

AI **PET FOOD** **MAGAZINE** INTERNATIONAL MAGAZINE ABOUT THE PET FOOD INDUSTRY

**SCIENCE AND TECHNOLOGY
IN PRECISION INGREDIENTS**

**BIOTECHNOLOGY
IN THE PET FOOD
INDUSTRY**

**HOW GUT MICROBIOME
AND MITOCHONDRIA SHAPE
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EDITORIAL

Welcome to a new edition, and the last one of this year, of All Pet Food Magazine!

The pet food industry is undergoing an unprecedented revolution, driven by technological advances and an increasing focus on science-based nutrition. That is why, in this edition, we have spoken with the President of one of the leading companies in the technology industry in our market. In addition, we bring you articles from various professionals and editors.

Maximilian Furley, President at Premier Tech, highlights, among other things, the importance of integrating technology at each stage of the value chain, from raw materials supply to final delivery. For their part, the companies participating in this edition bring us valuable information about the modernization of the industry thanks to the automation of complete processes, food safety and traceability optimization, and new proposals to improve packaging and palletizing, among other most nutritious topics for both producers and academics specialized in any topic referring to or related to our industry.

The science behind pet nutrition is reaching new levels of sophistication. That's why, in this edition, our Guest Editors discuss the interplay between science and technology in precision tools, custom additives, and other technological advances that arise from the merging of science and technology.

We know that, to move towards an increasingly larger, effective, successful, and sustainable industry, the exchange and connection between its members are essential. That is why, this September, we held the CIPAL third edition, which has brought together more than 1,000 attendees who connected and received current and academic information in the presentations and conferences offered. Participants from Argentina, Chile, Brazil, Peru, Uruguay, Mexico, Germany, Spain, Italy, China, and Japan, were present among those who chose CIPAL as their strategic space for networking and meeting industry innovations, always with a focus on the needs of the regional market.

Last, we want to express our thanks to you, our readers, for being with us for another year in this search to build ties, bridges, and meetings between the different parts and members of this industry that, thanks to the effort and work of everyone, has not stopped growing!

We hope you enjoy this edition, and that we meet, once again, next year.

Editorial team

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BIOTECHNOLOGY IN THE PET FOOD INDUSTRY

For several years now, biotechnology has been growing in the industry to facilitate finding new protein sources for pet food, benefits for animal health, and new ways of reducing the industry's environmental impact.

By All Pet Food

It is a multidisciplinary field that, through living organisms, biological systems, and processes, develops products and technologies that benefit different ecosystems of society, people, and animals. Its main goal is obtaining additives and simulating the natural process of protein synthesis at the cellular level to produce specific protein molecules, as well as to improve the conservation of forage and silos. But its fields of application are very varied, so let's discover some of the most used ones:

Specific industries

Poultry farming

In its function related to protein, it is related to this industry with enzyme use, since using the appropriate ones make it possible to use cheaper raw materials, improving production costs. As an example, we can mention what happens with barley, with high contents of β -glucans, which birds cannot digest because they lack the appropriate enzymes, and,

when solubilized in the intestinal environment, they produce a high degree of viscosity, which hinders nutrient absorption, reducing diet digestibility. This results in dirty eggs, muscle injuries, and more.

Pig farming

In this case, **enzymes are used to complete the enzymatic system of these animals, immature until they are 8-10 weeks old**, which means that they cannot completely digest certain nutrients and substances. Enzymes also help with bacterial growth.

Ingredients

Probiotics and prebiotics

These are microorganisms, live or dead, extracts or a combination of some of them, used to promote or improve animal intestinal health and immune system. Prebiotics, for

their part, are compounds that promote the growth of these beneficial microorganisms.

Acidifiers

Acidifiers are rather a type of biotechnology that allows the modification of biological systems’ behavior.

Alternative proteins

One of the most dynamic areas of biotechnology applied to pet food is alternative protein development. Traditionally, animal proteins such as chicken, beef, and fish have been the basis of pet food formulation, but nowadays, topics such as sustainability and animal welfare impact the perception of these animals, and consumers have started demanding other alternatives. In this sense, biotechnology allows the creation of alternative proteins, such as those obtained from insects, plants, cell cultures, and laboratory-grown meat.

Personalized microbiomes

The microbiome is made up of various microorganisms that live in the digestive tract. It has gained pretty much scientific relevance in animal health in recent years. Biotechnology has enabled significant advances in understanding how microbiomes influence digestion, nutrient absorption, and pets’ immune systems, for example.

Personalized food

There have already been cases in which manufacturers have used DNA analysis and microbiological studies to develop a food formulation for a specific pet. This allows the creation of food formulas that not only meet general nutritional needs but also address particular health problems of animals with delicate health or highly specific conditions.

Improved Omega-3

Omega-3 fatty acids are essential for pet health, but are traditionally obtained from sources such as fish, which come from the aquaculture industry. Thanks to biotechnology, genetically modified crops are being developed, such as canola, that produce high levels of this fatty acid, which positions it as a more sustainable source to complete formulations.

Sustainability and environmental impact

One of the most significant challenges for the pet food industry today is its environmental impact. Biotechnology presents itself as an innovative solution that can, among other items, facilitate carbon footprint reduction and minimize production waste.

Production waste

An emerging approach is the use of organic waste to produce pet food ingredients. **Through biotechnological processes such as fermentation, waste from the food industry can be transformed into proteins, lipids, or carbohydrates.** These can be used in new pet food

formulas, which contribute to reducing waste and having a more sustainable production chain.

Biodegradable and even edible packaging

Biotechnology is also being applied to developing materials for biodegradable or even edible packaging, managing to address one of the main problems associated with sustainability and the production of non-renewable or recyclable waste.

Innovations in food safety

Genetic optimization

Biotechnology is playing a crucial role in improving the ingredients used in pet foods. Today, **through genetic modification, it is possible to develop crops with improved nutritional profiles, achieving greater resistance to diseases and a lower need for pesticides or fertilizers.**

Biosensors for pathogen detection

We are seeing the development of technologies based on biosensors to detect the presence of pathogens such as Salmonella or E. coli used in real-time during food manufacturing, this will allow faster detection and immediate response to conditions, thereby reducing the risk of disease outbreaks in the target population.

Improved natural preservatives

Biotechnology has also allowed the development of natural preservatives, used to prolong food shelf life, avoiding the use of chemical additives. These derivatives of plants and other natural organisms are effective in preventing the growth of mold and bacteria, which improves and prolongs final product conservation.

Conclusion

Advances in biotechnology are transforming the pet food industry. This discipline offers innovative solutions to improve pet health, promote sustainability, and ensure food safety. As it continues to evolve, it will keep creating a path to optimize the industry’s proposals for pets and, therefore, we will continue to grow together as a market that seeks to offer increasingly safer, efficient, specific, and sustainable solutions.





THE CONSCIOUS NUTRITION ERA, OR WITH SCIENCE ERA, NOW IN DOGS AND CATS

During my career as a researcher, doctor, nutritionist, and pet mentor, I understand that change is necessary. What is the future if it only repeats the past, or if our points of view, knowledge, and talks are always the same, based on the same concepts?

By Dr. Bonauro M. Candela

A brief scientific point of view about veterinarian nutrition in dogs and cats

Science can be the evil in many stories. However, it allowed us to enjoy long years of joy and company close to our dogs and cats.

The furry friend era requires a real and ethical commitment from science to provide all the support and great knowledge to their needs. Do not we hope they live a longer, quality, and plenty life?

Ranges of knowledge are deeper and deeper, necessary, and useful. But we still have a huge unexplored field since there are no possibilities for organ

transplantation, diagnosis, and treatment of many diseases.

In my personal and professional experience, I was lucky to explore a field in constant growth: dog and cat nutrition, or the conscious nutrition era as I call it. Even so, it is not free from myths and false truths that pet owners have on hand. **We should recognize that this field is still taking shape, so it is necessary to provide information and experiences based on scientific evidence**, and that is the goal for those who want to give a “nice meal” to each animal.

Science has helped to understand the functioning of the metabolism, diseases and treatments, and animal behavior. It also allowed us to know the relationship and genetic

changes between dogs and wolves, and domestic and wild cats. We cannot deny what we introduced, so our effort is mandatory to fulfill their needs. Dogs and cats, carnivorous animals that have adapted their digestive system to other nutritional sources, still present a big challenge to find an ideal food diet, even more so when they present health problems.

Understanding digestive physiology is a nice beginning to see which nutrients adapt the most to that functioning. We must not forget that animals are a whole; it is important to consider the changes and behavioral modifications since they influence them when indicating a diet or eating habits.

In Argentina, at least 40-60% of the canine and feline population live with obesity, a pathology that has no positive effects on pets' health. Obesity treatment requires understanding the following concepts: nutritional requirements, nutrients, genetic contributions, eating habits, digestive disorders or similar, as well as behavioral habits, such as gluttony and sedentary lifestyle, among others. Only science could provide this information.

On the other hand, in the last issue, we talked about the importance of the three Rs principle, ethics, and animal well-being, associated with research. **Nowadays, we focus on results and the impact of science in veterinary medicine and the environment;** we hope that it continues growing to provide powerful tools when saving or improving pets' lives and the planet at the same time.



Here are some scientific clippings with information about each species to consider:

1. Science revealed that cats found the perfect evolution scale. "They have fixed this in a good way that they simply vary in size. That is why they are perfect in evolution. They do not need variations".
2. Curiosities about dogs: they can understand up to 250 words; they are sensitive to sounds because they hear four times as much as humans; their sweat glands are in their paws, and their fingerprints are in the nose.
3. Science confirmed that their companion boosts people's mood and health.

Science advances and provides information and useful data that allow us to improve their life, or that is why I use science.

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SCIENCE AND TECHNOLOGY IN PRECISION INGREDIENTS

In the last few years, science and technology have significantly transformed the pet food industry, increasing nutritional quality as well as food safety.

By MVZ. Armando Enriquez de la Fuente Blanquet

On the one hand, science is a systematic process that studies and understands the natural world through observation, experimentation, and analysis. It is based on a scientific method, which means to make questions, formulate hypotheses to test them, and analyze the results to develop theories and laws. The aim of science is to build up a reliable body of knowledge about how things function in nature.

On the other hand, technology refers to the practical implementation of scientific knowledge to develop tools, systems, and processes that solve problems and satisfy human needs. It includes a wide range of approaches, from electronic devices to industrial production methods as well as medical and communication techniques.

After all, science and technology are deeply interrelated and often drive each other.

Science provides the necessary knowledge to understand the nutritional needs of pets and how ingredients affect their health and well-being.

- **Animal nutrition:** Investigate specific dietary needs of different pets and how nutrients (proteins, fats, vitamins, minerals) affect their health.
- **Digestion and metabolism:** Study how animals digest and metabolize food and how different formulations can optimize nutrients absorption.



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Technology in pet food manufacturing includes methods and tools used to transform ingredients into high-quality pet food.

- **Extrusion process:** Uses equipment to make and shape ingredients at high-precision and temperature levels, manufacturing kibbles and other forms.
- **Drying technology:** Eliminates pet food moisture through drying techniques, ensuring its stability and longevity.
- **Formulation and mixture:** Ensures a uniform distribution of ingredients by using technologies to mix ingredients with precision.

Moreover, vitamins and trace minerals are essential compounds for pet nutrition that play a crucial role in their health and well-being. Science and technology have significantly advanced in the formulation and incorporation of these substances in pet food. Below, there is detailed information about how technology and science manage vitamins and trace minerals.

Vitamins and minerals in formulations

Accurate formulation: Technology allows accurate formulation to ensure that vitamins and minerals are in correct amounts. Both nutrients measure in ppm (parts per million) so precise inclusion, distribution, and bioavailability are important. Software and mathematical models calculate the exact nutritional needs in each formula.

Vitamins and minerals stability

Chemical stability: Vitamins and minerals can break down during the processing and storage process. Science has developed more stable vitamins, such as vitamin E—in the form of mixed tocopherols—that has better resistance to oxidation. Another example is ascorbic acid (vitamin C) that can be damaged by the extrusion process and is sensitive to temperature, humidity, pH, oxygen, and light. However, technology has developed chemical structures like the “ascorbyl polyphosphate”, which make it resistant to the pet food manufacturing process. Ascorbic acid is released by digestive enzymes in the gastrointestinal tract, so pets ingest the necessary vitamin C (Figure 1).

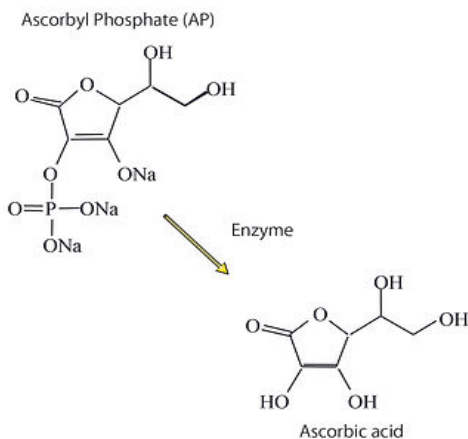


Figure 1: Ascorbyl polyphosphate and ascorbic acid diagrams.

Microencapsulation: This technology covers vitamins and minerals with a protective coating to prevent their degradation and release them into the digestive tract in a controlled way.

Sources of vitamins and minerals

Synthetic vs. natural vitamins: Synthetic vitamins, such as vitamin A and vitamin D3, are used due to their stability and efficacy, while other formulas incorporate natural sources for a complete nutritional profile.

Chelated minerals: Trace minerals combine amino acids and other compounds to make chelates, improving their absorption and bioavailability in the pets’ digestive tract (Figure 2).

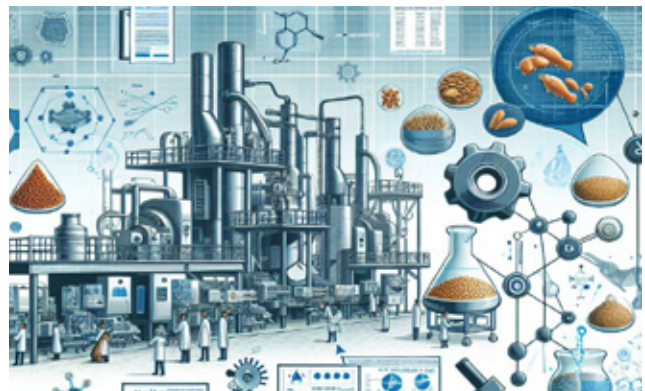


Figure 2: Available sources of trace minerals in the market

Absorption and bioavailability technologies

- **Bioavailable forms of vitamins and minerals:** The selection of vitamins and minerals easily absorbable is key. For example, zinc in the chelated form is more bioavailable than organic zinc.
- **Controlled release technology:** Some ingredients are designed to gradually release nutrients, which can enhance vitamin and mineral efficiency and absorption.

To sum up, combining science and technology in pet food manufacturing allows the development of safe, efficient, and high-quality products that meet pet nutritional needs. Science provides the required knowledge, while technology employs it to create and control the production process.





CARING FOR OUR PETS' BACTERIA

With the advancement of science, new market trends are emerging, with high demand and little competition, which are eager for supply. At 3A BIOTECH, we have identified this business opportunity.

By 3A BIOTECH

A few years ago, it seemed incredible to think that our bodies contain more bacterial cells than human ones, but this is indeed the case. In a 70 kg human, the number of bacteria is around 3.8×10^{13} , while human cells are estimated at 3×10^{13} . Some studies even suggest this difference could be greater, making us a true ecosystem where various types of bacteria coexist with our own cells. This concept is not only applicable to humans but also to other animals, including our pets.

Pets are now perceived as family members, and the efforts to improve their diet and health have drastically increased in recent years. Numerous advances in understanding how the bacteria in their bodies affect their health have made the search for new foods and products to care for these bacteria fundamental in maintaining a healthy balance.

1. The microbiome and its importance

The set of microorganisms that coexist in balance within the bodies of our companion animals is known as the microbiome. **The microbiome plays a crucial role**

in the host's health, protecting against pathogenic microorganisms, modulating the immune response, contributing to the production of neurotransmitters, and participating in digestive processes such as fibre breakdown. The microbiome in a specific part of the body is called the microbiota, and depending on its location, certain types of bacteria will predominate. Thus, in the same animal, the bacteria living on the skin, in the mouth, or in the intestines will differ. **Moreover, the microbiome is specific to each individual and depends on factors such as hygiene habits, stress, the animal's age, its living environment, contact with nature, and diet.**

A prolonged imbalance in the microorganism population can lead to dysbiosis, which, in turn, can trigger various diseases. For instance, in the mouth, dysbiosis can cause dental problems, gum inflammation, bad breath, digestive issues, promote the growth of caries-causing bacteria like *Streptococcus mutans*, or even increase the risk of cardiovascular or neurological diseases. In the gut, dysbiosis is associated with diseases like irritable bowel syndrome or inflammatory bowel disease, which alters the intestinal microbiota that disrupts key functions such as

metabolite production and the intestinal barrier. This can lead to symptoms like diarrhoea, vomiting, loss of appetite or weight, though some pets may be asymptomatic.

Treating dysbiosis involves dietary changes and the use of prebiotics, probiotics, or symbiotics, alongside managing underlying gastrointestinal conditions.

On the other hand, the loss of beneficial bacteria leaves a niche available for opportunistic microorganisms, which can be pathogenic for both our pets and us. This is the case with some bacteria like *Escherichia coli* or *Clostridium perfringens* in dogs. Microorganisms may not always be serious pathogenic for animals, but they can be for humans, as in the case of toxoplasmosis (*Toxoplasma gondii*) in cats, highlighting how our health is directly linked to that of our pets.

2. Helping to care for their microbiome

As we have seen, it is essential to care for our pets' microbiomes to maintain their health, focusing on proper nutrition and habits. **Among the available foods, some can help maintain, enrich, or enhance the microbiota in their digestive system.** An example of this is foods rich in prebiotics, compounds that our pets cannot metabolise, but which serve as food for the beneficial bacteria in their bodies. Compounds, such as plant fibres, fructooligosaccharides, beta-glucans, various arabinogalactans, and inulin are particularly effective in promoting the development of intestinal microbiota. These compounds can be found in pet-safe foods like pumpkin, sweet potatoes, chicory root, or wheat bran, among others.

Numerous studies have shown that consuming foods rich in prebiotics boosts the abundance of microorganisms from the *Bacteroides*, *Bifidobacterium*, or *Lactobacillus* genera, all of which are beneficial. Another advantage of prebiotics is that, since pets cannot digest them, they help control weight by reducing calorie intake and suppressing appetite.

Another noteworthy group is probiotics. These foods contain live microorganisms that, when consumed in adequate amounts, can colonize different parts of the digestive tract, protecting the host from pathogens and directly benefiting health. Many probiotics belong to the lactic acid bacteria genus, which can be cultivated and introduced into our pets' diets.

Fermented foods typically consumed by humans, which contain bacteria from the *Lactobacillus* and *Bifidobacterium* genera or fungi like *Aspergillus*, also offer such benefits. Currently, new functional foods include these strains in prepared foods for both humans and pets, usually obtained from healthy individuals and tested to ensure they promote balance and provide health benefits. An example is the colonization of *Lactobacillus* bacteria that has been shown to reduce pathogenic bacteria from the *Enterobacteriaceae* genera or *C. perfringens* in dogs. When a probiotic is combined with a prebiotic, results in a symbiotic. These products enhance the benefits of both by providing both positive strains and the food they need to thrive in their target niche, typically a segment of our pets' intestines.

Lastly, postbiotics are metabolites produced by bacterial activity. These include short-chain fatty acids, enzymes, antimicrobial peptides, and other compounds. A subgroup of postbiotics is paraprobiotics, which are postbiotics obtained after lysing the bacteria that produced them, preventing their viability and development in the host. **Industrial biotechnology has utilized these metabolites as natural preservatives since many microorganisms produce substances that inhibit the growth of undesirable microbes.** By optimising the production and purification of these compounds, it is possible to offer natural and sustainable solutions to improve both food and cosmetics, extending the shelf life of these products.

3. Development at 3A BIOTECH

We are committed to a comprehensive development of these three key areas for the proper functioning and maintenance of intestinal microflora: we combine prebiotics from our raw materials, develop products with probiotics cultivated from our own strains, and obtain the best blends of postbiotics, ready for application by our clients to their products. Under these principles, **at 3A BIOTECH we have developed the Bioprotect range, formulations with 100% natural ingredients that allow our clients to use clean label ingredients.** These products are not only more environmentally friendly but also offer safer alternatives to synthetic compounds, meeting the growing demand for more natural and sustainable options.

Among this range is Bioprotect-RT, a product enriched with reuterin, a natural postbiotic with activity against *Salmonella*, produced by the probiotic *Lactobacillus reuteri*, which is well known for its benefits in both oral and intestinal health.

One of our standout solutions in this range is Bioprotect-DF, a product generated from the fermentation of the bacterium *Propionibacterium acidipropionici*, enriched with short-chain fatty acids with antifungal activity, ideal for wet pet food.

This line comes as a result of expanding our facilities, including larger volume bioreactors, or as we like to call them, biofactories. These large tanks are essential for maintaining the optimal conditions for microbial growth and production of the desired compounds. Additionally, local waste by-products can be used as raw materials in these bioprocesses, improving the sustainability of the region—a fundamental principle for our company.

In addition to the Bioprotect range, we have developed other innovative formulations that not only promote intestinal microbiomes in humans and pets but also act as antioxidants and preservatives in foods, enhancing their shelf life. Furthermore, **they improve the organoleptic profile, adding distinctive aroma, flavour, and texture, making products more palatable and attractive to pets.**

At 3A BIOTECH, we aim to expand into new markets, building new biofactories to become leaders in Spain and developing new product lines for both human and animal nutrition. **With the help of our microorganisms, we will continue to be “The shield for tomorrow’s well-being” for years to come.**



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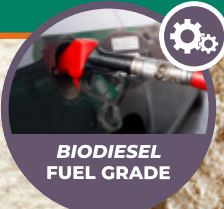
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JANUARY Issue

Topic: **Trends, Expectations, and Market in 2025.**

Distribution in the following events:

- AFIA & IPPE** - January 28-30, **Atlanta, USA.**
- Iberzoo Propet 2025** - February 26-28, **Spain.**
- Figan 2025** - March 25-28, **Zaragoza, Spain.**
- World Plastic Connection Summit** - April 8-10, **San Pablo, Brazil.**

APRIL Issue

Topic: **Sustainability in the Plastic Era.**

Distribution in the following events:

- Zoomark 2025** - May 5-7, **Bolonia, Italy.**
- Fenagra 2025** - May 13-15, **San Pablo, Brazil.**
- Seminario Extrutech** - May, **Puerto Vallarta, Mexico.**
- Expo Pack 2025** - June 10-12, **Guadalajara, Mexico.**
- Foro Mascotas 2025** - June 25-27, **Guadalajara, Mexico.**

JULY Issue

Topic: **Manufacturing Innovations and Pet Food Processing.**

Distribution in the following events:

- Pet South America 2025** - August 13-15, **San Pablo, Brazil.**
- Victam Latam 2025** - September 16-18, **San Pablo, Brazil.**
- CIPEU 2025** - October 1-2, **Zaragoza, Spain.**
- Expo Envase 2025** - September 16-19, **Buenos Aires, Argentina.**

OCTOBER Issue

Topic: **Artificial Intelligence in Pet Food .**

Distribution in the following events:

- AllPetFood Day 2025** - November, **Santiago de Chile, Chile.**

SPRAY-DRIED PLASMA INCLUDED IN THE FORMULATION ALLOWS FOR HIGHER MEAT INCLUSION IN DIETS

Increasing fresh meat inclusion in dry kibble can be challenging. When extruding, variation of moisture and fat of the incoming raw meat ingredient adds to the complexity of producing quality kibbles. As fresh meat feed rates are increased, the ability to extrude quality kibble may be impacted depending on the matrix. Spray-dried plasma (SDP) has historically been used in wet pet foods to increase water holding, binding, and fat emulsification properties to maintain quality products. APC and testing partners, Wenger, conducted studies to see if meat inclusion levels could be increased in extruded grain and grain-free kibble formulas by using SDP for both dogs and cats.

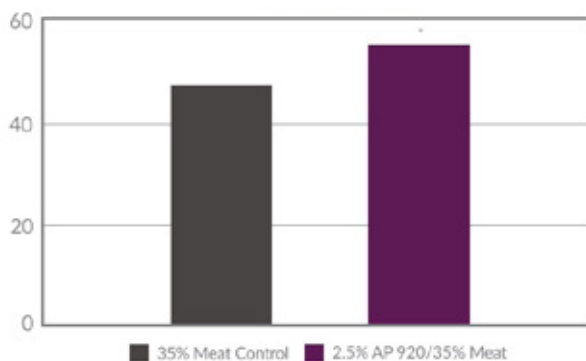
By: Dr. Joy Campbell, Senior Director of Global Pet Food Technical Service, APC

Several initial tests were completed to prove the concept. The dry blend feed rate was established, and adjustments in fresh meat and SDP feed rates to the dry blend feed rate were evaluated initially with a twin-screw extruder. **Limits were determined by the extruder inability to continue the production of kibble.** Feed rate ranges from 2.5 to 20% SDP and 25-50% fresh meat were evaluated. With initial concept testing, SDP feed rates from 2.5 to 20% allowed for increased fresh meat feed rates to 45-50% depending on the feed rate of SDP and formulation type.

Follow-up evaluation tests were completed formulating SDP into the dry blend with the least cost formulation. These formulas were evaluated on both single and twin-screw extruders. Targets of 2.5 and 5.0% SDP in the final kibble were formulated into the dry blend in both grain-free and grain formulas. Ranges of meat feed rates from 25 to 45% were again evaluated. Overall, **the addition of plasma in the dry blend formula allows formulators to increase meat levels while improving kibble durability and palatability**, all while increasing meat inclusion levels.

CONCLUSIONS

- Plasma included in the formulation allows higher meat inclusion in diets.
- Cook and Durability are maintained or improved.
- Palatability was improved in both cat and dog kibbles.



REVIEWING KEY RESULTS

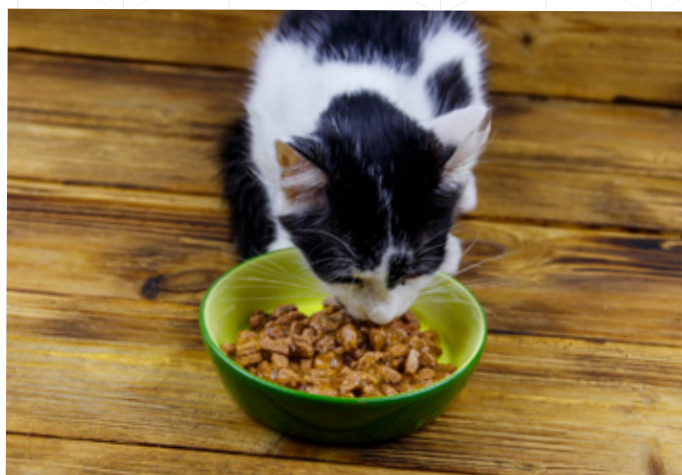
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18	25	0	0	7.2	96.2	96.15
23	35	0	0	8.0	89.1	92.46
23	35	2.5	3.75	7.0	98.6	96.16
23	35	5	7.5	7.37	97.0	95.68

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FOOD, DEFECATION AND ENVIRONMENT: A GLANCE TO IMPROVE THE IMPACT (PART 1)



Brazil has an increasing number of dogs (67,8 million) and cats (33,6 million), a number expected to grow (ABINPET, 2024). Consequently, the amount of animal waste grows, which causes health diseases and environmental impacts.

By Jéssyka Laura Galdino Costa, Ricardo Souza Vasconcellos (Universidade Estadual de Maringá–Brasil), Fernando José González González (Universidad de la Salle–Colombia)

Pet feces transmit bacterial and parasitic diseases (Cinquepalmi et al. 2013), but there has been little discussion about its impact. **With the emerging focus on sustainability to meet the 2030 calendar and the SDL (ONU, 2015), this aspect can be widely considered.**

Although there are programs that promote the collection of pet feces in public areas and alternatives to manage this kind of waste, such as composting and anaerobic digestion (Martínez-Sabater et al. 2019), we still do not know its impact, especially those managed in Brazilian homes.

This waste significantly contributes to the environmental fingerprint for pet ownership since nitrogenated waste from defecation—in great numbers and non-neutralized—can be toxic to the environment (Hobbie et al. 2017).

Social media and local governments know this waste harms the environment, but there is not enough scientific data about its real impact. **It is necessary to use appropriate research tools to correctly understand its flows and emissions to find the best way to manage and reduce the effects of dog and cat defecation.**

Dog/cat defecations and sustainability: Their relationship

Sustainability involves environmental, social, and economic aspects that ensure resources are available for future generations.

In Brazil, pet feces are commonly thrown away in the sewage system or in the garbage to be collected by governmental programs or leave them in the open air where they decompose.

Water waste is usually treated to reduce pollutant loads of waste; however, feces in the garbage, outdoors, or collected by local governmental programs increase the amount of organic solid urban waste (SUW) that ends up in landfills and is the main responsible for methane emissions.

The aforementioned information means a challenge. The Greenhouse Gas Emissions and Removals Estimates (SEEG in Portuguese) include the following goals in their 2030 calendar: reduce almost 14% of organic waste in landfills, recover 50% of methane generated in these landfills, and improve the recovery of animal waste methane (SEEG, 2022).

In 2023, 2,300 million tons of SUW were generated globally; by 2050, this number will reach 3,800 tons (PNUMA, 2024). Managing this waste cost 252,000-361,000 million dollars in 2020 (Figure 1). In Brazil, around 77,1 million tons of SUW were generated in 2020, with estimated costs of R\$ 29,2 billion (ABREMA, 2023). **That indicates that the generation of solid urban waste affects the environment, society, and the economy.**

In Brazil, almost 50% of SUW is organic waste from pets though the concrete amount is not clear. Documenting these numbers and potential emissions can help to enhance the management of waste and reduce the impact and costs, contributing to the SDLs.

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Figure 1: SUW generation in Brazil (2022). Published by ABREMA (20239).

Pet waste and sustainability are also related to the amount of nitrogen (N) and phosphorus (P). These waste and nutrients highly risk most species living on this planet since they are non-neutralized and appear in great amounts. Related to nitrogen, it can raise pollutant gases in the air, reduce vegetal digestion, and pollute urban water. On the other hand, P is essential for animal nutrition and can contaminate fresh water, which is increasingly rare (Rezende et al. 2022).

Due to nutritional and physiological aspects, pets, mainly cats and dogs, can release large amounts of N and P to the environment (Ritchie & Roser, 2020). Dogs are facultative carnivore animals, and cats are obligatory carnivores, which need a diet rich in total and animal proteins (NRC, 2006; Rousseau et al. 2019; FEDIAF, 2021) and, at the same time, have high excretion of nitrogen waste.

As consumers purchase according to the protein level on the label, without knowing pets' nutritional protein and amino acid (AA) needs (Singh et al. 2024), **pet food industries commonly formulate food with high-protein levels and with high-quality ingredients that compete with human nutrition** (Swanson et al. 2013; Okin, 2017; Su and Martens et al. 2018).

High ingestion of proteins in dogs and cats promotes high AA oxidation to eliminate excess. On the other hand, maintaining body condition score in adult dogs and cats depends on the non-restriction of proteins in food practices (Li and Wu, 2024). In addition, pet fecal and urinary excretion can contain other waste, such as plasticizers (Li and Kannan, 2024), but their effect on the environment and human health are not known.

These factors show the relationship between pet waste and sustainability, highlighting the importance of studying this topic in Brazil. The appropriate characterization of feces and urine impact is a way to cooperate with strategies aimed at mitigating the problem and maintaining the future sustainability of agriculture.

In the second part of this article, we will provide information about the Life Cycle Assessment (LCA), a useful approach to analyze how products and processes impact the environment which includes pet waste production in Brazil, standardizing these processes to help sustainable decision-making.

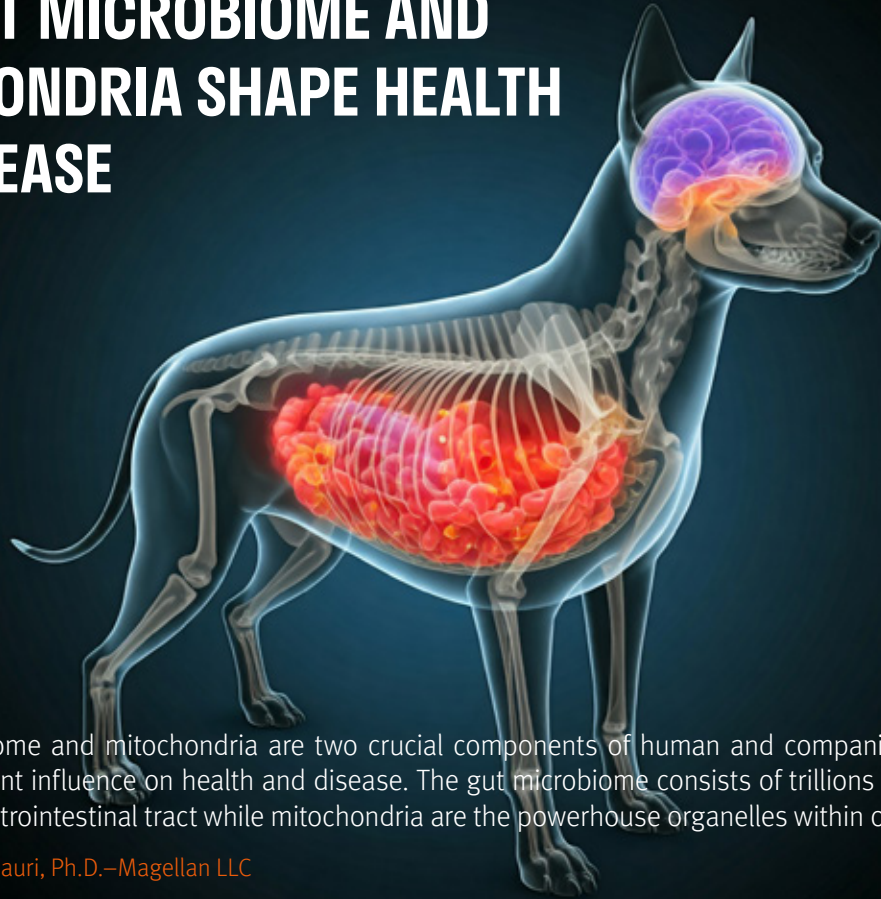
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HOW GUT MICROBIOME AND MITOCHONDRIA SHAPE HEALTH AND DISEASE



The gut microbiome and mitochondria are two crucial components of human and companion animal biology that have significant influence on health and disease. The gut microbiome consists of trillions of microorganisms residing in the gastrointestinal tract while mitochondria are the powerhouse organelles within our cells.

By Juan Gomez-Basauri, Ph.D.—Magellan LLC

The relationship between the microbiome and mitochondria is a fascinating and complex area of study, reflecting complex interconnections that have a profound impact on various aspects of human and companion animal health, influencing metabolic processes and disorders, immune function, neurodegenerative diseases, and aging.

This article will briefly explore the roles of the gut microbiome and mitochondria, their interactions, and their combined effects on human and companion animal health.

The microbiome

The microbiome itself is the complete set of microorganisms (microbiota), their genes, and the metabolites they produce in the microenvironment (habitat) in which they reside in and on an organism's body (e.g., the intestinal tract, mouth, skin).

The gut microbiome per se encompasses a diverse community of bacteria, viruses, fungi, and other microorganisms that inhabit the gastrointestinal tract.

These microbes play essential roles in various bodily functions, including digestion and nutrient absorption, immune system regulation, and the production of vital metabolites.

Digestion and nutrient absorption

Certain gut bacteria produce enzymes that digest complex carbohydrates, such as dietary fiber. This microbial

fermentation process produces short-chain fatty acids (SCFAs), like butyrate, propionate, and acetate, which provide energy to colon cells, have anti-inflammatory effects, and help the regulation of glucose and lipid metabolism.

Immune system regulation

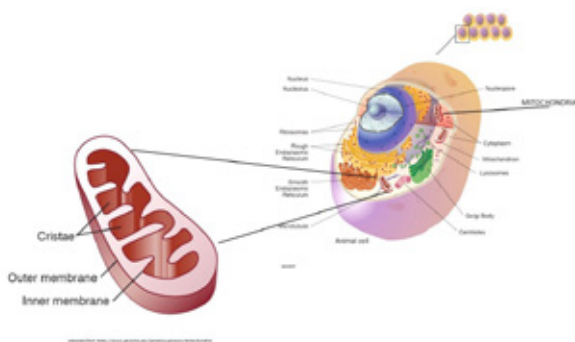
The gut microbiome plays a crucial role in the development and modulation of the immune system. It helps in the education of immune cells and the maintenance of immune tolerance, preventing autoimmune diseases.

Metabolite production

Gut bacteria produce a number of metabolites which have specific roles, e.g., serotonin and gamma-aminobutyric acid (GABA), which can influence mood and cognitive functions via the gut-brain axis.

Mitochondria

The mitochondria (Fig. 1), often referred to as the powerhouse of the cell, are double-membrane organelles responsible for producing ATP through oxidative phosphorylation (energy production), involving the electron transport chain and ATP synthase. **The energy thus produced is essential for various cellular functions:** apoptosis, calcium signaling, the regulation of metabolic pathways, and overall cellular health.



Apoptosis

Mitochondria play a pivotal role in apoptosis, a programmed cell death mechanism crucial for maintaining cellular homeostasis and preventing cancer.

Calcium signaling

Mitochondria help regulate intracellular calcium levels, which are vital for muscle contraction, neurotransmission, and other cellular processes.

Metabolic pathways

Mitochondria are central to the metabolism of carbohydrates, fats, and proteins, converting these macronutrients into usable energy.

Redox balance

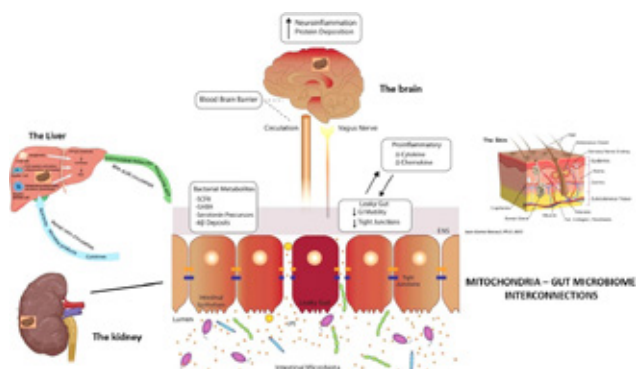
Mitochondria produce Reactive Oxygen Species (ROS) as by-products of oxidative phosphorylation. While ROS play roles in cell signaling, excessive ROS can cause oxidative stress, damaging cellular components.

Antioxidant defense

Mitochondria possess antioxidant systems, such as superoxide dismutase (SOD) and glutathione, to neutralize ROS and maintain redox balance.

Interconnections between the gut microbiome and mitochondria

Recent research is beginning to reveal intricate connections between the gut microbiome and mitochondria, highlighting their collective impact on health (Fig. 2).



Microbial metabolites and mitochondrial function

SCFAs produced by gut bacteria can be used by mitochondria for ATP production. Butyrate, in particular, serves as an energy source for colonocytes and enhances mitochondrial function.

SCFAs can activate signaling pathways that promote mitochondrial biogenesis, enhancing mitochondrial function and energy production.

Inflammation and oxidative stress

Dysbiosis, or imbalance in the gut microbiome, can lead to chronic inflammation, contributing to mitochondrial dysfunction. Inflammatory cytokines can disrupt mitochondrial function, increasing ROS production and oxidative stress.

Elevated oxidative stress due to mitochondrial dysfunction can affect the gut barrier integrity, leading to increased intestinal permeability or “leaky gut” and systemic inflammation, further exacerbating mitochondrial damage.

Gut-brain-mitochondria axis

Gut bacteria produce neurotransmitters and other signaling molecules that influence brain function. **Mitochondria in neurons are crucial for neurotransmitter release and neuronal activity.**

Dysbiosis and mitochondrial dysfunction are implicated in neurodegenerative diseases, such as Alzheimer’s and Parkinson’s disease. **The gut-brain-mitochondria axis highlights the interdependence of these systems in maintaining neurological health.**

Gut-liver mitochondria axis

Metabolites produced by gut microbiota consisting of short chain fatty acids and bile acids contribute to the regulation of hepatic homeostasis by interacting with mitochondria. The function and dynamics of the liver mitochondria, i.e., metabolism, biogenesis, and redox homeostasis, can be modulated by the gut microbiota.

Gut-kidney mitochondria axis

Mitochondria injury is the common damaged subcellular organelle in renal, intestinal and cardiovascular dysfunction. Mitochondrial structural and functional abnormalities, including impaired mitochondrial biogenesis, and oxidative stress contribute to the development and progression of cardio renal syndrome.

Combined impact on health and disease

The interplay between the gut microbiome and mitochondria has profound implications for health and disease. This relationship can influence metabolic disorders, immune function, neurodegenerative diseases, and aging.

Metabolic disorders

Dysbiosis can lead to altered energy metabolism, promoting **obesity and insulin resistance.** Mitochondrial dysfunction further exacerbates these conditions by

impairing ATP production and increasing oxidative stress.

Probiotics, prebiotics, and dietary interventions targeting the gut microbiome can improve mitochondrial function and metabolic health. For example, increasing dietary fiber intake enhances SCFA production, supporting mitochondrial health.

Immune function

Dysbiosis and mitochondrial dysfunction can contribute to the development of autoimmune diseases. Restoring gut microbiome balance and mitochondrial function can modulate immune responses and reduce disease severity.

A healthy gut microbiome enhances the immune system’s ability to fight infections, indirectly supporting mitochondrial function by reducing the burden of chronic inflammation.

Neurodegenerative diseases

Dysbiosis and mitochondrial dysfunction are linked to the pathogenesis of neurodegenerative diseases. **Modulating the gut microbiome and improving mitochondrial function offer potential therapeutic strategies.**

Maintaining a healthy gut microbiome and an optimal mitochondrial function is crucial for cognitive health, particularly in aging populations.

Aging

Mitochondrial dysfunction and chronic inflammation (inflammaging) are hallmarks of aging. **The gut microbiome influences these processes by modulating inflammatory responses and mitochondrial health.**

Strategies to enhance gut microbiome diversity and mitochondrial function, such as dietary interventions and probiotics, have the potential to promote healthy aging and extend lifespan.

Final thoughts

The gut microbiome and mitochondria are intricately linked, playing crucial roles in maintaining health and preventing disease. Their interactions influence metabolic processes, immune function, neurodegenerative diseases, and aging.

Understanding these relationships opens new avenues for therapeutic interventions, targeting both the gut microbiome and mitochondrial function. **By harnessing the power of nutrition, functional bioactives, and lifestyle modifications, we can optimize these systems to improve overall health and longevity for both humans and companion animals.**



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IMPROVING IN THE PATH OF SCIENCE AND TECHNOLOGY INNOVATION

The pet food industry in Latin America is transforming by a series of technological innovations, particularly in premium and super-premium segments. Brazil, Argentina, and Mexico stand out by using advanced technologies as key elements that enhance the quality of premium products.

By Iván Franco

Using technology in the overall production and sales processes of pet food is not a trend but a market differentiation that appeals to pet owners. There are numerous examples of companies leading their markets due to the use of cutting-edge production processes.

Brazil and Argentina: Innovation and technology in premium food

Brazil and Argentina use advanced technologies such as the latest generation extruders and automated production lines to develop high-end products. They improve efficiency and ensure constant and superior quality, aligned with the expectations of strict pet owners. **In addition to its commitment to innovation, these countries lead the region in premium food penetration.** In these countries, the amount of premium food in their total supply is significantly higher than in the rest of Latin America, making them pioneers in market premiumization.

Mexico: Growth potential in the premium segment

Although Mexico is in the same development line as Brazil and Argentina, there is still a great potential to expand its premium segment leveraged in technology.

Premium products represent approximately 12% of the overall pet food market. Driven by the increasing pet

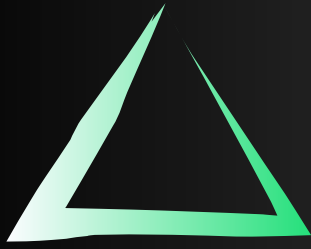
humanization and the demand for high-quality products, this percentage will increase by almost 20% in the country (even in LATAM) in the long term.

The presence of international sellers, like Petco and Amazon, has positively impacted the market. **Introducing high-end imported products has driven local brands to follow this trend to raise their standards.** In this context, Mexico seems to be a step forward regarding premium offerings compared to the rest of the region; Chile is like Mexico in terms of the variety and functionality of products and ingredients.

Inversions in advanced technology to include ingredients and automated packaging lines allowed Mexican companies to emulate and innovate their premium products, satisfying nutritional-specific needs in the local market.

Technology: The differentiation element in the super-premium segment

Integrating scientific and advanced production technologies is a key market differentiation among the super-premium segment, where pet owners seek products that feed and contribute actively to their health. **Leading companies are investing in full-automated technologies in the production chain to provide scientifically proven nutritional benefits.**



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Key strategies to enhance premiumization by using technology in the pet food area

As the pet food market in Latin America goes by, technology is a determining factor for those companies aiming to stand out in premium and super-premium segments. Implementing effective strategies that integrate advanced technology not only improve product quality but also enhance brand awareness and consumer loyalty. Here are some key strategies that make a difference:

- 1. Innovation of process and products:** Using advanced technologies is fundamental to developing exclusive formulations that fulfill the market demands, which are increasingly sophisticated and aware of pet health, **including the choice of nutrients and the manufacturing process to conserve nutrients.**
- 2. Expansion of technological capacity:** The automation of the process, from mixing ingredients to packaging, optimizes efficiency operating and ensures consistency and high-quality of the product, which is essential to maintain consumers' trust and meet strict standards.
- 3. Strategic collaboration:** Building alliances with technological institutions and research centers is vital to be updated with advances in animal nutrition. These collaborations can fasten the development of new

products and offer access to research that supports affirmations in health and well-being.

- 4. Education and technological communication:** Using digital platforms to inform about technological advances and premium/super-premium benefits is fundamental. **By educating the market about the added value of these innovations, companies can foster greater approval and preference for their products.**

Turning point: Technology as an agent of change in pet food

Technology is changing and increasing quality and efficiency standards in the pet food industry in Latin America. Catalyzed by cutting-edge technological innovations and an emerging trend to humanize pets, the premiumization era has new rules for pet food manufacturers. **Companies that are ahead of the curve in integrating these technologies are achieving superior products tailored to the needs of modern pet owners.** Moreover, they are strengthening their leadership in a highly competitive market, positioning themselves as food manufacturers and pioneers in animal well-being and advanced nutrition. This proactivity not only enhances their presence in the actual market but also prepares them for leading future innovations in an area that continues to expand and diversify at a fast pace.



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TECHNOLOGICAL ADVANCEMENTS IMPROVING THE QUALITY OF PET FOOD

Year after year, both science and technology advance in the search for better-quality food and ingredients for dogs and cats because, as in human nutrition, pet food is regulated by specific organizations in each country and registered and certified for use in formulations.

By Josiane Volpato and Ingrid Caroline da Silva

Although no specific laws characterize industrialized food (Standard, Premium, Super-premium, Special Premium, High-premium, etc.), the quality, research, and applied technologies in their manufacturing and evaluation are crucial to ensure their positioning in the market.

This article investigates the steps applied in the research process and the development of food in which science and technology are combined with the extrusion process using NIR evaluation and digestibility tests.

Extrusion process

The extrusion process has existed for centuries; Joseph Bramah developed the first report in literature in 1797 (England). **It was not until 1900 that extrusion began**

to be used for food manufacturing by the Frenchman Alexandre P. Pigozzi and, in 1954, by the Ralston Purina Company to manufacture dog and cat food.

Extrusion is a thermal process that makes the material (powders) go through a die with holes to shape a specific kibble (ball, bones, heart, among others). It is a HTST process (High Temperature-Short Time), the most widely used method for manufacturing pet food, as dry diets are still the most sold.

Even being an old process, it always grows along with technology, aiming to meet the needs of the pet food industry and ensure excellence in its production and high-quality pet food. Besides being considered one of the most efficient, the technology offered by extrusion is

also very economical for manufacturing dog and cat food, especially in terms of quality and food security compared to other processes.

Many extruders in the market aim to satisfy the most diverse process for dog and cat food. Single-screw extruders are the most affordable and used in manufacturing, especially for standard quality in which many formulations are extruded. However, double-screw extruders offer better quality and more options for shaping. Moreover, they can use more ingredients in the formulation, which is advantageous when industries want to diversify their products with Premium and Super-premium food.

Research has demonstrated that controlling its thermal or mechanical energy offers considerable benefits in feeding, for example, managing the effect on starch gelatinization by allowing it to reach the large intestine (colon) and act as prebiotics for dogs and cats. Jackson et al. (2020) discovered that identical formulated food processed in extrusion conditions of high and low shearing results in tough starch to dietary digestion, which produces potentially beneficial changes in the gut microbiome by altering starch digestion. Another benefit related to food, Alvarenga et al. (2021) altered the mechanical energy in the extrusion process and found that kibbles produced in low and middle shearing were denser (varying between 296 and 338 g/L) and less expanded than those in high shearing.

The pet food industry is constantly seeking innovation. With the high demand for new food, including fresh meat, such as Super-premium, fruits and vegetables, or insect proteins, **extruders with advanced technology offer an improvement in the use of thermal energy and a reduction in mechanical energy, enhancing the nutritional quality and satisfying nutritional requirements and realities of each factory.**

NIRS food evaluation

Near Infrared Spectroscopy is a technology widely used in factories to predict the bromatological condition of ingredients in pet food formulation. This technique has gained popularity in recent years with new advances in execution due to the rapidity and agility of results. Since then, this analytic technology has provided factories with rapid analysis of specifications such as the percentage of proteins, fats, ashes, moisture, and pH, among others.

With almost immediate results, it assists quality control in making decisions by accepting or rejecting the receipt of raw materials. **Pet food factories also use NIRS to update the formulation program database and ensure that the composition matches the end product specifications,** the labels, and the specifications of each product in its portfolio.

Technological advances make equipment calibration easier and faster for many food and animal ingredient analyses. In addition to macronutrients such as proteins and fats, it is also possible to carry out analysis with near-infrared spectroscopy, e.g., detecting if the sample is contaminated

by mycotoxins or biogenic amines or calibrating it to detect adulterations and ensure product approval.

Research in other species (Montoro et al., 2023) examined chemical compounds in feces and the coefficients of apparent digestibility of the total tract. Hervera et al. (2012) evaluated the possibility of the NIRS to estimate the energy content in commercial dog and cat food. These studies strengthen the potential to help the analysis, ensuring food quality.

Therefore, **nutrient composition and digestibility are essential to the qualitative evaluation of pet food** since they provide results about the nutrient availability in that diet with a significant impact on animal health.

With this goal and ethical guidelines in animal experimentation, that seek to reduce the use of animals in research, many studies evaluate pet food digestibility through the in vitro method, which aims to reproduce apparent digestibility in dry extruded food for dogs and cats. Hervera et al. (2007) studied a two-step multienzyme incubation approach adapted to dogs' digestion characteristics. It consists of two consecutive incubations: the first for 2 hours with pepsin A to acidic pH and the second for 4 hours with pancreatin. After that, the material is filtered, dried, incinerated, and then the digestibility value of the dry and organic matter of the feed is calculated.

Using experimental animals to evaluate the nutritional value of food and raw materials for pets requires time, financial investment, and animal management. **That is why industries can use the in vitro technique, a reliable methodology to estimate product digestibility** with high reproducibility and repeatability. It also examines and probes new hypotheses in nutritional research in dogs and cats.

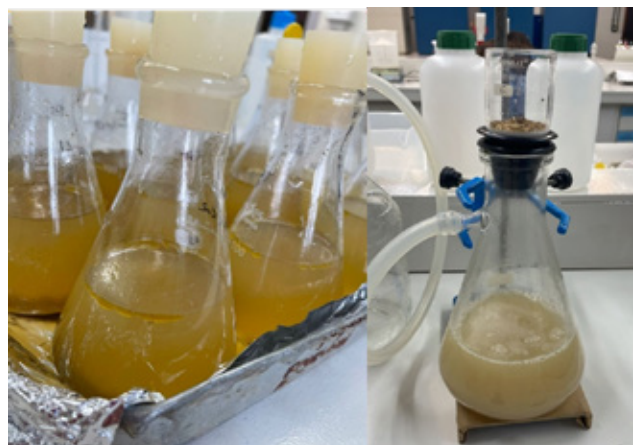


Figure 1: In vitro digestibility technique – Source: compiled by author





ARTHRITIS IN DOGS: THE USE OF CHONDROITIN AND GLUCOSAMINE

Osteoarthritis is the most common musculoskeletal condition in dogs; it is caused by chronic inflammation of joints due to articular cartilage damage. As it is a high genetics multifactorial disease, the specific aspects of each dog can boost the development of this condition, for example: age, body condition score, sex, breed, physical activity level, and diet.

By Julia Santos Rodrigues, Thainá Batista de Medeiros, Eduarda Lorena Fernandes, Heloísa Lara Silva, Laiane da Silva Lima, Lorena Nicole Araújo Santos, Renata Bacila Moraes dos Santos de Souza, Ananda Portella Félix, Simone Gisele de Oliveira - Universidade Federal do Paraná

Osteoarthritis in dogs is a chronic inflammatory disease that requires nutritional control along with conventional treatment.

It is diagnosed when the animal's mobility is affected and by being a disease without a cure, it should be prevented and controlled (RYCHEL et al., 2010). Dogs with arthritis not only require a conventional treatment but also special nutritional control with nutraceutical food supplements.

Glucosamine and chondroitin supplementation and its results in dogs are widely recommended to prevent and treat the disease

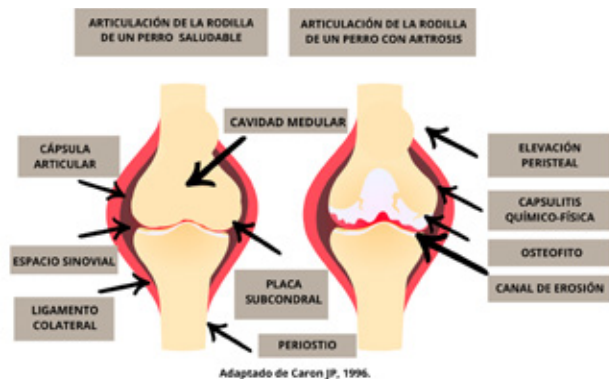
Supplementation of glucosamine and chondroitin is highly recommended by veterinarians to prevent and treat osteoarthritis (RYCHEL et al., 2010). Classified as chondroprotective agents, they are basic components of the cellular matrix and the synovial liquid and contribute to the synthesis of glycosaminoglycans and proteoglycans—building blocks in the cartilage formation (BEALE et al., 2004).

Based on that, several research have been conducted to explain the use of glucosamine and chondroitin when treating dogs with articular problems. Although research show beneficial clinical effects, proof vary according to the function in formulation and additional active principles in the commercialized supplements (BHATHAL et al., 2017).

Articular anatomy and arthritis

Cartilage is a conjunctive specialized tissue, mainly formed by an extracellular matrix made up of type II collagen and chondrocytes, among other molecules. In arthritis, the articular cartilage is damaged affecting other structures, such as ligaments, synovial membranes, and meniscus (ARDEN y LEYLAND, 2013; LOESER, 2013). Clinical signs manifestation, e.g. pain and limp, can be related to cytokines and chemokines that work directly on articular nociceptors.

Moreover, they promote neovascularization in articulations and meniscus, where compressive strength and hypoxia stimulate the development of new sensory nerves.



Regarding risk factors, males are more prone than females; this can be related to differences in hormones and the body condition score (HAYS et al., 2007).

In addition, neutered dogs develop articular diseases as their sexual hormones, which work as chondroprotective agents, are at lower levels. The procedure is also associated with an increase in weight. Finally, there are breeds prone to develop this condition, such as golden retrievers, Labrador retrievers, Rottweilers, and German shepherds (ANDERSON et al., 2018), because of their high body weight and conformation-related hereditary defects (ASHER et al., 2009).

In general, arthritis is diagnosed when the animal shows modified mobility combined with other risk factors and is rarely diagnosed during the initial stage (MOSHER et al., 2013). These are some of the trials to diagnose the disease: x-ray and computed tomography, along with the medical record and the physical examination of the animal, using a test known as Ortolani's sign (BOHRER, 2002), which consists of flexing the lower limbs, followed by the abduction of the thigh, that allows the evaluation of a cracking noise when moving it.

Nutraceutical food supplements containing glucosamine and chondroitin for arthritis treatment

Nutraceuticals are food supplements elaborated in purified or extracted ways that are orally administered to provide the necessary compounds to the organism's physiology; its aim is to improve health and well-being (ARONSON, et al., 2017). Being food supplements, formal testing is not required for commercialization, so market access is easier. Therefore, there is a wide range of these products with differences in composition, doses, and the combination of other active principles.

Because of the synergy action of compounds (LIPPIELLO et al., 2000), the combination of glucosamine and chondroitin is recommended for treating and preventing arthritis (MILLIS and LEVINE, 2014) among the available nutraceuticals for dogs. In dogs, it is recommended a 2-6 weeks oral treatment to show clear therapeutical effects (PLUMB et al., 2015), such as reducing the overall pain and increasing the percentage of the neoformed subchondral bone (ELEOTÉRIO et al., 2015).

Research by Silva et al. (2022), evaluated analgesic effects of carprofen, associated or not to the combination of glucosamine and chondroitin, in the treatment of dogs with osteoarthritis. Researchers concluded that animals evaluated with carprofen associated with glycosaminoglycans showed a significant increase in controlling limp.

Moreover, Tudury et al. (2022) evaluated the use of chondroitin-sulfate-based nutraceuticals, glycosaminoglycans, and manganese in preventing intervertebral disc damage in dachshund dogs. It was observed that administrating this supplement in the first year of life reduced the number of disc mineralization in the thoracolumbar spine.

However, due to the difference between the formulations and additional active principles in commercialized supplements (BHATHAL et al., 2017), some studies have not found significant effects of these compounds on osteoarticular diseases in dogs.

It should be noted that when diagnosing it early, physiotherapy is an ally that stabilizes the condition, in addition to the use of nutraceutical. At the same time, hydrotherapy, laser therapy, thermotherapy, and therapeutical ultrasound contribute to physical rehabilitation, increasing the production of extracellular matrix (Canário, 2021).

Conclusion

As it is a disease without a cure, it should be prevented and controlled to minimize the animal discomfort. Therefore, it is important to conduct more research to clarify the real influence of using glucosamine and chondroitin when treating dogs with articular problems, contributing to the treatment and the diagnosis of affected animals.

Formulation	Dosage	Period	Results	Author
200 mg of chondroitin sulfate, 300 mg of glucosamine, 24 mg of aromatics, and 1200 mg of incipient vehicle.	1 tablet up to 10 kg, 2 tablets/11-20 kg, 4 tablets/21-30 kg.	15, 30, 60, or 90 days.	Supplementation resulted in a lower percentage of chondrocytes without degenerative aspects and a higher neoformed subchondral bone.	Eleotério et al., 2015.
Carprofen + Pro Cart supplement: 220 g/kg of chondroitin sulfate and 250 g/kg of chondroitin sulfate. Pro Cart 25: 262 g/kg of chondroitin sulfate and 298 g/kg of glucosamine sulfate.	Carprofen: 2.2 mg/kg. Pro Cart: 1 capsule every 10 kg. Pro Cart 25: 1 capsule every 25 kg.	Carprofen: 15 days. Pro Cart: 30 days.	Carprofen treatment provided a significant improvement in controlling limp. Specially, when was combined with glucosamine and chondroitin supplements	Silva et al., 2022.
216 g/kg of chondroitin sulfate, 314 g/kg of glucosamine sulfate, 2100 mg/kg of manganese, 20 g/kg of sulphur, 20 g/kg of DL-Methionine and incipient vehicle.	1 tablet of 2 g per day.	240 days	Supplementation reduced the mineralized intervertebral discs (in the T9 and L3 segments of the vertebral column), evaluated by computed tomography.	Tudury et al., 2022

Table 1. Concentration levels of glucosamine and chondroitin in main studies.

THE EVOLUTION OF THE PET FOOD INDUSTRY: MODERNIZATION AND AUTOMATION OF PLANTS

The incorporation of artificial intelligence (AI) into our lives has led to a radical transformation in how production plants operate. Today, we talk about smart, fully automated plants capable of running with minimal personnel or, in some cases, without human intervention at all.

By Clivio Solutions

What seemed like science fiction just a few years ago is now a reality. But how is it possible that so few people can manage an entire shift of pet food production, with all the challenges that come with it? What does it really mean to have a modern and smart plant? And more importantly, how can a plant be designed to maximize efficiency, safety, and product quality?

Here are some key insights to help understand this new paradigm:

- **Automation of the Dosing Process:** The implementation of automatic dosing systems has significantly reduced human error. This ensures that each formula contains the exact amount of ingredients, preventing health issues in pets and economic losses for brands. Precision is critical, as any over-/under-dosing can have undesirable consequences.

- **Sustainability:** Modern plants are designed with sustainability in mind. They use renewable energy sources such as solar panels, efficiently manage water usage and waste, and employ recyclable or biodegradable packaging materials. **Reducing energy consumption is another key aspect; energy-efficient technologies, like low-consumption transport systems, help make plants greener.** Moreover, in terms of social sustainability, odor control to avoid disturbances to neighbours is a standard that must be met.

- **End-of-Line Automation:** The latest generation of highly automated and flexible packaging and palletizing machines adapt to different packaging formats and production volumes. This allows plants to quickly respond to changing market demands without sacrificing efficiency. Automated inspection and quality control systems ensure that every product meets quality standards before being packed,

minimizing the risk of product recalls and protecting the brand's image.

- **Real-Time Quality Control: Smart plants feature advanced systems that monitor each stage of production in real-time, from start to final product disposition.** These systems verify parameters, such as moisture, water activity, density, and temperature, ensuring they remain within optimal safety and hygiene ranges.

- **Artificial Intelligence and Data Analytics:** AI helps predict demand, manage inventories, and optimize the supply of raw materials, reducing waste and costs. With this technology, plants can quickly adapt to market needs, optimizing their performance.

At Clivio Solutions, we offer comprehensive consulting for the design of modern, efficient, and sustainable plants. Our personalized approach is based on understanding each client's operational needs and strategic goals. **From process optimization to the selection and integration of cutting-edge technologies, we help ensure that each plant is ready to maximize its performance while minimizing its environmental impact.**

Finally, by focusing on operational efficiency and a flexible, scalable design, we ensure that facilities can quickly adapt to changes in demand or technologies, avoiding high investment costs in the future.

Are you ready to take your plant to the next level? Contact us today and discover how we can help you design a smart, modern, and sustainable plant that meets your needs and goals. Together, we can make the future of pet food production a reality.

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RELIABLE PACKAGING & PALLETIZING OF BULK MATERIALS WITH STATEC BINDER MACHINES

STATEC BINDER can look back on more than 45 years of experience in packaging technology and has already installed more than 1,800 machines worldwide. The company stands for the development of machines of the highest quality, as well as individual and customized systems. The customer-oriented company philosophy and the worldwide customer service ensure first-class customer support before, during and after the purchase of a system. Whether free-flowing or powdery products, open-mouth or FFS packaging machines, STATEC BINDER specializes in developing the right solution for each customer.

By Statec Binder

The history of STATEC BINDER goes back to 1978, when the first packaging system of the parent company Binder+Co AG was realized —in 2008 the joint venture was founded under the name STATEC BINDER. Thanks to the continuous optimization and further development of the proven technology since then, the company is now one of the leading suppliers in the high-performance packaging industry.

Packaging systems from STATEC BINDER

The Austrian packaging and palletizing specialist focuses primarily on flexibility and innovation. All packaging systems are characterized by high quality and precision. The product portfolio ranges from packaging systems for open-mouth bags, FFS packaging machines, BIG-BAG filling stations, bag closing systems and scales to palletizing systems for free-flowing bulk goods. Products from a wide range of industries can be processed, such as the petrochemical, chemical, agricultural, food, animal feed, minerals and fuel industries. The proven packaging systems impress with their high efficiency and performance and contribute to greater value retention, cost-effectiveness and optimization of the customer's packaging process. The systems are also of high quality and reliable; the use of high-quality materials and the possibility of modernizing all machines means that they have

a very long service life. **The Austrian company therefore focuses on the implementation of high-tech, individual and high-quality all-in-one concepts**, which are tailored to the individual product requirements and plant conditions of the various customers.

Packaging machines for open-mouth bags

The PRINCIPAC, CERTOPAC, ACROPAC and CIRCUPAC packaging machines for open-mouth bags are suitable for polyethylene (PE), woven polypropylene (PP) and paper bags with a filling weight of 5 kg to 80 kg. Up to 2400 bags can be filled every hour. The packaging machines for open-mouth bags are suitable for all types of free-flowing bulk goods. With additional equipment, powdery products such as flour can also be bagged.

Depending on customer requirements, **the packaging machines for open-mouth bags are designed for low, medium and high production capacities**. The durable systems enable a high level of product protection, improved shelf life and filling to precise dimensions.

Form-Fill-Seal packaging machines

The product portfolio also includes the SYSTEM-T FFS (Form-Fill-Seal) machine for bag processing from tubular film

and the SYSTEM-F vertical FFS machine for bag processing from flat film. Both packaging systems are suitable for bagging all types of free-flowing bulk goods. The SYSTEM-F is particularly suitable for packaging moderately free-flowing or powdery products. The FFS machines can fill up to 2800 bags per hour with a filling weight of 5–50 kg.

BIG BAG filling station

The BIG BAG filling station from STATEC BINDER enables the safe filling of bags with a filling weight of 500–1500 kg. **Up to 150 bags can be filled every hour.** The machines are adapted to customer requirements depending on the desired filling capacity and degree of automation. In addition, the systems enable maximum weighing accuracy and precision and are also sturdily built.

Palletizers

The palletizers from STATEC BINDER impress with their top performance as an ideal addition to the packaging systems or as stand-alone machines. With the high-level, gantry and robotic palletizer, the perfect solution is found for every customer to enable the best possible and most efficient palletizing of bags or cartons. As with packaging machines, the various palletizers are suitable for a wide range of industries. **The focus is on bringing together complex systems so that the respective product can be placed on load carriers or pallets as quickly and cost-effectively as possible.** The palletizing systems are also individually adapted to the customer’s requirements. Both

the gentle handling of the packages and the optimal and stable appearance of the palletized load units are the basis of STATEC BINDER’s palletizing technology.

Customer Service

In addition to the high-quality and efficient high-performance machines, the packaging specialist is also characterized by its unique, worldwide customer service after the purchase of a system. Complete customer satisfaction is the top priority here. Customers should be able to rely on being well looked after not only before and during the purchase, but also after delivery of a machine, and therefore receive sound advice, a high level of service expertise and support in all areas. **STATEC BINDER’s global Customer Service team supports customers with the highest level of expertise and impresses with many different services,** such as spare parts delivery, modernization & optimization of machines, customer training and much more.

“STATEC BINDER’s philosophy is clear. Even though we primarily deal with packaging and palletizing systems, our aim is to provide our customers with the best possible advice, to find the perfect solution for them and to provide them with the best possible support even after they have purchased the system. This is the only way we can be a strong and reliable partner,” Josef Lorger, Managing Director.

For more information visit our website at: www.statec-binder.com/en



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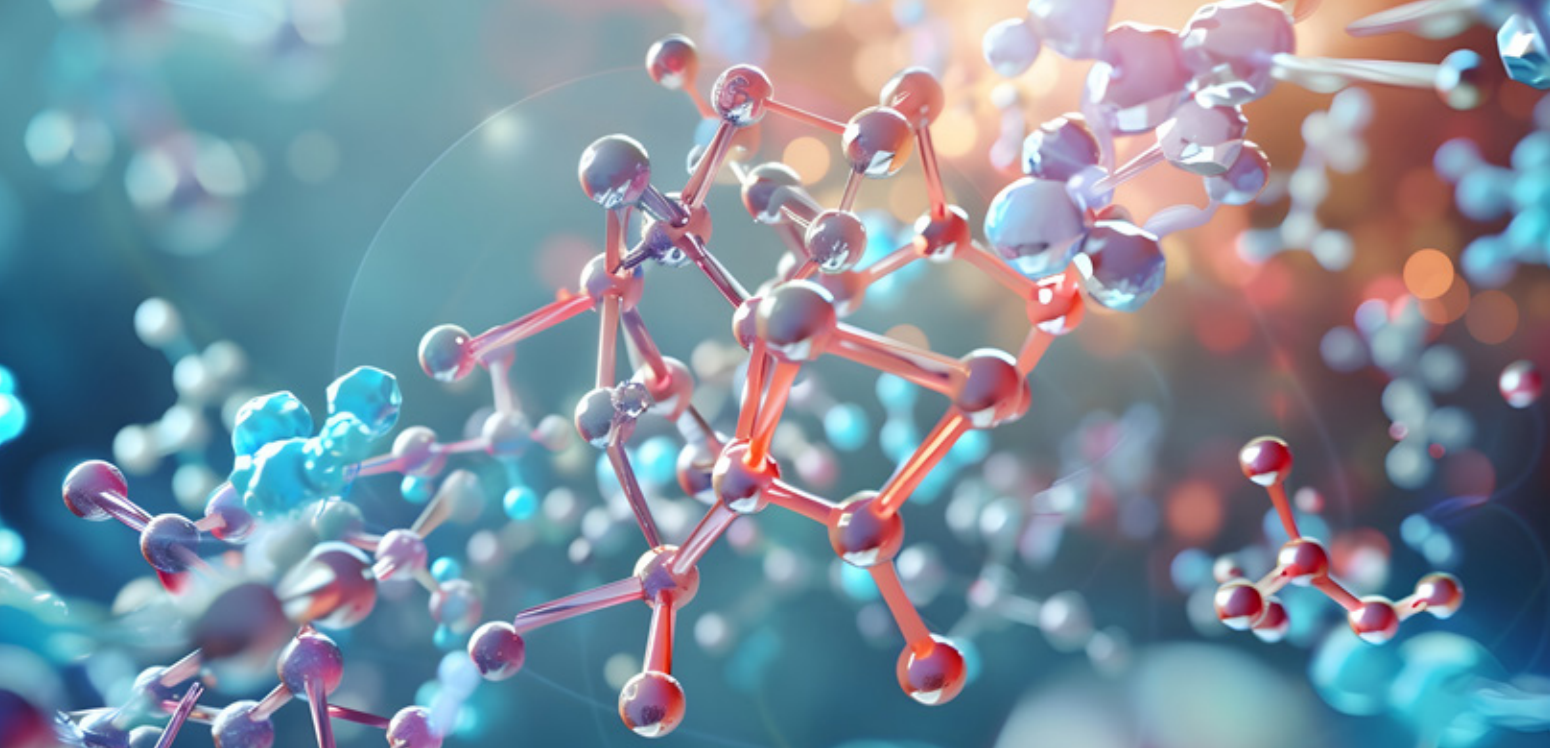
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CUSTOMIZED ADDITIVES: NEW SCIENCE AND TECHNOLOGY TRANSFORMING THE PET FOOD INDUSTRY

The pet food market is constantly seeking differentiation elements and innovations. Consumers are increasingly strict and search for products that fulfill their animal bare necessities and offer specific benefits for their health and well-being. Considering this, customized additives have gained popularity by providing pet food companies with the opportunity to create exclusive and high-competitive formulations.

By Erika Stasieniuk y Ludmila Barbi Trindade

Customized additives: competitive advantages for manufacturers

Adopting customized additives can be a competitive advantage for pet food manufacturers. **By developing them, companies can adapt their formulations to satisfy specific nutritional needs, e.g., supporting joint health, optimizing digestion, or reducing food allergies.** That can be a significant difference in a collapsed market, allowing brands to offer distinguished consumer solutions.

In addition, customized additives ensure better flexibility in formulation, which allows fast settings in response to market trends or changes in consumer demands. This adaptability is particularly valuable for companies seeking to be at the forefront of pet food innovation.

These ingredients may have a positive impact on the operational efficiency of industries. As many additives have low inclusion levels (between 0.5% and 0.05% of the

formula), there is a significant risk of weighing mistakes when managing different ingredients in small quantities; a way to reduce this risk is to combine many additives in one personalized premix to minimize errors and ensure accuracy in the formulation. It also enhances the end product consistency and increases the company's productivity by simplifying the weighing and mixing process. Moreover, centralizing additives in a personalized solution can reduce operational costs by optimizing the sales process and the ingredient storage, which is more agile and efficient.

However, it is essential to recognize the practical disadvantages of customized additives. Their development requires an initial huge investment, especially in research & development, and efficacy tests. For smaller companies, this cost can be a barrier. In addition, the dependence on specialized suppliers can increase the risk of interruptions in the supply chain, which can affect manufacturing. A sophisticated focus is required to ensure the availability of

the ingredients as necessary since running the customized additives inventory can raise logistic complexity.

Science behind customization

Additive customization is not a marketing trend. It is based on scientific research that has actual benefits for animal health. Recent research shows that probiotic and prebiotic customized mixes can significantly enhance gut health and immunity in farm animals such as swine and poultry. **These concepts have adapted to pet food nutrition, where customized additives adjust to the specific needs of different species and health conditions.**

In aquaculture, for example, antioxidant customization has shown positive effects by increasing fish resistance to oxidative stress and extending the shelf life of food. For pet food companies, these scientific principles application allow the creation of products that offer tangible benefits by differentiating their product lines in the market.

When formulating food for dogs with articular disorders, **the customization of additives, such as chondroitin and glucosamine, has demonstrated their efficiency in enhancing animal mobility and life quality.** Results highlight how science can be an ally in creating innovative and competitive products.

Choosing supplies of customized additives is crucial in efficiency and quality of pet food formulations. Experimented suppliers not only provide necessary ingredients but

also carry out detailed evaluations of different additives interactions. That is fundamental to ensure that compounds work in synergy, avoiding possible antagonisms that may compromise the expected benefits. Besides, their experience determines the optimum dose for each additive, ensuring that the end product meets the pet nutritional and health requirements without exceeding the security limits. **Partners that understand these matrices increase product effectiveness and add value to the brand,** standing it out as a company committed to science and innovation.

Innovation and differentiation through customization

Adopting customized additives means a great opportunity for pet food companies to lead the market with innovative products that meet consumer-specific demands. **By integrating science and technology into the development of customized formulations, companies improve animal health and well-being and position them as leaders in innovation.**

The future of pet food nutrition is linked to customization; companies investing in this trend will be better positioned to have a larger market share. Additive customization is not a temporary trend but a science-based strategy that has concrete results for pet food manufacturers.

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IMPROVING PRODUCT PURITY IN PET FOOD WITH MAGNETIC SEPARATORS

The food processing industry standards are consistently improving, and the pet food manufacturing industry is not exempt. Magnetic separators have played a significant role in improving product safety and purity in pet food processing, and there is a growing demand for good quality wet and dry pet food product that meets the standards and expectations of both resellers and consumers.

By **Magnattack**

More 'humanised' pet foods have become available on the market and are becoming increasingly popular among pet owners, who want the very best, healthy meal options for their beloved pets.

We have seen a change in quality control in the pet food and meat rendering industries, with a heightened focus on product purity, including metal fragment control.

These industries tend to have high levels of metal contamination in their product, as the meat and bone meal product can be very abrasive to process and tends to wear down machinery more quickly than some other product types. The contamination can originate from various stages of processing, as well as from the product itself, so it is important to install metal fragment controls such as magnetic separators or metal detectors in various locations, and in particular, the most final stage in a processing line prior to packing.

How to know where to install magnetic separators?

Choosing a location for food magnets will depend on multiple factors. For example, the amount of metal contamination within the product can play a significant role, as this can affect any existing magnets in the processing line and their ability to collect and retain the contaminants. With a high level of metal contamination, a magnet that requires manual cleaning can get overloaded and 'short out', meaning that it cannot collect and retain more contamination. Any additional metal contamination can then flow past the overloaded magnet and remain in the product.

This highlights the importance of having upstream magnetic separators to offload the final magnets in food processing lines, especially ones that have a high level of metal contamination. The importance of cleaning magnets frequently also shouldn't be overlooked and should be a crucial step in manufacturing procedures.

Another example of a reason to install magnetic separators can be to protect machinery from damage caused by certain non-ferrous or ferrous metal contamination. Depending on the product and processing line, as well as the type of contamination, there are a number of magnetic separation solutions suited for the job.

The Magnattack® Magnetic Separation range for pet food has proven to be very effective in both dry and wet product applications. Let's have a look at each magnetic separation solution and the type of product each magnet is designed for:

Magnetic Separation Examples for Dry Pet Food Products

Magnattack® manufactures a number of magnetic separators for dry pet food processing applications.

Mag-Ram® Self-Cleaning Magnet

The **Mag-Ram® Self-Cleaning Magnet** has proven to be an amazing self-cleaning permanent magnet and metal fragment control solution for dry products and incoming raw materials such as MBM, protein meal, grain, final kibble, and more.

With the ability to configure the cleaning cycle to suit tonnage rates and contamination levels, the Mag-Ram® gives operators the ability to have the magnet frequently cleaned, and automatically.

This self-cleaning magnet requires zero downtime, with no need to stop production, which is a huge benefit for processors with products high in metal contamination that cannot stop production for frequent cleaning. The rotating magnetic rams ensure minimal product build-up and blockage, and the magnet design provides excellent product stream coverage.

Not only this, but the magnetic rams can be configured to be cleaned one at a time, meaning that your product stream remains covered by the other magnetic rams!

You are truly going to want to add this self-cleaning magnetic separator to your materials handling equipment wish list!



Rapidclean® Grate Magnet in Housing

The **Rapidclean® Grate Magnet** overcomes issues associated with conventional magnetic grates, such as stainless steel sleeves, cleaning difficulties, jamming, safety issues, and more. This permanent magnet consists of open-ended magnetic bars, and once the magnetic drawer is opened, the cleaning is completed away from the product stream, using the Rapidclean® Cleaning Tool.

This grate magnet is designed for dry products, such as meals, powders, grain, and premixes.

Dual Round Nose Plate Magnet System

The **Dual Round Nose Plate Magnet System** is another industrial magnet design suited for pet food applications. This magnetic separator can be installed in applications processing chicken frames, whole muscle products, poultry, beef, lamb, venison, final meal products and more, prior to expensive processing machinery such as grinders, shredders, dicers, and emulsifiers.

In some applications, especially those with high tonnage and fast-flowing products, **fragments can be brushed off plate magnets by the oncoming product and back into the product stream. To reduce this risk, Magnattack® has developed the RE8o® Round Nose Plate Magnet.** This system features a High-Intensity RE8o® Bar Magnet at the end of a standard magnetic plate. The Separation Bar

Magnet offers protection against dislodged fragments and prevents them from re-contaminating the food product. When metal fragments are collected by the Separation Bar, they are washed safely to the underside of the magnet and out of the path of oncoming product.

With the deep field capability of the magnetic plate added to the intensive coercive force of the Separation Bar, you gain far superior control over foreign metal pieces and increased protection against contamination.

Spherical Pneumatic Transfer Magnet

The **Spherical Pneumatic Transfer Magnet** is a powerful magnet designed for high-velocity blow, vacuum, gravity, and pneumatic transfer lines. This magnetic separator suits pneumatically conveyed powders, grains, premixes, and palatant products. **The aerodynamic design of this Magnattack® system enables efficient extraction and retention of metal from high-velocity powder lines, without experiencing bulk density problems.**

The Spherical Magnet is considered a more hygienic, powerful and superior alternative to traditional bullet-style and cartridge-style magnets.

Magnetic Separator for Wet Pet Food Products

Emulsion & Slurry Pipeline Separator

The **Emulsion & Slurry Pipeline Separator** is an inline liquid magnet that is ideal for viscous liquid applications including meat emulsions, meat slurries, and more.

It is often difficult to extract weakly magnetic fragments from viscous meat emulsions, slurries, and liquids. In answer to this problem, Magnattack® has developed a special hydro-dynamic magnet system specifically for this purpose. The units are an efficient and sanitary alternative to Liquid Trap/Finger Pot Magnets, which can also be heavy and difficult to clean properly. This mince separator excels in these applications as it features our patented RE8o®HT Acutex® Probe Magnets, which provide superior product-to-magnet contact and more efficient magnetic separation.

The lachrymiform (or “tear drop”) shape of the Acutex® Probe Magnets allow for very smooth transition of viscous products to move around the magnet with minimum resistance to flow. Maximum product to magnet coverage is achieved without causing leaks, blockages, and pressure problems.

The peak (or V-section) of the probe is faced towards the oncoming product stream, ensuring that collected magnetic fragments are washed to the back of the probe and safely retained until cleaning operations are underway. **This feature greatly reduces the risk of recontamination caused by the impact of the product flow dislodging the collected fragments and reintroducing them back into the product stream.**

We’re here to help! **Contact Magnattack® for a consultation**, or **book in a risk assessment** to determine potential gaps in your foreign metal controls.

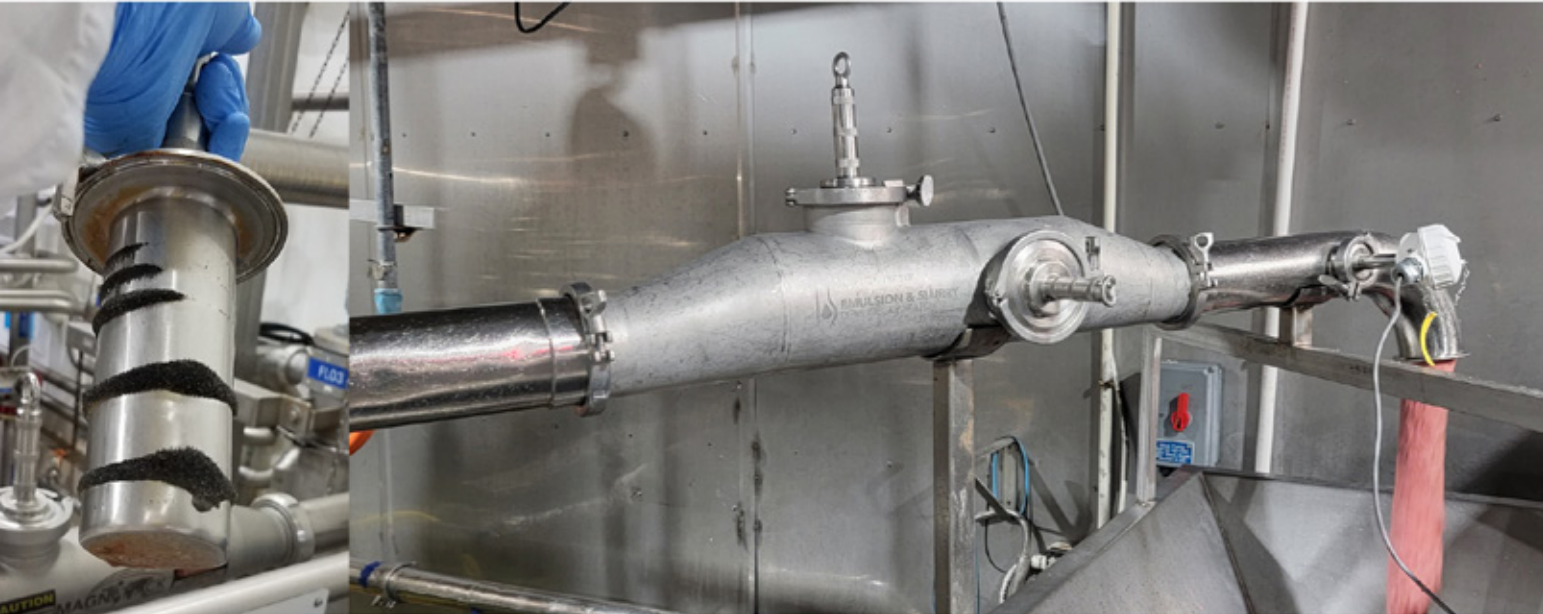


Magnetic separation solutions for foreign metal fragment control

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HIGH-LEVEL NUTRITION: THE REVOLUTION IN PET HEALTH

Today, more than ever, consumers consider pets as family members, deserving a nutritional quality comparable to that of humans. According to Euromonitor, 66% of pet owners believe that proper nutrition can increase the quality of life of their pets.

By [Kemin Nutrisurance](#)

In this context, science and technology have played a fundamental role in developing pet food that not only meets basic nutritional needs, but also promotes long-term health. The evolution of pet food processing and formulation technologies has enabled the creation of increasingly personalized diets for pets, meeting the specific demands of different breeds, ages, and health conditions. Through specialized proteins, probiotics, and functional ingredients, **Kemin ensures that its products provide enhanced**

nutrition and immune support, which not only contributes to the animal's current health but also helps prevent potential issues in the years to come.

One of Kemin's goals is to bring innovations and drive the market to constantly evolve. Our Research & Development team focuses on creating practical and effective solutions for the pet food industry. We offer a wide range of products that, carefully formulated, contribute to the success and quality of

the food. Each solution is developed to add value, ensuring that our partners are always a step ahead in an increasingly competitive market.

Thus, technological innovation becomes the main driver behind the continuous development of our solutions and services. It is not just about offering high-quality items; Kemin is constantly refining processes to ensure that our clients receive the most advanced products. This commitment to delivery and customer satisfaction is made possible through the services we provide: the Kemin Application Service (KAS), for example, is designed to integrate the latest technologies, enabling efficient implementation. Our specialists in pet food and rendering are constantly monitoring and updating application methods to ensure precise execution, guaranteeing maximum performance. Each strategy and plan are meticulously crafted to meet the specific needs of each client, making it possible to offer the highest quality equipment and service.

Additionally, our Customer Laboratory Services (CLS) are constantly evolving, incorporating advancements that ensure faster and more accurate analyses. This allows clients to obtain reliable and personalized results, essential for safe

and informed decision-making. **With the expertise of the Technical Service Managers (TSMs), we ensure that cutting-edge technical knowledge is always available to assist with any challenge, offering support that goes beyond the conventional.**

Kemin's Research and Exploratory Services (RES) marks a significant advancement in our ability to innovate. Utilizing the latest research tools and techniques, we are exploring new frontiers and developing solutions that anticipate market needs. This proactive approach allows us not only to keep up with trends but to lead the way, ensuring we are always ahead in delivering products and services that exceed expectations.

The future of pet food is directly tied to the ability to innovate and adapt to new scientific discoveries and emerging technologies. With its customer-centric approach, Kemin is ready to lead this path, offering solutions that promote pet health and well-being in a sustainable and efficient manner. In doing so, **Kemin not only strengthens its commitment to excellence but also reaffirms its role as an indispensable partner for all those seeking the best in animal nutrition.**



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THE INTERVIEW

MAXIMILIAN FURLEY

VICE PRESIDENT AT PREMIER TECH FOR LATAM

Maximilian Furley started his career at Premier Tech in August 2022 as Vice President for LATAM. Rather after the pandemic demonstrated better control worldwide, Premier Tech decided to push on a quick expanding business in the whole LATAM.

Understanding the “new” consumer demand that was booming and changing after the pandemic, Premier Tech was in the field, listening to its customer voices, and was committed to making it a reality.

Through strategic adjustments in sales coverage, operations, and service support, Premier Tech LATAM has become one of the fastest-growing regions globally. Since 2022, they have seen remarkable growth, with 2023 marking their best year since establishing their first manufacturing facility in Brazil in 2015, followed by Mexico in 2017.

How does Premier Tech incorporate sustainability into its technological advancements and business practices?

Premier Tech is committed to continuously advancing sustainability, embedding it into every facet of our operations. From developing energy-efficient technologies to utilizing recyclable materials and minimizing waste, we design solutions that not only boost productivity but also reduce environmental impact. By supporting a circular economy and extending the lifespan of our products, we are dedicated to building sustainable processes that contribute to a greener future. **Our commitment is reflected in both our technological innovations and environmental preservation initiatives, as we strive to make progress every day.**

What roles do innovation and research play in maintaining Premier Tech’s competitive edge in the technology industry?

Research and innovation are at the heart of Premier Tech’s strategy. **The company operates advanced laboratories and multidisciplinary teams dedicated to developing new technologies that enable greater automation, precision, and sustainability in industrial processes.** By continuously focusing on R&D, Premier Tech stays ahead of market trends such as digitalization and Industry 4.0, offering solutions that not only enhance efficiency but also create long-term value for our clients, while remaining committed to environmental sustainability, keeping Premier Tech at the forefront of the global technology industry.

How do you see technology developing in the pet food industry?

The pet food industry is transforming significantly, with a growing demand for wet and highly customized products. Premier Tech, attuned to these changes, is already developing end-of-line equipment specifically to meet the rising demand for wet products, offering solutions that ensure flexibility and efficiency in packaging processes. Additionally, with a focus on comprehensive customer service, the company invests in technologies that enhance quality, sustainability, and process automation, keeping Premier Tech at the forefront of innovation in the sector.

What are the most significant challenges for the company these days?

One of the biggest challenges faced by the industry is balancing the need to handle a wide variety of SKUs while maintaining operational efficiency. Although some solutions offer flexibility to manage this diversity, they do not always guarantee the continuous efficiency of production lines, which can lead to higher maintenance and operational costs in the long run. At Premier Tech, our focus is on providing robust and reliable equipment that ensures maximum productivity, regardless of the SKU complexity. We are committed to helping our clients keep their operations efficient and competitive, backed by a strong after-sales support system dedicated to their production success.

From your experience, what do you think will be the biggest challenge for the whole industry in the coming years?

The biggest challenge will be adapting to emerging technologies while staying sustainable. The rapid digital transformation, driven by automation, artificial intelligence, and data-driven solutions, is reshaping the future of industries. As companies embrace these advancements, they are also under increasing pressure to adopt more sustainable practices and reduce their environmental impact. Achieving this will require significant investments in innovation and a comprehensive restructuring of industrial operations. Balancing technological innovation, sustainability, and operational efficiency will be a key challenge in the coming years.

What is the company currently working on for the near future?

Premier Tech is constantly investing in innovations that enable greater automation, flexibility, and efficiency. **The company is developing new equipment that responds to emerging market demands, such as technologies that support sustainable packaging and more agile production lines.** Premier Tech is also integrating AI, connected machines, and robotic solutions into its portfolio, driving even greater advancements in automation and smart manufacturing.

Additionally, Premier Tech Systems and Automation has recently launched a new training offering designed to help clients enhance the performance and profitability of their Chronos™ equipment. This training program is part of the company’s exploration of innovation, combining both new and existing training modules into a unique commercial offer that provides comprehensive support for clients. These new commercial offers reflect Premier Tech’s commitment to value creation, focusing on both tangible and intangible aspects, and reinforcing the foundation of its innovation approach.



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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 digests.



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A MEETING AN EXPERIENCE

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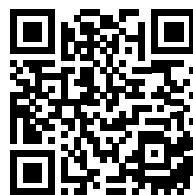
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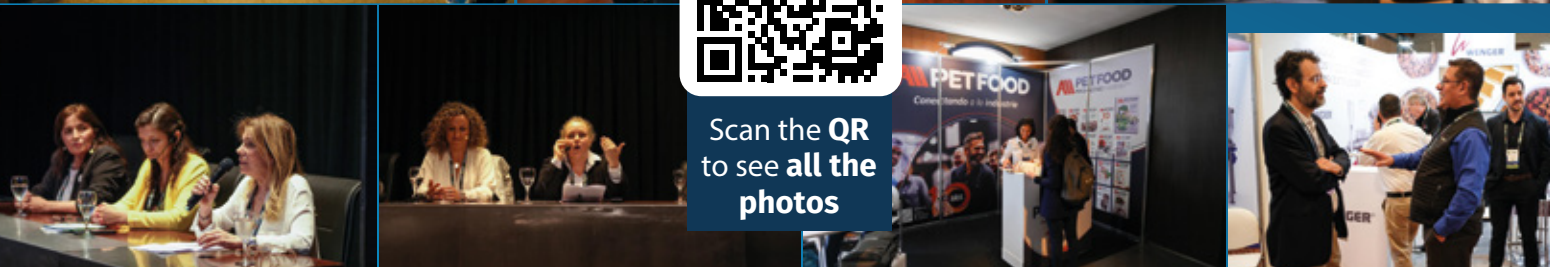
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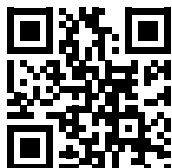
In this All Pet Food Magazine section we highlight the latest innovations to optimize pet food production. Let's take a look at the solutions proposed by different supplier and market leader companies.



DETERMINATION OF VOLATILE COMPOUNDS AS MARKERS OF LIPID OXIDATION IN ANIMAL FEED USING SPME-GC-MS

The aldehydes hexanal and 2,4-decadienal are volatile compounds that play a crucial role in the pet food industry, especially regarding the palatability and product freshness. These compounds are indicators of lipid oxidation, a process that can negatively affect the flavor and scent aroma of foods. The measurement and control of these compounds are essential to guarantee that foods keep their quality over time, and this is why **INNOCON** has implemented and validated an analytical process using **Solid Phase Micro Extraction (SPME)** along with **Gas Chromatography-Mass Spectrometry (GC-MS)** for their quantification pet food oily and extruded matrices, being the only ones in Chile with this technique.

<http://www.setop.com/>



JRS - VITACEL® PSYLLIUM P95T

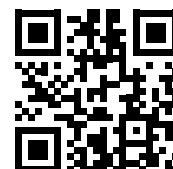
VITACEL® Psyllium P95T, derived from *Plantago ovata* seeds, offers numerous benefits in pet nutrition. As a soluble but non-fermentable fiber, it helps regulate bowel movements by absorbing water and forming a gel-like substance in the gut, making it effective for managing both constipation and diarrhea, as well as supporting the hairball control.

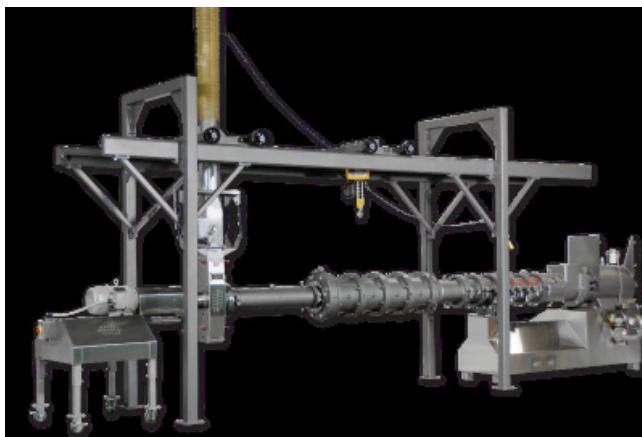
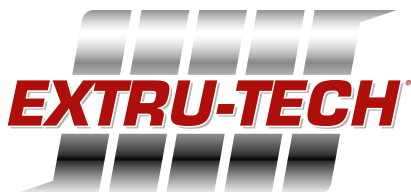
Psyllium also acts as a prebiotic, promoting the growth of beneficial gut bacteria, improving digestion and nutrient absorption. Its high fiber content contributes to weight management by increasing satiety, making it valuable for overweight pets.

VITACEL® Psyllium P95T, a food-grade psyllium powder with high purity, enhances the texture and processing of pet foods and snacks, benefiting both pets and manufacturers.

Incorporating psyllium into pet diets supports digestive health, hairball control, weight control, and overall well-being, making it an essential component of holistic pet nutrition.

<http://www.jrspetfood.com/>





EXTRU-TECH'S MULTI-COLOR MULTI-SHAPE SYSTEM

Extru-Tech sought to make single-screw cooking extrusion systems more flexible for the pet food industry. One example of this is to produce dry-expanded multi-colored pet food in one extruder. Traditionally, pet food manufacturers seeking to produce a multi-colored mix have used one of two approaches:

- **Multiple extruders simultaneously**—one for each color and shape—and then combine the kibbles from the different extruders together into a mix. This requires a huge capital investment in machinery and high operating costs.
- **One extruder to make various batches** with a different color/shape run in each batch. Each run is set aside until all production is complete, and then mixed to create a multi-color, multi-shape mix.

This resulted in Extru-Tech designing and releasing the **Multi-Color Multi-Shape (MCMS)** system for the **E750 extrusion line**, with a capacity of 2,000 to 8,000 kg/h of pet food. Later, Extru-Tech made available the **MCMS** for the **E525** line, that can handle volumes of 800 to 3,400 kg/h of pet food.

The **MCMS** system allows the creation of up to four shapes and colors during a single batch on a single extruder. The **MCMS** System is also now being used to make Marbled products, two-color kibbles and Soft Moist Treats, widening the versatility and flexibility when making pet food products.

The **MCMS** system makes operation simpler for the producer and lowers capital and operational expenses than a multi-extruder system.

www.extru-techinc.com



E-FINITY® PNEUMATIC CONVEYING SYSTEM IS DESIGNED FOR STABILITY AND RELIABILITY

Coperion's E-finity® is a patented continuous dense phase convey system for fragile materials. Precise pressure monitoring and airflow corrections allow the system to operate efficiently under all conditions, while gently inducing materials through the convey line in slug form. **E-finity®** is ideally suited for granular and pelleted materials and has proven itself on many pet food manufacturing applications.

Unique **E-finity®** air controls can employ a single air source to operate 2-3 different systems simultaneously. The result is a significant cost savings in both equipment and installation, with continued savings in operation and maintenance moving forward.

Coperion's ability to design, size, sell, fabricate, and integrate other OEM processes as well as installing and providing ongoing support delivers full control. As a primary equipment manufacturer, **Coperion** manages production schedules for faster lead times on highly engineered, custom-built systems. The end result is a predictable, efficient, and effective material handling process.

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“Contributing to a more sustainable future, with packaging solutions that improve everyday”

PLASTIANDINO S.A. is a familiar company specializing in flexible plastic packaging. With more than 50 years of experience in the market, headquartered in the district of Cuadro Nacional (San Rafael, Mendoza), the company provides services to the Argentinian market and the bordering area.



Setbacks and resilience

On May 23rd, 2023, **PLASTIANDINO** was almost destroyed by a fire, losing the entire production plant.

Since then, they implemented a contingency plan to continue serving the market, and soon after, the reconstruction of the production plant began to work.

This October, proudly and emotionally, they start producing from San Rafael again.

How it all started

In 1972, **PLASTIANDINO** began as “**Rodolfo Bianchi and Sra.**”. Initially, the factory focused on bags for business but then became an industry supplier.

In February 1977, it changed its corporate structure to be renowned as **PLASTIANDINO SA** in the market.

In the first years, the focus was on producing flexible packaging, which distinguished the company as a leader in printed heat shrink.

In November 1998, the area in which they were located became a residential area, so they moved to the actual location in Cuadro Nacional.

By 2012, Hugo, the oldest son, bought the share from his brothers, becoming the owner.

Under his leadership, he changed the company’s strategy and, from 2015 to 2016, advanced in the conversion project investment on which their business model is now based.

By 2023, **PLASTIANDINO** had 164 employees, being the referent in the Argentinian market of flexible plastic packing and packaging. With cutting-edge technology in the transformation process as well as in packaging conversion and manufacturing. It seeks to control its position in the market not only through product innovation and sustainability and the technology of its processes but also through the personalization of its management.

Research and development

BTB USER EXPERIENCE

Christian Ivanchich, General Manager of our client **RyG Sgarlata SRL**, gave his testimony about his packaging and the benefits of using those products.

*“Four years ago, a simple observation caused a great worry while we were considering the future and reality with **PLASTIANDINO**, supplier and strategic partner: ‘Current bi or three-ply metalized polyester packaging end up in the garbage without being recycled, or even have a high-cost and produced in a low percentage. Moreover, their production leaves a great carbon footprint because of the large process. What is the reason? First, this packaging was associated with premium food, but the industry adopted it in overall production to use it in any standard product. According to food conservation, is its use determining? Not really, it’s an image issue. We pollute at high levels by injecting millions of packaging into homes.’ Then the need to do something about it burned out: something tangible, low-cost, of immediate impact, and affordable for everyone.*

*The starting point was simple: to develop together a 100% recyclable packaging, made of recycled material, that maintains and cares for food properties, and premium quality in terms of image to replace metalized polyester packaging. Its development took more than two years with rights and mistakes, progress, and setbacks. By the end of 2021, we proudly achieved our aim and named the product **ECOTEC**.”*

Industry solutions

ECOTEC DEVELOPMENT – USER EXPERIENCE

The packaging that cares for the environment and animal nutrition

With the development of pet food bags with **ECOTEC** technology, the company showed a new sign of its capability to offer adaptable solutions to emerging sustainable precepts with packaging that meets all the functional, visual, and sensorial characteristics for manufacturers to get into the market with premium food in a bag that maintains and increases product characteristics.

Besides the product, the brand was developed to reach the consumer with a differential message about the packaging

and sustainability content aiming to educate a more sustainable world by offering an improved user experience in which the bag provides a QR code with information about the structure, recycling advice, and other ways to use it that also sends the end consumer to an exclusive landing page of the product.

Commitment to sustainability

A few years ago, aiming to serve world trends that require a market with even more sustainable and recyclable products, **PLASTIANDINO** committed to incorporate their mission and view: **CONTRIBUTING TO A MORE SUSTAINABLE FUTURE**. For more than ten years, aligned with this actual trend, **PLASTIANDINO** has been developing its EcoFilm portfolio, which includes the following products:

- **ECOTEC**: 100% recyclable PE bags.
- **ECOSUP**: 100% recyclable PE Doy Pack bags. Now, it will be commercialized in the following segments: solid, grains, powder, and promotional products, among others. NO liquid.
- **BLUEPACK**: Heat shrink with recyclable material content for the drink market and other segments.



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NOURISHING FLAVORS: EVOLUTION AND TRENDS

In each All Pet Food Magazine issue, we share recognized products and new launches from prominent worldwide pet food manufacturing companies.

We present innovative formulations with high-quality raw materials, in line with market trends, obtained through technological production processes, and providing benefits to both pet health and nutrition.



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Luisa Bersanetti, Exhibition Manager at Zoomark, has revealed that the 2025 event will feature new sections, covering over 68,000 square meters of exhibition space, attracting leading exhibitors and visitors from across the globe.

<https://tinyurl.com/2bd65wb6>



SCHENCK PROCESS FPM CHANGES NAME TO COPERION



The former Schenck Process Food and Performance Materials (FPM) group of companies have officially changed their name to Coperion, following the acquisition of the companies by Hillenbrand (NYSE: HI), the parent company of Coperion.

<https://tinyurl.com/2df4udnz>



THE CUSTOMER'S CHOICE OF THE CS-WP SOLUTION



KSE's groundbreaking CS-WP (Container Shuttle – Weighing Proportioning) project is a system that makes it possible to dose directly into the container within the Automatic Container Transfer concept.

<https://tinyurl.com/26887dqg>



JOSERA INTEGRATES KSE'S CUTTING-EDGE ALFRA TECHNOLOGY

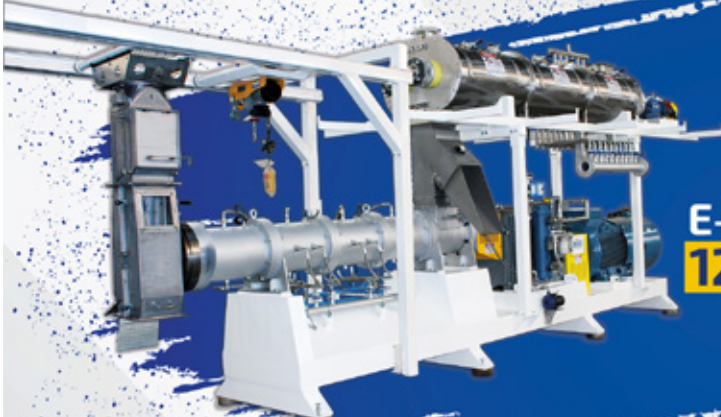


Josera, part of the ERBACHER the food family group, has successfully integrated KSE Group's advanced ALFRA machinery, including the ACT system, enhancing efficiency, precision, and sustainability in their operations.

<https://tinyurl.com/26jtyfsz>

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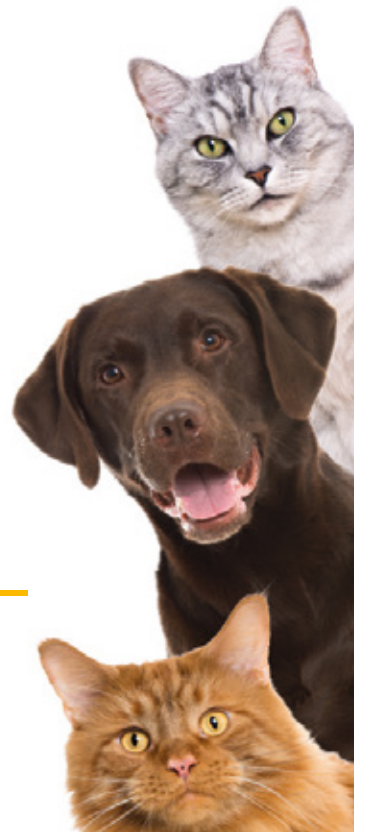
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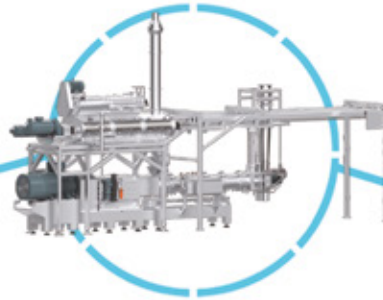
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