectively
- Animal protein <40%

Economical

- Low density (provided by proteins and fats)
 - The lowest fat and protein content on the market
 - Digestibility is less than 60%
 - Target of consumers concerned about the price
 - Protein source is a mixture of meat meal and bone powder
 - Lower quality ingredients
 - Smaller portfolio (no size differentials, sometimes even stages, no special care products)
 - Artificial colors, flavors, and preservatives
 - Average protein and fat of 20-27/8-10, respectively
 - Animal protein <30%
 - Poorly digestible fibers
9. Therapeutic: These are foods intended for a specific stage of an animal or need. They can be temporary or permanent, aimed at preventing, helping, or treating a specific disease. They are another clinical tool, a therapeutic one, sometimes the main one of a treatment (DIETOTHERAPY).

Although there is no specific legislation, we must consider the digestibility, type of meat or meat flour, differential of kibbles or sizes, portfolio, colorant presence, antioxidants, or palatability as important aspects when selecting the appropriate product for a pet's needs. Product price, in general, is determined by the ingredients used (which are or should be organized in descending order), energy density, protein quantity and quality, and nutraceutical addition.

We must be able to guarantee complete food that covers the requirements of an animal according to their needs, stage and size, digestibility (maximum nutrient use), good energy intake (3000-5000 Kcal), palatability, and safety.



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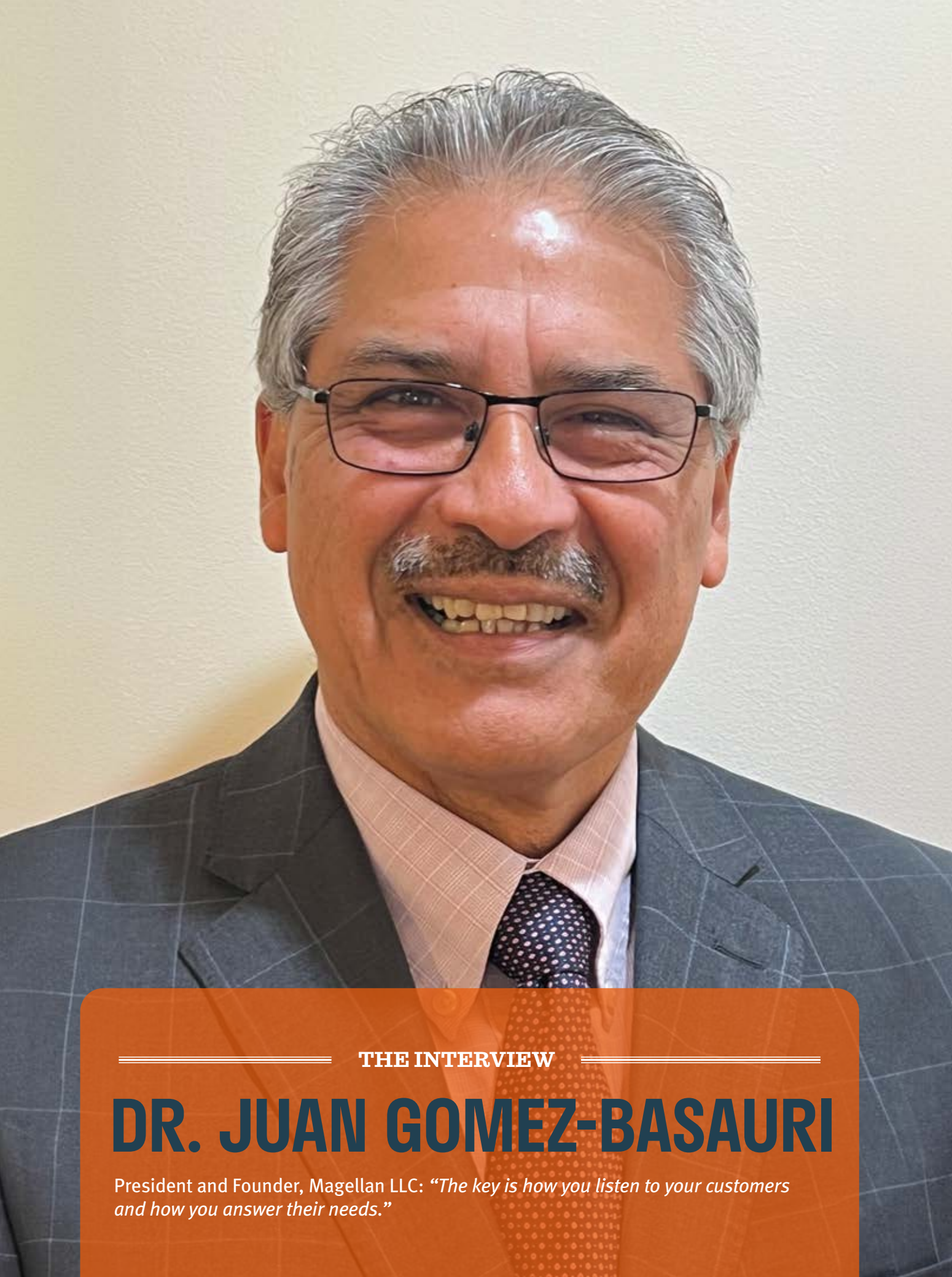


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THE INTERVIEW

DR. JUAN GOMEZ-BASAURI

President and Founder, Magellan LLC: *"The key is how you listen to your customers and how you answer their needs."*

In this edition's interview, we talk with Juan, a professional in our industry with an interesting and exciting career path. He was born and raised in Lima, Peru, and continued his postgraduate education in England (Leeds University) and the US (Cornell University). He then developed into leadership positions at multinational companies such as Ralston Purina and Alltech and recently founded his own technology and consulting business.

Which challenges have you faced in your professional career?

There are different and varied challenges during each stage of a professional career, from moving to a new place, or a new city, leaving old friends and colleagues, making new friends and colleagues, balancing work, and family, to learning very quickly from mistakes and understanding new cultures. I think most of us will have gone through one or the other, but the way we face each of them is what makes the difference, what makes us who we are. It's what defines us.

Why did you make the decision to open your own technology consulting business in 2023?

My style has always been to be highly entrepreneurial, especially when it comes to positioning new technologies and innovations in the market. I was very fortunate that, in previous roles, my responsibility was to be that of a business champion, that is, leading the charge for new products and technologies, building from scratch, as we would say. However, there comes a time when one needs to step out of their comfort zone if there is a desire to keep growing both professionally and personally. That's the reason why I founded Magellan LLC.

What are your company's goals?

Magellan LLC is a business dedicated to providing innovative, science-based technologies and consultative solutions to the agri-food, nutrition, and human and animal health businesses.

What solutions do you provide and why?

The key is how you listen to your customers and answer their needs, which will define the solution and the service. From product innovation to the design and execution of research projects, through the development and application of new bioactive and nutritional compounds, we listen extremely well to the needs of our clients and respond to them.

What's your vision about the pet food industry development in the upcoming years?

The pet food business is an exciting area, but, like any other industry, it is bound to change, to evolve. There is a close connection between people and their pets. We care about them as much as we care about ourselves. There is an emotional component in the bond between human beings and animals. **The industry will strive to find new, functional, and proven nutritional technologies and new feeding formats in order to provide health and well-being to our companion animals because they are part of our families.**

How do you think trendy topics, such as sustainability and product customization, are being addressed by the market?

Sustainability is a driving force for business. However, how much of what we are actually doing is truly sustainable? **Sustainability must include environmental, social, and economic factors.** Everyone must do their part, as we are all linked, we are all connected as individuals and companies, from transportation to packaging, from supply chain to life cycle assessment, and with full transparency in all processes. **Companies must encourage and embrace innovation to find better technologies and processes that can be truly sustainable, and that, in the end, is what will make a difference.**

In your experience, what will be the most significant challenges during 2024?

I'd say change and disruption and how we adapt to them, from raw materials and supply chain challenges to changing consumer spending patterns, to name a few. **The market is evolving, and companies will have to adapt and do it quickly.** This, in turn, will accelerate innovation and provide opportunities for launching new products and services.

What trends you could say will growth the most?

Predicting specific trends involves a certain degree of uncertainty. However, several trends are shaping the pet food market and will continue to evolve in the coming years. As we mentioned before, sustainability and transparency are some of them. We will continue to see advances related to microbiome diets and the health benefits they bring will be the basis for personalized diets and foods. Interest in alternative sources of protein and energy will increase. Cellular agriculture and its applications will find their market niches. We should not discount AI (artificial intelligence) and how this technology will be a game-changer in the pet food industry.

Currently, from his technology and consulting business, Magellan LLC, Juan continues the legacy of what, he affirms, he has been fortunate to receive throughout his professional path:

"Throughout my career, I have been fortunate to have good mentors and people who believed in me, from my parents and family to my teachers during my college years and professional career. That is what I have practiced and will continue to strive for with Magellan LLC."



TWO ESSENTIAL PARAMETERS FOR PET FOOD LAUNCHING

In recent years, the pet food industry has experienced exponential growth, driven by increased awareness among owners about the importance of proper nutrition for their pets. However, this dynamic and expanding sector is quickly becoming a highly competitive field where companies relentlessly seek innovation to offer high-quality products that meet specific consumer demands.

By Ludmila Bomcompagni & Érika Stasieniuk

The fierce competition in the pet food market not only highlights the need for differentiation and excellence in pet food formulation but also emphasizes the importance of validating their effectiveness. Carrying out digestibility tests and fecal score evaluation is one of the crucial methods for evaluating the nutritional pet food quality.

Two essential parameters for pet food launching

Digestibility test

The digestibility test is a crucial tool in evaluating the efficiency with which animals use and absorb food nutrients. This method provides a deep understanding of the digestion and absorption capacity of essential nutrients, which is essential for optimizing diet formulations and ensuring adequate nutrition for living beings. By analyzing the digestibility rate of various components present in food, such as proteins, fats, and starch, the digestibility test contributes significantly to the development of more efficient and sustainable feeding strategies, benefiting pet food products.

Fecal score evaluation

Assessment of fecal score in dogs and cats is a practical and valuable method for monitoring the digestibility of food

consumed by these animals. The fecal score refers to the consistency and appearance of feces, being a visual indication of gastrointestinal health and digestive efficiency. This method involves assigning an appropriate score to stool, usually on a scale from 1 to 5, based on characteristics such as consistency, color, and shape.

When applied to food digestibility studies for dogs and cats, fecal score plays a crucial role. Well-formed stools with adequate consistency indicate good nutrient absorption in the gastrointestinal tract. On the other hand, excessively soft stools, diarrhea, or other abnormalities can be attributed to poor diet digestibility.

Fecal score assessment is often performed in experimental feeding studies in which animals are subjected to different diets. By comparing fecal scores over time, researchers can infer the relative digestibility of different food ingredients or formulations. Diets that result in better-formed and more consistent stools generally indicate better use of food nutrients.

Visual examination of the fecal score can complement the assessment of digestibility. This approach provides a more comprehensive understanding of the impact of food on the gastrointestinal health of dogs and cats, allowing adjustments

to formulations to optimize nutrition and digestibility, thereby promoting pet health and well-being.

Evaluating these parameters before launching a pet food product onto the market can give you advantages in comparison with competitors, evaluating whether the processing was done correctly, and identifying in time the need for changes in formulations.

A demonstration in practice would be excess carbohydrates in the diet, for example, which leads to accentuated lactic fermentation, and the feces appear pasty with a light color and acidic smell (without a rotten smell). The same occurs when the feed is poorly processed. Normally, to manufacture dry food, a process called extrusion is used, which consists of applying steam and pressure to a crumbled mass, forming those granules that we technically call “kibbles.” In this process, starch is essential for making the feed expand. However, if it does not undergo good cooking (or gelatinization) there is a risk of causing osmotic diarrhea in the animal fed with the feed in question. (Saad et al., 2014).

The use of ingredients with lower digestibility directly impacts the fecal score. Ingredients such as soybean meal, widely used in standard or economical pet food manufacturing, contain 20% non-starch polysaccharides (PNA). Soluble PNAs can reduce the digestibility of nutrients and energy in the diet due to the increase in the viscosity of the gastrointestinal tract (GIT) and the reduction in food passage time, making it difficult for digestive enzymes to access the food bolus and interfering with diffusion and transport of nutrients, resulting in loose stools and large quantities.

To minimize the adverse effects of ingredients with less digestibility, their use can be restricted to small inclusions. Otherwise, additives, such as enzymes or adsorbents, can be used. In the case of diets with raw materials rich in PNA and its influence on the fecal characteristics of dogs and cats, for example, the inclusion of a zeolite-type adsorbent additive adjusts the diet fecal score, since this additive, when passing inert through the GIT, adsorbs water and gases and reduces the elimination of ammonia, which improves the fecal characteristics and odors of animals.

The animal's fecal score after consuming a feed plays a significant role in consumer satisfaction and can directly influence the repurchase decision. Thus, the digestibility and consistency of the fecal score reinforce consumer confidence in the product. If the food provides healthy and regular digestion, owners tend to associate this quality with the brand, thus strengthening customer loyalty. Brand trust is crucial for repurchase, as consumers look for products that consistently meet expectations in such a competitive market.

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	Extru-Tech Solution	VS	The Competition
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Operating Costs	1.0		1.60
Ingredient Flexibility	Excellent		Excellent
Complexity	Low		High
Operating Cost (\$/M Ton)	1.08		2.80

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ODOR CONTROL TECHNOLOGIES COMPARISON

Currently, countries are acting more rigorously on caring for the environment based on different established measures. A clear example is the regulation of odors emitted into it from industrial processes.

Governments or environmental entities are not the only ones that require compliance with laws to control industrial odors. Nowadays, society plays a key role in public opinion when it comes to the Earth, its care, and pollution. There are various technologies with their advantages and disadvantages and with different functions for odor control.

By Clivio Solutions

Biofilter Technology

Process air, which contains an annoying odor, is treated using a filter material, normally woodchips, and eliminated by microorganisms located therein, and can reduce various compounds such as sulfides, ammonia, and amines when present in low concentrations. Then, the clean air is released into the atmosphere, leaving the residual drainage (nitrates and sulfides) as a contaminant that must necessarily be treated, because, otherwise, they continue to cause negative odors. This system can treat flows of 1,000 to 50,000 m³/h, and requires water for its operation and a large area for its implementation, using little electrical energy. To avoid damaging the filter material, periodic maintenance should be

considered. When it comes to processing air with a high dust content, it is mandatory and necessary to treat it, for example, using a gas scrubber.

It is considered a good technology due to its cost/efficiency ratio, obtaining results with up to 85% of odors eliminated. Regarding investment costs, and even though they may vary by brand, manufacturer, or model, those generally range between USD 700,000 and USD 1,000,000.

Ozone and UV Light Treatment Technology

Airflow, which must be less than 20,000 m³/h, first passes through the UV lights, where the ammonia, sulfides, and

amines are decomposed, and then the remaining compounds are broken down with catalysts by injecting ozone (O₃). Removing dust from the air during the process is crucial as it will damage the effectiveness of the UV light. That is, highly contaminated air can considerably affect the efficiency of the system due to the flow density.

On the other hand, it uses electrical energy for its operation, and the air must either not exceed 60°C or the humidity be greater than 85%. This treatment allows good results, reaching levels of 70 to 90%. In this case, investment costs are considered between USD 200,000 and USD 400,000, with high annual operating costs.

Non-thermal Plasma (NTP) Technology

Technology capable of treating flows ranging from 5,000 m³/h to 250,000 m³/h depends on the system: in the case of direct NTP, normally 20,000 m³/h can be treated, but it could be up to 250,000 m³/h with indirect NTP. These devices use ambient air to generate free or active oxygen (O₁), which has a high oxidation power with the molecules that contain the annoying odor. To obtain them, the air must pass through a stage of filters to rid them of impurities and then go through the cabinet with non-thermal plasma modules, where the dissociation of the molecules is achieved, and the aforementioned oxygen radicals are obtained. These are injected into the outlet duct where the annoying odors come from, and in just 1 second, the odor molecules react and oxidize, becoming imperceptible to our noses.

Unlike other technologies, non-thermal plasma does not use water or chemicals for its operation, so it does not generate a secondary contaminated by-product. It only requires a minimum of electrical energy. In addition to the large flow rates it can manage, there is no restriction on the humidity or temperature that the process air can have. Optimal results are achieved, reaching up to 95% of odors eliminated.

These systems easily adapt to existing installations, thanks to their flexibility and the little space they take up. Regarding investment levels, these range from EUR 120,000 to EUR 250,000.

Scrubber technology

The air coming from the process, which contains the annoying odor, comes into contact with the stream of water and drip-type chemicals. This way, the odors react or are dissolved into the liquid and the air is released into the atmosphere clean.

Scrubbers, also known as gas scrubbers, can treat air flows that contain dust without using filters. They can treat flows ranging from 1,000 to 60,000 m³/h, achieving good results from 50% to 70% of controlled odors.

A great disadvantage of this system is that strict control of the contaminated water generated after the process is required, and it also occupies a large area for its installation.

The investment can reach up to USD 500,000 with high operating costs of up to USD 150,000 per year.

Conclusion

As a summary, see a comparative table of the technologies presented with their advantages and disadvantages, considering the following as a score: 5 highly positive, 4 positive, 3 medium, 2 negative, and 1 highly negative.

The choice and installation of the appropriate system will depend, on the one hand, on the industrial process that needs to be treated, considering the components of the contaminated air, and, on the other hand, on the levels of odor control that must be achieved to comply with current regulations in each country.

	Biofilter	Ozone and UV light	Non-Thermal plasma	Scrubber
Operating cost	3	2	3	2
Effluent generation	2	5	5	2
Odor concentration reduction level	3	3	4	4
Electrical consumption	4	2	4	4
Water consumption	2	5	5	2
Chemical consumption	5	5	5	2
Space requirement	3	4	4	3
Flow that can be treated	1	2	4	4
Score	23	28	34	23

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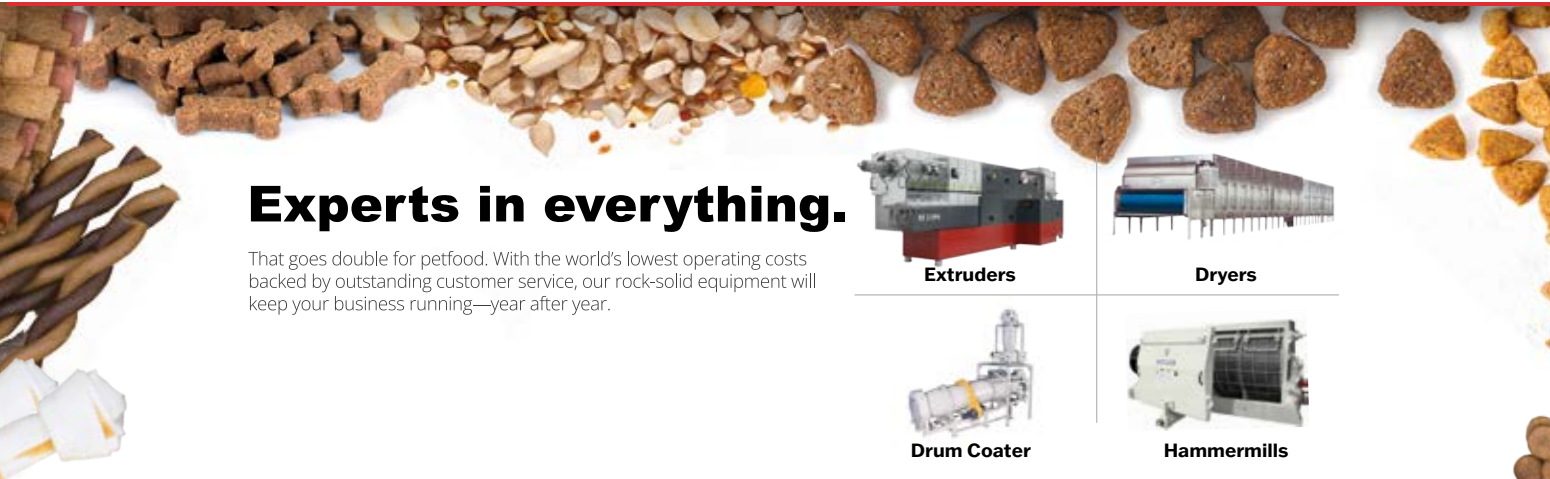


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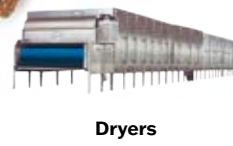


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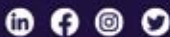


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QUALITY CONTROL IN THE PET FOOD INDUSTRY THROUGH CUTTING-EDGE SOLUTIONS



Globally, the pet food industry has seen a boom in demand for high-quality, nutritional products. Pet owners are increasingly aware of the importance of providing a balanced diet that meets specific nutritional needs. This growth in the industry has led to a diversification of products, dry and wet foods with nutritional fortifiers, and even gourmet options.

By Leonel Fulcheri

However, this trend presents significant challenges. **Quality control and laboratory analysis processes are often slow and expensive, resulting in production delays, loss of raw materials, reprocessing of batches, and, consequently, the loss of time and valuable resources.** All of this has been an obstacle to the efficiency and competitiveness of companies in the industry.

The solution to these challenges lies in near-infrared (NIR) spectroscopy technology, which has revolutionized the way the pet food industry approaches quality control, ingredient analysis, and process control. **NIR instruments allow multivariate analysis to be performed in less than 10 seconds, providing accurate data for critical parameters such as moisture content, protein, fat, fiber, and ash, among others.** As a result, not only is the quality control

process significantly accelerated, but a substantial reduction in costs associated with traditional laboratory analysis is also achieved, giving companies the competitive advantage they need to stand out in the industry.

Pet food manufacturing process: critical points

Within the framework of the pet food manufacturing process, there are critical stages identified that require special consideration to achieve efficiency and productivity to obtain a final product of excellence. We cannot reach a good final result if our raw material does not meet the requirements. NIR instruments can quickly provide us with the information necessary to decide whether a batch we are receiving meets them or not.

Each food has its recipe, and each variety has its nutritional composition. NIR equipment can help us confirm if the mixture or formula was correctly made prior to entering the extruder. After drying, it is common to apply coatings with fats, oils, or flavorings to make them more palatable, and, in some cases, vitamins and minerals can also be added to strengthen the nutritional content. NIR equipment can monitor the fat or oil content at this stage. Prior to packaging, and after the cooling process, obtaining an accurate reading of the humidity value of the product is essential to prevent common problems, such as the growth of mold or other types of fungi, which can cause deterioration of the product, affect its quality, and lead to significant economic losses. The ideal task for an NIR instrument will not only give us an accurate reading of the humidity value, but also allow us to verify that our final product meets the nutritional requirements we communicate on our packaging.

PerkinElmer has been leading the market for years with its DA 7250 analyzer, the third generation of NIR instruments in the company's more than 60-year history. This equipment combines Near Infrared Reflectance technology and a diode array (DA) detector, allowing accurate and reliable results in less than 10 seconds. Thanks to its excellent signal-to-noise ratio, large analysis surface area, and light range used with superior penetration capacity, grinding of raw materials or pre-treatment of samples before analysis is not needed. In addition to its speed in obtaining results, the DA 7250 stands out for its efficiency, simplicity of use, robustness, simple maintenance and cleaning, as well as its extremely friendly operating environment. It also has two online and inline versions, the DA 7440 and DA 7350 respectively, fully compatible with each other in terms of calibrations.

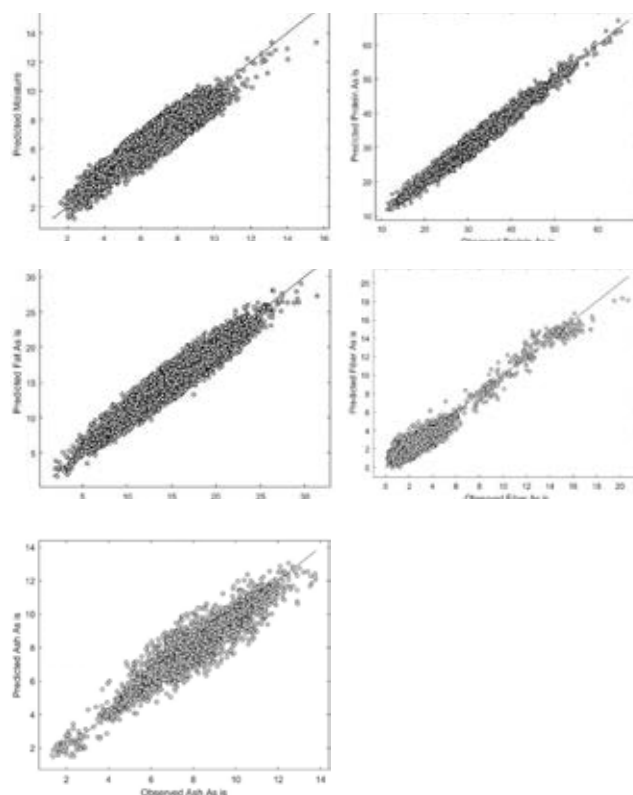


Mathematical models, prediction, and security in the results

Thanks to spectral data from more than 15,000 dry dog and cat food samples from worldwide manufacturers (including kibble, biscuits, tricks, and more), calibrations have been developed to model relationships between NIR spectra and reference chemical results. This has been achieved using Honigs™ Regression (HR) types and Artificial Neural Network Regression (ANN) algorithms, as well as the application of a temperature stabilization pretreatment.

Parameter	Unit	Samples	R	Range
Humidity	%	+15600	0.94	1.63 - 15.58
Proteína	% Tal cual	+17000	0.99	11.4 65.3
Mat. Grasa	% Tal cual	+15300	0.95	1.92 - 31.4
Fibra	% Tal cual	+6500	0.94	0.1 20.7
Ashes	% Tal cual	+6900	0.92	1.32 13.78
Starch	% Tal cual	+2500	0.95	15.9 37.4
Gel. Starch	% Tal cual	+2400	0.96	15.0 31.9
Water absorption	% Tal cual	+700	0.95	0.09 0.66

As an example, the following table shows data from calibrations carried out for samples of dry food for dogs and cats:



The great product variability incorporated in the calibrations, added to the aforementioned characteristics and virtues of the instrument, guarantee accurate and robust measurements over time. The models can be used for whole and ground pet foods with similar prediction accuracy. In parameters such as humidity, protein, fat, fiber, and ash, these models are very precise, with similar differences to the deviations obtained between the two reference laboratories.

In conclusion, in a market with increasing demands in terms of quality, nutritional value, and cost, NIR instruments are a powerful solution that offer fast, accurate, and robust results for all stages of the production process, reducing costs and leading to the efficiency and quality of our product at optimal levels.

TECHNOLOGY SHOWCASE

In this issue of All Pet Food Magazine, we highlight the latest innovations that can optimize your pet food operations. We take a look at innovations from different leading companies in the Pet Food market.



PALASURANCE

Kemin is a leading manufacturer of pet food palatants, and its portfolio starts with **PALASURANCE**. As their flagship line of palatants for all types of pet food products, they designed **PALASURANCE** products to offer the level of palatability that the industry and consumers expect.

Palatability of Pet Food Products

While pets' sense of taste differs greatly from ours, pets have their own preferences for quality food. The palatability of pet foods depends on many factors, including the freshness of the ingredients, the texture, size, and shape of the kibble, and especially the application of palatants. As a manufacturer of pet palatants, **Kemin** understands flavor at the molecular level and designs palatability enhancers to optimize food taste and pet acceptance.



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YERALBUM UF 16 is produced from chilled whole blood obtained from bovine or swine slaughter of establishments authorized by SENASA, an agri-food control agency in the Argentine Republic

Made with high standards of quality and traceability, where the process of concentration by ultrafiltration and nanofiltration and subsequent dehydration by atomization, which guarantees the preservation of the functional properties, solubility and availability of proteins.

Pets useful: Yeralbum UF 16 is used in pet diets due to its high digestibility, nutritional profile adequate and improvements in the palatability of food. Improves the fur of the animal.

Not having allergens, it is a protein source of choice in Premium foods. Yeralbum UF 16 has binding and gelling power to be used in cooked wet foods.





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Discover PAYPER's range of bagging machines for open-mouth bags, for extended precision and efficiency in Pet Food packaging. The CSA series includes six fully automatic models with high-precision dosing and weighing system, achieving speeds up to 1,800 bags per hour. Energy-efficient and high-speed, the refurbished CSA line adapts to any kind of production in the Pet Food industry.

Compatible with 5 to 25 kg (11 – 55 lb) pre-made bags, our machines offer hassle-free customization for bag types and kibble size changes. Modules like de-aeration systems and heat-sealing ensure impeccable presentations in stores.

With over 50 years of expertise, PAYPER tailors custom bagging lines for unique project needs, reflecting its commitment to innovation and customer satisfaction.



FAMSUN
Integrated Solution Provider



FAMSUN AND ITS EXTRUSION TECHNOLOGY WITH HIGH FRESH MEAT CONTENT MAKES ITS WAY AGAIN!

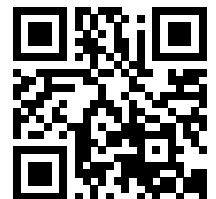
With the cooperative testimony of the world's leading pet food producer, at the world's leading testing center of FAMSUN, the FAMSUN twin screw extruder managed to produce dry pet food with 135.2% fresh meat (comparing the dry matter, as explained below). This means FAMSUN's high fresh meat extrusion technology is breaking through again.

Compared to animal protein of raw materials such as meat powder, fresh meat is tastier and more nutritious for kibble.

Starting in 2016, FAMSUN's pet food department began conducting research on adding fresh meat to extruded pet foods. With the support of the FAMSUN USA Institute, after 3 years of in-depth research, in 2019, more than 20 Chinese pet food producers witnessed FAMSUN successfully conduct a trial of adding 70% fresh meat in pet food, extruded at the FAMSUN testing center. In 2021, kibble with 70% fresh meat came to the market from a real production line in a pet food factory in Shanghai. Another extrusion line with more than 70% fresh meat was successfully put into operation in 2023 in China as well, marking the maturity and stability of commercial dry pet food mass production operations, with the production technology of 70% fresh meat.

海南某宠物食品生产现场			
干物料重量 (kg/%)	新鲜肉重量 (kg/%)	添加量	质量 (kg/%)
Dry Material	Fresh Meat	Add Amount	Quality
200	27	75	20
2019年12月15日 2020年1月15日 2020年2月15日 2020年3月15日 2020年4月15日 2020年5月15日 2020年6月15日 2020年7月15日 2020年8月15日 2020年9月15日 2020年10月15日 2020年11月15日 2020年12月15日			

2019, the witness firm for extruded croquettes with 70% fresh meat





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Example of a pet food coating line using the MT series coater, gravimetric feeding belt, Dosamix for multiple oils inclusion and separate dosing of digestes.



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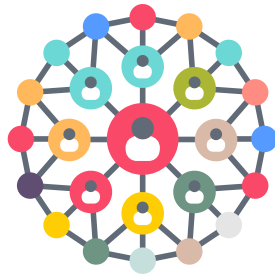
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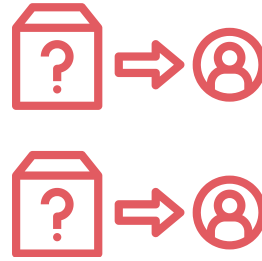
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20 YEARS OF ART IN NATURAL-ORIGIN INGREDIENTS

Biorigin

For more than 20 years, Biorigin has provided customers with solutions to promote pets' health, well-being, and nutritional support so they live longer, healthier lives. The company is committed to the quality and safety of its ingredients, constantly seeking innovative solutions to satisfy market demands and contributing to the preventive protection of animal health.

How it all started


Biorigin has been active in the Animal Nutrition market since 1994 when it began selling its first product, sugarcane inactive dry yeast. The business grew, and in 2003, Biorigin was officially created as Zilor's business unit focused on innovation and biotechnology. In the following years, the Research and Development Center was created, a significant step towards expanding the company's product portfolio. Starting in 2008, the internationalization process began with the acquisition of PTX Food Corp (USA) and Immunocorp Animal Health (Europe), including MacroGard, the most studied yeast beta-glucan on the market, in its portfolio.


Guaranteed by the full traceability of the vertically integrated production process: from raw materials, in addition to the quality assured by FSSC 22000, ISO 22000, ISO 14001, GMP+, Kosher and Halal certifications, Biorigin's portfolio is made up of safe products and sustainable solutions.

Recently, Biorigin invested in the development of a line of yeast extracts for pet foods, leveraging its strong knowledge base in fermentation processes for the food industry, officially launching the PalaUp line.

CONNECTED TO THE WORLD

 <https://www.biorigin.net/>

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 [linkedin.com/showcase/biorigin-animal-health-and-nutrition](https://www.linkedin.com/showcase/biorigin-animal-health-and-nutrition)

Industry solutions



PalaUp: Yeast-based products.

The PalaUp line products intensify the Umami flavor and bring the flavor to specific notes, such as beef and roast chicken, bringing the palate of the guardian and the pet closer together.




MacroGard: purified 1,3/1,6-beta-glucans

The most studied purified yeast beta-glucan is considered a scientific and commercial reference for pet nutrition and health. It supports natural defenses, helps maintain healthy skin and coat, and provides benefits to joint health, contributing to well-being.



HyperGen: second-generation prebiotic

Prebiotics from the primary fermentation of the yeast *S. cerevisiae* generate highly available cell wall components and effective functionality of the product with a powerful prebiotic action that enhances intestinal defenses.



HiCell: autolyzed yeast
 It contains high protein and amino acid content that contribute to nutrition. It is also rich in nucleotides that improve palatability and is a natural source of several B vitamins.

COMMITMENT TO SUSTAINABILITY

The commitment to respect the environment and people underlies all Zilor businesses. The company constantly invests in technologies to reduce the impacts generated by its operations, taking care of its employees, and generating value for its stakeholders. Biorigin is one of Zilor's business units and follows these same principles.

BIORIGIN IN VIDEO



Bringing pet's
tastes closer
to their parents'

Biorigin has improved the flavor of human foods for more than 15 years, and now, it will turn pet foods tastier! PalaUp line products enhance Umami flavor and specific beef and roasted chicken notes. **If you want to make pets wipe out their bowls, add PalaUp!**



Choose Biorigin. #GoBiorigin.
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For technical information:
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CZECH COMPANY EARNS EU REGISTRATION FOR CULTIVATED PET FOOD

Bene Meat has become the EU's first cultivated meat company to be cleared for sale in pet food after receiving approval from the European Feed Materials Register. The milestone is the latest development in the burgeoning cultured pet food sector, which has witnessed new tech, new brands, as well as rebrands.



<https://bit.ly/3SogeEy>



GERMAN PET MARKET CONTINUES TO GROW

Numbers of pet ownership in Germany rank in second place in overall ownership rates, making Germany one of the most promising markets for pet supply brands in Europe. Moreover, almost half of German pet owners have not made and are not considering making changes with regards to their pet due to inflation.



<https://bit.ly/3Spa8E7>



ALL PET FOOD JOINS AFIA PET FOOD CONFERENCE AS MEDIA PARTNER

We have joined AFIA PET FOOD CONFERENCE as media partners. The conference is coming and will be held in Atlanta, on January 30, 2024. This partnership means a significant role to our mission of acting as a bridge between sector members.



<https://bit.ly/3U7uOS5>



FEDIAF EUROPEANPETFOOD ANNOUNCES SONIA FRANCK IS THE NEW GENERAL SECRETARY OF

FEDIAF EuropeanPetFood, the overarching association for the European Pet Food Industry, is delighted to announce the appointment of Sonia Franck as its new Secretary General. Sonia's experience leading European trade associations and her love of pets, positions her well to contribute to the continued growth and success of the European Pet Food Industry.



<https://bit.ly/3tWslFX>



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Texas A&M University



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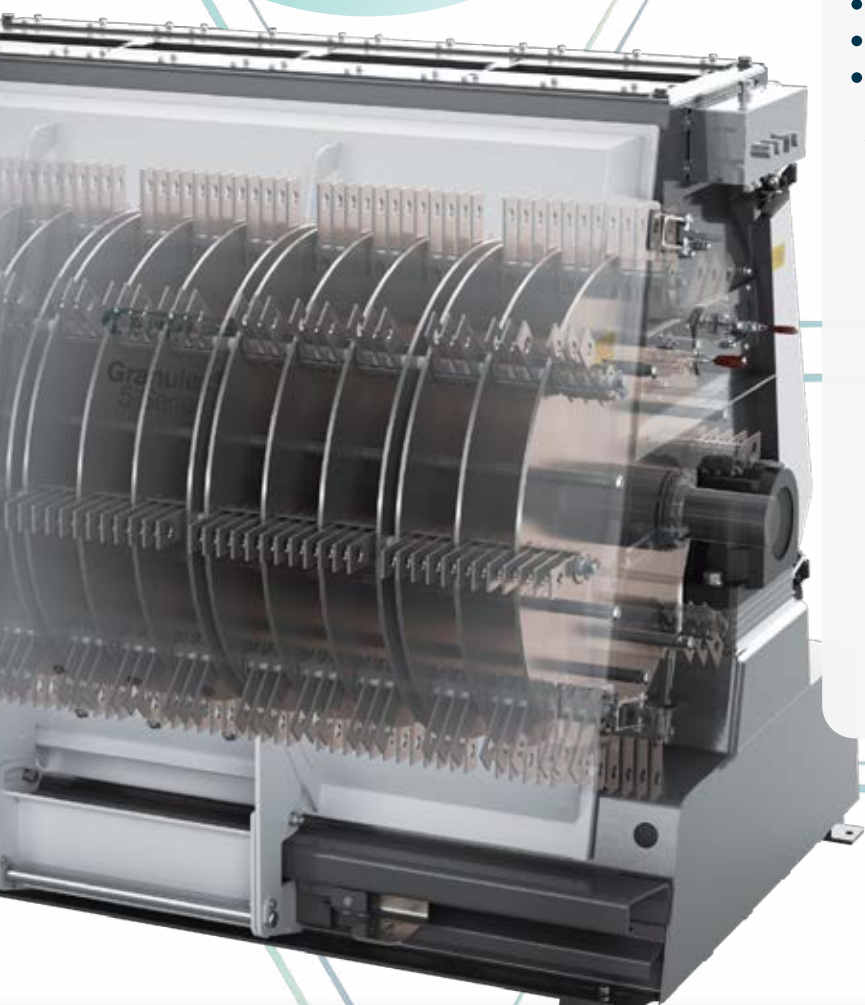
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