

CRITICAL POINTS IN THE DEVELOPMENT OF WET FOOD

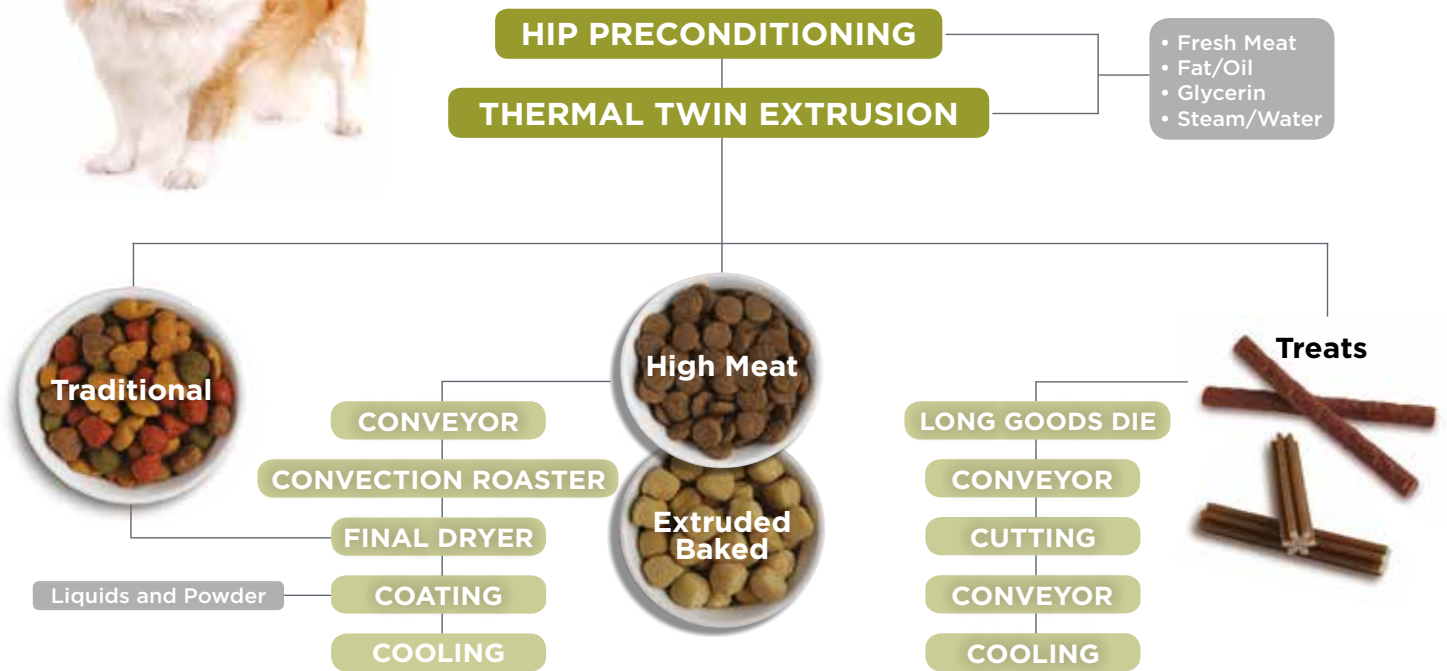
Following the humanization trends of dogs and cats, the pet food market needs to satisfy demanding customers who are looking for food that resembles, as much as possible, human food. For this reason, the moist and semi-moist foods for our best friends continue to expand.

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WHAT ARE NUTRACEUTICALS, AND WHAT IS THEIR USE IN PET FOOD?



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4- EDITORIAL

8-WHAT ARE NUTRACEUTICALS, AND WHAT IS THEIR USE IN PET FOOD?

10- SALMONELLA IN PET (& HUMAN) FOOD

12- MAIN USES OF AUTOMATION IN PET FOOD PRODUCTION DURING 2022

14- ENZYMES IN PET FOOD: USES, BENEFITS, AND CHALLENGES

20- ARE THERE ALTERNATIVES TO TITANIUM DIOXIDE?

24- HOW DOES INFLATION IMPACT PET FOOD PRODUCERS?

26- TOWARDS SUSTAINABILITY: DICHOTOMIES AND CHALLENGES IN THE PET FOOD INDUSTRY

30- TECHNOLOGY SHOWCASE

32- FACTORS THAT DETERMINE THE PURCHASE DECISION IN PET FOOD

36- CRITICAL POINTS IN THE DEVELOPMENT OF WET FOOD

38- THE IMPACT OF THE RUSSIA-UKRAINE WAR ON THE PET FOOD INDUSTRY

40- INDUSTRIAL TRANSPORT

44- WHAT IS THE MOST IMPORTANT INGREDIENT IN PET FOOD?

48- SPRAY DRIED PLASMA FOR CATS AND DOGS

49- OPEN LETTER TO FACTORY MANAGER

52-MARKET TRENDS AND THE DEVELOPMENT OF NEW PROTEIN SOURCES IN PET FOOD

56- - PET PARENTS AND THEIR PETS SHARING THE SEARCH FOR WELL-BEING

58- MARKETPLACE



EDITORIAL

We arrive at the July edition of our **All Pet Food Magazine** with mixed feelings as we're currently facing an unprecedented global crisis due to the war in Ukraine, the restrictions of the port of Shanghai due to lockdown, which has brought enormous consequences to the entire pet food industry due to the lack of raw materials, oil and many of the main commodities, not only in Latin America, but worldwide.

But not everything is disruptive. **All Pet Food** had the pleasure of attending recently the major industry events in Europe such as **Interzoo, Victam Europe and VIV Europe**, as well as two leading events in **Latin America such as FENAGRA in Brazil and the Foro de Mascotas in Guadalajara, Mexico**.

In all these events there was a great fervor for innovation, new trends & ingredients, products and what is more important, there was a great desire to meet us again, meeting old friends of the industry and networking with new companies and professionals who have burst into the world of pets with such a great impact. The common point of all these international events was the impressive growth the Pet Food Industry experienced after the COVID 19 Pandemic, growth the industry takes advantage and pave the way for a bright future.

Digging in our July edition, I invite you to enjoy new trending topics such as Nutraceuticals, the use of enzymes, as well as their benefits and applications in pet food, alternatives for titanium dioxide due to the announcements of *the European Food Safety Authority (EFSA)*, by not considering it a safe additive for animal production, the impact of inflation for pet food producers, a current hot topic, as well as the key points for the development of food wet for pets. These among other features of extreme importance to our industry in terms of ingredients, processes and applications.

I don't want to close without inviting all of our readers to **CIPAL 2022**, the Congress All Pet Food organizes with too much love for the entire Latin American Industry and with the presence of exhibitors and speakers from LATAM Region, as well as from Europe and the USA. We'll be very happy to meet you again on September 28th and 29th in Puerto Madero Argentina. Don't hesitate to register at <https://cipal.com.ar/web/registro/> to update on the latest trends in the Industry and enjoy a meeting between colleagues and friends from the Pet Food Industry.

Don't miss it!!

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WHAT ARE NUTRACEUTICALS, AND WHAT IS THEIR USE IN PET FOOD?

Traditional canned or dry food diets no longer meet the needs of pet owners. Nowadays, they want more: transparency, variety, sustainability, but, above all, more quality. During the last few years, the pet food industry has seen an increase in nutraceuticals usage in formulas. This has taken place due to the trends in animal humanization and a greater awareness of their health.

by All Pet Food

What are nutraceuticals?

The term emerged in the late 80s resulting from the contraction and union of "nutrition" and "pharmaceutical". Nutraceuticals are bioactive compounds that occur naturally or by chemical or biological synthesis. The objective of its use is to improve nutrition and, consequently, health. They can be used for both humans and animals.

As we already know, the healthcare trend is booming, so it is not surprising the increase in the demand for this component. Thus, an important aspect of pet humanization is that people are paying greater attention to safety and nutritional needs; and as this comes at a higher cost, the rise in the global middle-class population (along with higher income available) helps the industry to develop along this path.

Currently, the owners want to give their 4-legged children the most pleasant and long life possible. Apart from going to the

veterinarians, when necessary, they look for other ways to prevent disease or nutritional problems.

Thanks to advances in the pet food industry, there is scientific evidence for the beneficial effects of many nutraceutical compounds.

Types of nutraceuticals

- Although there is no official regulation about the types of nutraceuticals, they are often classified as:
- Dietary supplements: They contain nutrients derived from food and usually come in liquid, capsules, or powder form. They are regulated by the FDA, although differently from drugs.
- Functional Foods: Fortified, enriched, or improved dietary components that may reduce the risk of chronic disease and provide an additional health benefit.
- Medicinal foods: used to treat a specific disease or condition

(diagnosed by a doctor and administered under his supervision).

- General benefits attributed to the use of nutraceuticals
- Creation of specialized formulas
- Improved palatability
- Improved nutritional quality
- Improved nutrient digestibility and bioavailability
- Increased antioxidant defenses
- Improves cell proliferation, gene expression, and protection of mitochondrial integrity
- Prevention of chronic diseases
- Delayed aging
- Increased life expectancy
- Reduction of probability of contracting diabetes and renal or gastrointestinal disorders

Most popular nutraceuticals

Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)

Coming from fish oils such as salmon and anchovy, for example, they are the most used and on which the most studies have been carried out. They are used to enhance essential nutritional functions and for their beneficial effects on the immune system response. In addition, it is said that they slow down the aging process.

Vitamin cocktails

The dietary supplement with various antioxidant vitamins (C, E, L-carnitine, lipoic acid, glutathione, etc.) is considered beneficial in periods of stress for the animal such as pregnancy, lactation, exercise, aging, and obesity, among others.

The problem of nutraceuticals? Their loophole

It appears that nutraceuticals have more than one health benefit for animals; however, there is a universal problem: there is still no legal definition for them. This results in manufacturers not having specific legal indications on their use. Thus, they also do not have to prove their benefits or where they get them.

The truth is that not enough information is yet known to confirm that these compounds provide the attributed benefits, so it is impossible to define doses and mechanisms to achieve a particular result. Nowadays, the dosage nutraceuticals usage is an uncertain and empirical process.

In cases of plant extracts such as: Vaccinium Myrtillus (European blueberry), Curcuma longa (turmeric), Echinacea Angustifolia (echinacea), or Silybum marianum (milk thistle), the difficulty is twofold; they not only represent a challenge for the correct dosage but also for its standardization.

The same goes for propolis: a resinous mixture that bees collect from various botanical sources. Its composition has more than 300 identified active components, and despite being a promising nutraceutical due to benefits associated with its components such as immunomodulators, antioxidants, and antimicrobials, more research is needed on its effect on dogs and cats.

In conclusion

We know that, in 2019, North America was the segment that presented the most participation in the use of nutraceuticals for their pets. The increasing number of one-person families, the rising cost of veterinary medicine, and the late aging of the pet population are some of the principal causes that push owners to seek natural and organic preventive alternatives.

Consumers' preference for this type of product undoubtedly leads us to rethink the strategies and mechanisms we use in the pet food manufacturing process and what role nutraceuticals play in each of them.

However, consumer pressure has meant that today (and we proudly say it!), the most important thing in the pet food industry is to improve formulas. Now, we offer diets based on conscientious, scientific nutrition. That is a battle that we have all won through hard work, research, and dedication.

What do you think of these components? We invite you to share your opinion in the comments.

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SALMONELLA IN PET (& HUMAN) FOOD

Salmonella is a bacterium that has been present on various occasions in food and has generated discussions and debates about its appearance and elimination. But what is the current situation regarding it? How do companies and States position themselves to seek new solutions and alternatives?

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It is unnecessary to go very far back to understand that salmonella causes problems today. In the United States, for instance, in March 2021, the FDA confirmed that five of the major brands of dog and cat food companies had to withdraw more than 140 products from the market for possible salmonella contamination.

In the field of human food, it is also unnecessary to go beyond 2022 to find similar news: the manufacturer of the Kinder brand had to withdraw, last March, hundreds of batches of the famous chocolate egg due to the notification of more and more cases associated with salmonella.

In the US, the Centers for Disease Control and Prevention (CDC) estimates that there are about 1.35 million cases of sal-

monellosis each year, with 26,500 hospitalizations and 420 deaths. In this country, salmonellosis is the second leading cause of foodborne illness.

But what exactly causes Salmonella bacteria?
Salmonella bacteria cause salmonellosis, a foodborne illness.

Salmonellosis in dogs and cats

Salmonellosis is rare in dogs and cats; very often, they do not develop the disease but become its carriers. It means that, even if a pet does not show symptoms of illness, it can shed Salmonella bacteria in its feces and saliva and spread it throughout

Salmonellosis is rare in dogs and cats; very often, they do not develop the disease but become its carriers.

to people and other pets, such as cats with shared litter boxes or climbing on kitchen counters. In the case of dogs, the most common way of spread is through kissing and petting.

The truth is that the most prone are puppies and adult pets with pre-existing diseases and their most common symptoms are vomiting, diarrhea (with or without blood), fever, loss of appetite, and decreased activity level.

If we are saying then that those pets do not run a major risk of contracting salmonellosis throughout their lives, why is it so

How many of us caress and kiss our pets even knowing that they self-hygenize their entire body? The correlation is consistent: the pet eats food with the bacteria, the owner kisses the pet, and the owner gets salmonellosis.

important to take care of the disease spread among their food?

Ideally, every pet has an owner who cares for it, loves, feeds, and protects it. In the case where this happens, the connection is direct. How many of us caress and kiss our pets even knowing that they self-hygenize their entire body? The correlation is consistent: the pet eats food with the bacteria, the owner kisses

the pet, and the owner gets salmonellosis.

Thus, the bond between pets and humans is more than visible, not only in terms of affection but also in the importance of caring for the health of both individually and interdisciplinary collective health (family and social).

In this sense, pet food is one of the ways in which people can get the bacteria (in addition to meat and poultry products, raw fruits, and vegetables).

If, for example, contaminated pet food or utensil is handled and then the person touches their mouth, they may be accidentally ingesting the bacteria.

What foods are most likely to contain the bacteria?

While all pet foods can contain bacteria, some formats are more likely than others, such as raw ingredient foods.

Freezing and drying, for example, are two processes that reduce the chances of bacteria growth; even so, they do not kill the bacteria. It can survive several weeks in dry environments and even months in humid ones.

Pet food typically goes through processes where cooking goes through temperatures that kill organisms like Salmonella bacteria. However, if a contaminated additive (such as flavoring) is added to the food after cooking, or even if the food comes into contact with contaminated materials, it will contain the bacteria.

For the FDA, tolerance is zero.

Long before the Food and Safety Modernization Act went into effect in the US, the FDA's tolerance level for Salmonella bacteria was ZERO in pet food.

The decision was taken due to a series of cases caused in 2000 sickening people who came into contact with contaminated dry dog food which not only made them sick but also caused the death of some infected. There is no question that they should have been prevented with sound safety and sanitation practices. However, for many in the industry, the zero-tolerance level seems impossible. Why?

There are more than 2,000 serotypes of Salmonella, so the pathogen is found almost everywhere in the environment.

The challenge is that the levels that can be detected in pet food production plants are often microscopic. The question here is: when there is a positive for the bacteria, how many are there? In the latest tests, carried out several years ago, the positives indicated only cell fractions: 0.1 colony-forming units per food gram. Those who claim that "zero tolerance" is too demanding, do so by ensuring that such small amounts of bacteria are highly unlikely to cause adverse reactions in pets.

For example, in the case of dry extruded food, the most consumed type, we are talking about a humidity of around 10% with a very low water activity, which does not favor the growth of pathogens.

But here we go back to the previous question: it does not endanger most pets, but what about the humans who come into contact with that food? What happens if a child ingests, due to parental carelessness, an extruded feed with 0.1 colony-forming units of Salmonella bacteria per food gram?

The importance of pet health, the importance of people's health: two inseparable paths

The effect of increasing awareness about the care and prevention of people's health and well-being has also been transferred to pets. Today, the greater access to information results in more demanding pet owners when it comes to choosing what they provide for their pets.

Now, bearing in mind that, in the case of salmonella, those who can be most affected by the bacteria are humans (and to a much lesser extent, pets), what is the responsibility of the pet food industry when are even microscopic levels of the pathogen allowed in human food?

If there is no doubt about something, that's that the relationship between food for pets and humans is becoming closer; therefore, taking care of the safety of our food should not only seek to protect pets but also all the people who have contact with them.



MAIN USES OF AUTOMATION IN PET FOOD PRODUCTION IN 2022

Pet food production is a complex and meticulous process, and errors can occur in all instances. If they are not detected in time, defective batches can occur which, in addition to wasting time and money, can seriously affect the company's image.

By All Pet Food

Precisely, detecting errors at an early stage is where process automation shines.

- Automation can bring great improvements and benefits in tasks such as:
- Exact dosage of multiple additives (dry or wet)
- Optimum control of the overall operation
- Product moisture control for more profitable production
- Reduction of waste products during startup and shutdown
- Quick and dynamic formula change for more flexible production

Advances in the automation of the pet food production process

Time optimization

Current automation allows the creation of considerably more efficient processes of instances such as filling, weighing, unloading, and mixing.

Process time optimization may require a substantial initial investment, but the potential for short- and medium-term profitability gains is even more significant. It's mathematical: working more efficiently allows us to produce more in less time.

In general terms, we can say that the most important thing is to improve the instance of processing time of the bottleneck, to meet the time of the upstream or downstream processes, and even improve them.

Scale system improvements

The weighing instance can be faster without sacrificing accuracy, but how? Finding the right scale and weighing strategy! For example, with a continuous mass flow weighing system, ingredients can be accurately measured without pausing the process. Or, if conveyors are used due to height restrictions, materials can be weighed and measured simultaneously with the movement.

Finding the correct scale and weighing strategy can help dramatically improve efficiency while reducing product defects. In many cases, it is even possible to weigh ingredients without introducing an additional step.

Automation of microingredients

The manual addition of small quantities of ingredients is a temporary solution that can become, without our realizing it, a permanent part of the food production. Additionally, it is also an inefficient and inaccurate technique that can result in errors, defective products, and workplace hazards and can even make batch tracking difficult and formula tampering. Automating this task of the production process ensures uniformity and eliminates possible delays and dangers that manual addition entails.

Since this automation would measure ingredients accurately, the formula doesn't rely on hand-added spoonfuls, and therefore there is less room for error and waste.

Reprogrammable controls

When mixing times change, microingredients are added, or processes change, the computer monitors and track those changes. This means, in many cases, rewriting the logic using the manufacturer's proprietary code, which requires a specialized technician.

Instead, with a programmable logic controller (or programmable logic controller), with a user-friendly interface.

Big Bag unloader

Using a Big Bag Discharger instead of individual bags allows for lower packaging and material costs while improving efficiency and reducing workplace hazards.

This automation can help save time and money significantly and is quite simple. Implementing it requires a safe and resistant unloader to facilitate the dispensing of ingredients.

Connection between data

The limit of automation platforms is given by the information collected and analyzed, which means that the more sensors there are at critical points, the smarter a system can be.

Today, processors can accumulate facts and data in almost every area of the production process. Combining such data in an external analysis system provides us with valuable and powerful information to make better decisions. Data analysis gives us the power to decide in real-time based on real data.

In general terms, the main benefits of automating production may be particular to the pet food market. However, they are mostly shared by various industries:

- Improve accuracy
- Optimize repeatable processes
- Increase productivity
- Facilitate scalability
- Reduce waste
- Reduce human error
- Improve security
- Processing and consistency of product quality

The conclusion is simple: there is no question that automation is bringing significant changes to the pet food industry. Technological advances are helping to integrate different systems, tasks, operations, and processes more efficiently, precisely, and profitably today, both in the short and medium term.



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ENZYMES IN PET FOOD: USES, BENEFITS, AND CHALLENGES

Enzymes are found in all living cells and are involved in catalyzing chemical processes that convert nutrients into energy and new tissue. That is, they participate in the efficient absorption of nutrients. They do this by binding to substrates in the food and breaking them down into smaller compounds. These, in many cases, are considered an alternative to antibiotics and are especially preferred to increase feed digestibility.

By All Pet Food

A report by Verified Market Research estimates that the value of the global market for enzymes was 1,300 million dollars in 2020 and will reach 2,410 million dollars in 2028, with a growth of 8%.

The pathway of enzymes in animal feed

Enzymes were first used in feed more than a decade ago. At that time, its acceptance was limited to phytase applications to reduce phosphorus excretion.

Today, the increased understanding of enzyme usage in feed comes with the market demand for high-quality protein for pets. Likewise, the increase in the animal and human populations, which share many raw materials, highlights the need to produce more in

Today, the increased understanding of enzyme usage in feed comes with the market demand for high-quality protein for pets.

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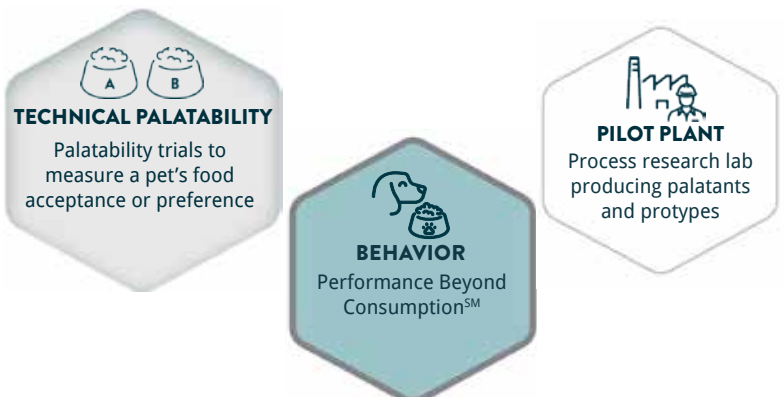
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less time. Then, producers must maximize production times to meet increased protein requirements, including maximizing feed utilization.

The growing demand for better quality pet food products, and the increased awareness of animal care and health, are driving the development of the feed enzymes market in the coming years.

Types of enzymes used

Commercially available enzymes can derive from plants, animals, and microorganisms.

One of the applied methods to increase nutrient absorption is to increase feed digestibility, and enzymes are one of the widely used feed additives for this purpose.

Those that currently stand out as additives are:

1. Proteases: These are preferred in young animals to increase the rate of digestion and absorption of plant proteins.
2. Carbohydrates: This allows animals to benefit more from energy by breaking down carbohydrates in grains used as feedstocks (such as barley, oats, and corn).
3. Lipases: They carry out the hydrolysis of fats.
4. Phytases: Increase the availability of vegetable phosphorus.

Benefits of enzymes in animal feed

The functions of enzyme additives in the feed market are essential to increase the digestibility of nutrients in animals. In fact, it's even more important in cases in which the nutrients cannot be digested for different reasons. This implies, first of all, a better capacity of the animal to benefit from what they consume.

Some specific benefits are:

- Intestinal viscosity reduction is due to a greater polysaccharides' decomposition from the cell wall of cereals.
- Higher values of digestibility and metabolic energy of food.
- Greater absorption of nutrients.
- Higher live weight gain with lower feed intake.
- Better phosphorus digestibility and lower level of it in the feces.
- In addition, enzymes are especially important for elderly pets or those with chronic conditions, such as exocrine pancreatic insufficiency, small intestinal bacterial overgrowth, or chronic pancreatitis.

Likewise, it is necessary to clarify that, since enzymes improve the digestibility of plant-based feed ingredients, they offer economic benefits for animal production. Enzymes have enabled animal feed producers to improve their feed conversion rates, the uniformity of their herds, and the efficiency of their feed mills. As a result, savings in feed costs and livestock overhead as a positive impact on pet food costs are achieved.

Main challenges of using enzymes

Financing for R&D

One of the main challenges today in increasing the use of enzymes is/ are? High investments in R&D are needed to advance with the research and development of enzymes for use in high-quality feed at competitive prices worldwide. For example, laboratories require greater infrastructure strength to use molecular techniques, such as metagenomics and genomics.

The right dose

Enzymes should be added in carefully measured amounts to formulas, considering the type of animal each feed is prepared for. It is also important to have a clear idea of the potency of the enzyme and what is the appropriate dilution for each one. The metering and mixing system for enzyme and carrier must be highly accurate and regularly calibrated, to ensure food safety.

Heat resistance

Enzymes added to the feed prior to pelleting must be heat stable or capable of losing some potency without losing their overall effect. Most enzymes will start breaking down when exposed to temperatures above 150^o C, which is a problem because high temperatures are required to kill bacteria. To solve this, the enzyme needs protection from the heating process, applied in amounts where the heat does not completely destroy it, applied after the heat process, or a heat-stable enzyme used.

Granulation resistance

Feed batches require optimum levels of moisture and density to retain their shape. If dry enzymes added to the mix reduce the moisture content beyond a certain level, product loss and waste can result. This problem could be solved with careful tests, gentler treatment of the granules, or through the use of enzyme applications for animal feed, after the granulation process, for example.

By way of conclusion, we can affirm that research on the different methods of enzyme production assures their benefits and epigenetic effects, for example, on the formation and development of the intestine and the interaction with the microbiota and intestinal health, as well as their direct or indirect action on the immune system.

If dry enzymes added to the mix reduce the moisture content beyond a certain level, product loss and waste can result.

As the research of these components moves along, we will be able to implement them more and more and revolutionize the animal nutrition industry.

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ARE THERE ALTERNATIVES TO TITANIUM DIOXIDE?

In 2021, the first announcements of the European Food Safety Authority (EFSA) came out stating that white pigment titanium dioxide was no longer considered a safe additive for animal feed.

By All Pet Food

Since then, the search to find a natural substitute for titanium dioxide has become very relevant, both in laboratories, companies and even at industry fairs and events.

But what, so far, are the alternatives to titanium dioxide as a pet food bleach?

The company Mintel carried out a study that found that the launches of new products with titanium dioxide began to decrease as early as 2019, even in the candy and snack market sector, the main users of this ingredient. This began with the suspicion that, sooner rather than later, this ingredient would be banned or at least discouraged in Europe (and it was).

Titanium dioxide is used, in most cases, as a whitening and opacifying agent to achieve uniform materials that allow colors

to be added or altered. Mixing different proteins, grains, and vegetables in pet food base formulations often creates an unpleasant and uneven color, resulting in color inconsistencies in the final product. The bleaching agent is used for merely aesthetic reasons, where the products are intended to be more uniform, more attractive, and, therefore, more inviting to consumption.

The truth is that, nowadays, color (and everything visual, really) is an important differentiator when making a purchase decision: color, in the case of food, is usually associated with concepts such as fresh, healthy, wholesome, poor quality, as is the case with green for vegetables, red and brown for protein, or orange for squash and sweet potatoes. For example, a 2019 study by Sensient found that brightly colored food is up to 5 times more likely to be chosen than dull brown food.

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the EFSA concluded that the recurrent genotoxicity problems after the ingestion of titanium dioxide particles, determined in the latest studies, are important enough to restrict its use in pet food

However, and despite the benefits it may provide to the superficiality of the aesthetic, the EFSA concluded that the recurrent genotoxicity problems after the ingestion of titanium dioxide particles, determined in the latest studies, are important enough to restrict its use in pet food. And,

although through oral intake, the absorption of titanium dioxide particles is low, they accumulate in the body. Thus, even though the evidence of toxic effects is not yet conclusive, we can't say that titanium dioxide Titanium is a safe component, free of side effects for animal consumption.

Alternatives to titanium dioxide

When we think of colors associated with pet food, orange, red, terracotta, and bright yellows come to mind... But none of them could exist without "the other color", the white resulting from the use of carbon dioxide titanium.

This ingredient is not limited only to the pet food industry but has been used in toothpaste formulas, sauces that must have a dairy appearance, or canned food.

What are the options for titanium dioxide today?

Starch-based options

The starch-based options with the biggest presence are rice or corn; they can be used as opaque agents in certain cases, such as soups and sauces to achieve a "creamy" look or to create opaque confections. Those who have tried it affirm that the effect is not the same as that achieved with titanium dioxide, but it is similar.

Rice starch

Another alternative is rice starch. Its pros: it is cheap and achieves a similar effect. Cons: It can retain more moisture and thicken, making it useless for working in large quantities. Those who produce and promote it claim that it is especially suitable for smooth, white, and shiny finishes (because of its small particles).

Small grain native cereal starch

Native wheat starch is another option to deal with the new regulations. It is an alternative that achieves the same effects as

titanium dioxide, while it's a natural and renewable raw material. This type of starch is dispersible, fluid, with a neutral flavor, and digestible. Each starch granule is less than 10 µm, so it includes ten-more-time particles than conventional corn or wheat starch in the same volume.

Calcium carbonate

Calcium carbonate is a natural, bright white, microcrystalline mineral. In addition to its whitening properties, it provides calcium and strengthens the bone system. However, in specific cases, calcium carbonate can affect the consistency and texture of the final product. Also, its use with pHs below around 3.0 is not advised. Another drawback is that its particle size is much larger than titanium dioxide, and its chemical structure makes it less effective at reflecting light.

Although not the same as titanium dioxide, it is a successful choice for uses as a white coating on candies and a clouding agent in sauces and soups. Calcium carbonate is allowed as a food colorant in the EU, US, Australia, and New Zealand.

Conclusion

While the ban on titanium dioxide only relates to Europe, for now, all markets need to start researching and looking for alternatives to a product that is discouraged due to potentially significant side effects.

Thus, if we add to this the growing demand from customers and consumers to have more natural ingredients in their pet food, the popularity of new ingredients such as rice starch, for example, will only grow. Other suppliers are already encouraged to combine starches with minerals to optimize the functionality of this component.


According to Commission Regulation (EU), 2022/63, foods and beverages containing titanium dioxide can be marketed until August 7, 2022, and can remain on the market until their expiration date. After August 7, the additive will no longer be allowed in EU food manufacturing or imports to the European market.

Considering the market news, there is no doubt that, in Latin America, we must start moving towards a pet food industry free of titanium dioxide and look for alternatives that are just as profitable and effective, but safer and more natural.

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HOW DOES INFLATION IMPACT PET FOOD PRODUCERS?



In the current inflationary situation, no category seems to be spared from pressures to increase their prices. Since pet food can be considered irreplaceable products, we must question what the prospects are for the industry in this environment. Particularly, the position in which food manufacturers find themselves in the face of rising global inflation.

By: Iván Franco

Among the most relevant questions are, what is the net effect of current pet food inflation on manufacturers' profits? Are producers likely to benefit from price increases? And finally, are manufacturers made better off or worse off by rising inflation?

It would be complex to generalize a single answer for all companies, since the situation of each producer is different. Therefore, we must analyze each case using the following premises.

Raw material costs are the key

First of all, it is important to clarify that when consumer price increases originate from production cost pressures, the manufacturer is only compensating for a reduction in profits.

In this sense, each manufacturer has a variable cost structure, as well as different sources of supply of materials and a certain market power. With these three elements we can know who loses and who can win with inflation.

Although it is true that each manufacturer has different costs, these do not vary significantly, since the ingredients and raw materials are basic products subject to global prices. Small differences in each manufacturer's sourcing costs and market bargaining power are likely to make a difference to their short-term pricing strategies.

For example, raw materials represent 60% to 80% of a pet food producer's operating costs. The 20% gap represents how flexible a producer can be in an environment of rising production costs. In other words, while the producer depends less on raw materials, the more flexibility he has to play with his cost structure.

On the other hand, it is important to point out that various pet food manufacturers are self-sufficient in supplies, since they are also the owners of the raw material. This represents an advantage over other producers who source elsewhere at market prices.

According to a Triplethree International report, under normal economic conditions, a profitability scenario for pet food manufacturers would be between 45% and 55% of gross profit, and between 30 and 40% of profit margin before interest, taxes, depreciation and amortization (what is known in English as EBITDA, for its acronym in English).

These proportions are much higher than other consumption categories, for example, cattle feed, where profits are significantly lower. This explains why countless animal food producers enter the pet food business, as the profit margins are attractive.

Inflation is changing industry profits

The truth is that pet food and general inflation are reshaping the pet food industry's usual profits.

For example: let's say that in a certain market the inflation faced by pet food producers reaches 10% in the year 2022. In this sense, the usual profits will tend to fall in a greater proportion, since other indirect expenses will also grow, product of inflation. general. Therefore, the profitability scenario that we mentioned above, between 30% and 40% of gross profit, could be seriously diminished, forcing less efficient producers to withdraw from the market, or at least to carry out cost reengineering strategies.

Finally, it is important to note that price adjustments in pet food are necessary to keep the business running, and more importantly, to maintain attractive profit margins for the industry and encourage investment in the sector.

Source: Triplethree International



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TOWARDS SUSTAINABILITY: DICHOTOMIES AND CHALLENGES IN THE PET FOOD INDUSTRY

In our industry, there is a truth that, at this point, is impossible to ignore: current trends conflict with where to go in search of greater sustainability in the pet food production system.

There is no doubt that sustainability has become both a buzzword, a necessity, and an inevitable social change. Like everything that is here to stay, trends arise that conflict with each other, as well as with traditional models.

By All Pet Food

What do we talk about when we talk about sustainability?

We speak of sustainable practices when the needs of the present are fulfilled without compromising the ability of future generations to meet their own.

Sustainability has a great objective: to guarantee a better life quality for all in a way that can be sustained in the long term. If we expand the concept of sustainability, we find that it is not only about caring for the environment: it also refers to social equity creation and long-term profitability increase. Based on these two concepts, a sustainable product will never become such if, at least, it does not achieve social equity or have growing profitability in the long term.

“A sustainable food system provides healthy food to meet current food needs while maintaining healthy ecosystems

that can also provide food for future generations, with a minimal negative impact on the environment.” APHA Definitio.

Sustainability is a shared goal

We cannot talk about sustainability without being aware that our industry is interdependent with many others simultaneously. Therefore, we cannot talk about sustainability without considering the ecosystem around the pet food industry. If we want to create a more sustainable industry, we must think about ecological, social, and economic aspects that not only impact us but the entire food system in general. The interdependence is endless: from sourcing and choice of ingredients, through marketing, packaging, and distribution, to carbon and water footprints, which vary greatly between plant- and animal-based ingredients, production strategy, and geographic location. To speak of a “sustainable” production process, we must measure several factors, such as: land use, waste management, green-



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house gas emissions, and biological diversity. That is because it is not only a matter of measuring how much plastic waste we cause but also of evaluating the real environmental impact of all the life stages of our products in terms of global warming, eutrophication, acidification, photochemical smog, and land use, among others. This situation can be seen at the local, national, regional, and international levels. Furthermore, if sustainability advocates for social equity, it also considers promoting local production and distribution infrastructures, the affordability and accessibility of food for those who need it, and the protection of farmers and other workers, consumers, and communities involved in the system.

Thus, as the industry uses by-products of human food production, it is intimately related to livestock production and the human food system. That is a challenge in itself: while we are already involved in the sustainability of systems using what for others is a waste, we face pet owners increasingly demanding cleaner and more transparent labels. And from the logic and (lack) of knowledge that most of them have, in terms of nutritional quality, the by-products or waste of food production for humans are synonymous with poor quality.

The core concept: nutritional sustainability

Applying these concepts to pet food production, we seek an industry with nutritional sustainability in which we are able to provide enough energy and essential to maintain the good health of the animal population without compromising the ability of future generations to meet their own nutritional needs.

And yes, a component of the sustainability of a food system must essentially be its ability to provide adequate and safe nutrition to its end users. But is that all? Of course not. As part of it, food can affect health not only because of its nutrient content and the amount consumed but also because of non-nutritive components, such as pesticides, fertilizers, preservatives, heavy metals, and microbiological contaminants. Indeed, many food systems may be nutritionally sustainable, yet the ecological, social, and economic aspects of sustainability need to balance to support comprehensive sustainability.

To be clear: The current global food system is nutritionally unsustainable... for many reasons

In developed countries, excessive consumption of highly processed and inexpensive foods high in sugar, saturated fat, and sodium has been a key contributor to the epidemic of obesity and obesity-associated diseases in humans. In contrast, the unavailability of affordable, nutrient-rich food in developing countries keeps contributing to hunger and malnutrition. In the near future, and if we continue down this path, this condition will only worsen as more crops such as corn, wheat, sugar cane, and palm oil (among others) are used for ethanol production or biodiesel and compete directly with food production. Furthermore, if we consider that most countries with the highest population growth are underdeveloped with poor economies, political instability, or inadequate agricultural land, what we can predict is not exactly... encouraging.

The important thing is: what are we doing?

Upcycling

This is a new word for something that, in the industry, we have been doing for a long, long time. It consists of using waste

from human food production that would otherwise have been wasted; we are talking about meat by-products and vegetables with non-standard shapes.

- We are exploring new alternatives as protein sources such as insects, peas, or algae.
- We are looking for alternatives to potentially harmful micro-ingredients like titanium dioxide.
- We are evaluating the incorporation of new supplements such as prebiotics, postbiotics for pets, apple cider vinegar, or nutraceuticals.

Packaging

Once pet food is produced, we face packaging dichotomies. Pet owners want containers with low environmental impact yet beautiful, colorful, practical, and convenient: resealable or single-serving containers that keep contents fresh for a long time.

Due to a need for marketing and differentiation in the market, packaging (especially premium and super-premium quality) tends to be made of high-barrier materials with very bright and colorful graphic prints. Transferring this type of packaging to renewable resources or with low environmental impact is difficult today.

- Re-use: While working on the research and development of more sustainable materials, many companies choose to offer reusable containers with refill systems. Thus, although the material is harmful, reducing its amount, pollution and impact is reduced.
- Clean (and educational) labels: It's not just about being transparent about food content but about educating consumers about our choices. If we never take care to make pet owners aware of the benefits of, for example, insect-based formulas, it is very likely that this raw material will never be accepted as valid as dry pet food.
- We are promoting paper bag usage since they have a lower carbon footprint.
- The use of recyclable plastic is being promoted to create single-use packaging.

In summary

We can say that the food system does not meet the needs of present generations, so it fails even before reaching future generations.

Undoubtedly, industry professionals must begin to think about and evaluate the current supply chains and systems and allocate new resources. As a result, we will create new resources to approach, little by little, a more sustainable process in all its senses. And although it is a path that still has a long way to go, more and more ways are being found to innovate with alternatives and more sustainable ingredients and raw materials.

Today we have the opportunity to address these challenges and positively impact the sustainability of the pet industry through the redesign of products and manufacturing processes and promoting public education and favorable policy change for the care of the ecosystem.

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TECHNOLOGY SHOWCASE

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



SOURCE TECHNOLOGY

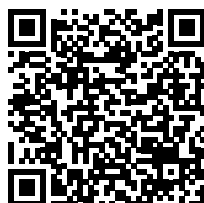
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<https://www.concetti.com/es/productos/sistemas-de-ensacado-para-sacos-prefabricados/sistemas-de-ensacado-imf>





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- Pearly BOPP
- Matte or gloss PET
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https://www.grupocopobras.com.br/alimentos_incoplast/alimento-animal/?lang=es



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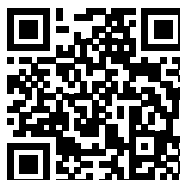
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THE INTERVIEW

EMILIE TARBAGAYRE

By All Pet Food

Dear Emilie, for us it is a great honor that you have granted us this interview, could you give us a brief personal introduction?

I was born and lived in France until 2006, at which time I came to Brazil in search of international experience. Regarding my studies, I'm an Agricultural Engineer specialized in food and I am currently studying an Executive MBA at Insper in São Paulo.

The same year that I arrived in Brazil, I began my career within Symrise Pet Food as head of Quality and Environment for

that country; In 2008 I assumed the responsibility of directing the Development and Technical Support department (DST) for Latin America, being involved, among other things, in developing specific solutions for our clients and technically assisting them in the search for more palatable and specific diets.

And now you have become the new general manager of Symrise Pet Food Argentina; Why that change? What are the challenges you will have in this new position?

This change is framed in a significant structuring of the

company; After several years of evolution and reorganization within the Symrise group by (among others) the Diana group, at the beginning of March we announced worldwide the birth of Symrise Pet Food, a company with the experience and dimensions necessary to take on the challenges of pet food industry of tomorrow. Thanks to the acquisition of companies such as ADF, Schaffelaarbos, or the recent Wing Pet Food in China, Symrise Pet Food required many people to take on new roles to answer these challenges. Without going any further we have Diego Maurizio, our former regional director as global director of the palatability business... a completely new and necessary position for these times.

About my new position I can tell you that I am very excited because despite the current economic situation in Argentina, the pet food market continues to be very promising. Thanks to being the country with the highest rate of pet ownership in households (in 2021 and according to Euromonitor, 7 out of 10 households had at least one dog), the Argentine market is the third Latin American market according to sales volumes. Personally I think there is a lot to develop and fortunately the manufacturers know this and are working on it.

My time in the regional management of DST allowed me to work closely with clients managing their daily challenges: new needs, increasingly complex raw material supply scenarios, an industrial production context with new technologies, processes and rapid expansion, among others. Having been in close contact with our clients for more than 10 years was one of the reasons why they entrusted me with this new position and which I hope to be able to develop to meet everyone's expectations.

Based on Symrise Pet Food's global experience, could you tell us about your solutions and services to improve pet welfare and owner satisfaction?

Symrise Pet Food acts in the market with the offer of 3 groups of solutions that address essential aspects of pet food: palatability, nutrition and food protection.

SPF, our brand of liquid and powder palatants, has been present in the world market for more than 40 years, turning feeding moments into moments of shared happiness. **Nutrios**, for its part, seeks to provide, through natural ingredients, animal nutrition in accordance with the current high demands of pet parents. Finally, **Videka**, a joint venture with Kalsec, is responsible for creating the next generation of natural antioxidants for the entire range of pet food and snacks.

Symrise Pet Food also owns **Panelis**, the leading expert measurement center providing reliable and innovative data on the eating behaviors and sensory preferences of dogs and cats, while setting the highest standards in terms of animal welfare.

Thanks to this broad portfolio we can fully serve all producers who want to go one step further and develop the pet food of the future.

Taking into account the importance that pets have acquired within the family core and the demands of their parents when it comes to feeding them, what do you think the Pet Food market will look like in a few years?

In recent years the pet food market has grown faster than other industries; And not to mention during the pandemic where certain consumption behaviors by pet parents are here to

stay. Double income and no kids (DINK), Social Networks and urbanization are three sociocultural factors that, in my opinion, orchestrate our industry and take it to a point of maturity that has only been seen (partially) in more developed markets.

I believe that in a few years we'll have a much more robust, premiumized Latin American market, and, above all, much more committed to the environment and the new "green" standards of living. Failure to address this will be decisive when declaring the success or not of a product.

As Symrise is a company committed to the environment, could you tell us how you respond to these challenges of generating more sustainable processes?

Sustainability has been present in the DNA of Symrise Pet Food since its origins, valuing side-streams and turning them into products of the highest quality at a global level. Likewise, we developed an agenda that closely follows the sustainable objectives set by the UN and thanks to which we work to reduce our carbon footprint, water consumption, supply of raw materials, innovation, building and process improvements, year after year, as well as caring for both employees and local communities (among others).

Regarding the innovation mentioned above, I can tell you that when formulating a new product we use our tool called the Eco-Design Matrix. With it we can measure 7 environmental impacts that occur in the production process. Did you know that pet food supplies generate about 80% of its environmental impacts? Thanks to the Eco-Design Matrix we can evaluate different alternatives to reach the same result with a significant decrease in environmental impacts and deliver to our client a product fully aligned with their sustainability strategies. In this way we are contributing in a pragmatic way to the reduction of the environmental footprint of our clients and the achievement of their sustainability goals.

I would also like to tell you that in 2019 Symrise Pet Food decided, together with the beginning of the construction of its plant in Colombia, that all new plants will have LEED certification (certification of sustainable buildings, developed by the Green Building Council of the United States). For this very reason, the plants we are building in Brazil and Mexico will be part of the select group of LEED-certified green buildings that are the future of the industry.

Is there anything else you want to add?

I would like to take advantage of this moment to invite all readers to visit us at our CIPAL stand; both to manufacturers who want to know more about our palatability solutions as well as to suppliers who want to introduce us to new businesses to continue developing the pet food industry. The Symrise Pet Food team and I are very excited to be back at face-to-face events and meeting all of our customers. We are waiting for you!



FACTORS THAT DETERMINE THE PURCHASE DECISION IN PET FOOD

Pet owners are increasingly aware of what they want to give their loved ones. This fact, accompanied by the premiumization of food, clean labels, and the promotion of sustainability, increases awareness and knowledge and, therefore, purchase decisions become progressively smarter.

But what are the factors that determine purchasing decisions in the Pet Food world?

By All Pet Food

Humanization, above all

We cannot say that this factor is a key aspect of the food itself, but seeing how this trend has become highly present in recent years, we cannot leave it out. That is a fact, and we already know it: pet humanization is one of the biggest trends in the pet food industry. In this sense, we can affirm that health care awareness in a preventive and not a curative way (that is, acting before diseases appear) results in greater access to information. Today, pet owners choose based on the ingredients, food quality, and specific benefits beyond price and packaging. It is remarkable that this is a movement that, without a doubt, allows us to consistently improve the market because we can compete by offering different alternatives and not just looking for the lowest price.

Thus, for example, we see how new proposals arise that seek to respond to the new demands for "grain-free," "natural" or "high protein" food; not to mention the search for food that can meet the specific needs of a pet group, such as neutered cats or large breed adult dogs.

Use case: United States

A study was carried out to determine the main purchase determining factors of the inclination toward one Pet Food product or another. The survey was conducted with 1,209 dog owners and 972 cat owners. It should be noted that, in the last country statistics, 68% of its inhabitants had at least one pet.



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Factors influencing Pet Food choice

Sources of dietary or nutritional information

Yes, for more than 43% of those surveyed, their veterinary health care team is their principal source of information about food for their pet. In the second place, there are Internet sources, with more than 24% (it is, therefore, important to inform with knowledge and verified sources). We can understand, logically, that, hand in hand with humanization, just as we listen to our doctors and the recommendations on how to take care of our health, it is also being done, progressively, more and more with veterinarians.

It is not strange to imagine a novice pet owner asking their veterinarian what Pet Food brand they recommend the most, right?

However, the majority of those surveyed agreed that the most important thing is to provide the pet with the best possible nutrition, one beneficial for them and of stable quality; and feed them with an appropriate diet for each particular condition.

Food characteristics

The characteristics of the food that, according to the survey, are considered most important when choosing are:

- Nutritional capacity
- Quality
- Ingredients
- Freshness

Surprisingly, the least important were:

- The sale (It means its space in the market)
- The color
- The packaging
- The absence of gluten

Labels

To understand the role of calorie labeling in pet food purchasing decisions, participants were asked about their use and awareness. The majority (74.9%!) stated that they were aware of this label type, but only 52% of them indicated that they use or look at this information.

Health prioritization

How important is it to buy healthy food for ourselves? And how important is it to buy it for our pets too? Health prioritization showed that at least 53% of pet owners think their health is as important as their pets' health. (health prioritization gap =

o). Surprisingly, 43.6% had scores indicating higher importance in buying healthy food for their pets, and only 3% stated a higher priority for themselves.

Price and brand loyalty

Surveyed were asked how important changes in food cost were for them versus their pets. And in this case, the price change in human food turned out to be more important than that of pet food. Likewise, pet owners claim to be more loyal to pet food brands than human food brands.

Conclusions

The majority of survey participants want to feed their pets the most nutritious diet possible. Results indicate that pet owners evaluate wholesomeness, freshness, and pet food ingredients when making purchasing decisions.

While it is encouraging that owners are trying to feed their pets the best nutrition possible, the truth is that, at the end of the day, most are not experts in animal nutrition and can misinterpret or understand certain information, either due to lack of knowledge or unclear marketing strategies or that promote benefits with a lack of scientific evidence. An example of this is what was seen in the survey, where 3% of respondents stated that they feed their pets raw food when, in fact, there is still not enough evidence that the raw diet offers the same or more benefits than the traditional diet, without increasing health risks.

There is no doubt that better education is needed from veterinary health professionals and manufacturers to continue providing tools to pet owners. This way, they can make intelligent decisions based on verified information.

Let's consider the context

We know, then, that the highest-ranked pet food characteristics were health and nutrition, quality, ingredients, and freshness (at least for US pet owners).

Additionally, the focus on ingredients and good nutrition may reflect how trends in human health and nutrition have begun to spill over into the world of pet health. And although this is something that can spread worldwide because we are seeing it in all the local pet food markets, it should be remembered that, after all, the choice of pet food also depends on the economic, political, and society in which people find themselves.

We encourage the data from this survey to be a reference, but not the last word about all markets, since each country, each city, has its particularities.





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CRITICAL POINTS IN THE DEVELOPMENT OF WET FOOD

Following the humanization trends of dogs and cats, the pet food market needs to satisfy demanding customers who are looking for food that resembles, as much as possible, human food. For this reason, the moist and semi-moist foods for our best friends continue to expand.

By: Eliane Gil Gatto, Ludmila Barbi y Erika Stasienuk



According to Euromonitor, in 2021, the volume of wet food sold in Brazil was approximately 72,000 tons, with a turnover close to 2 billion reais. This results in a growth of 18% for wet food for cats, and 5% for dogs in the year 2021, compared to 2020.

Moist foods, those with humidity greater than 60% according to FEDIAF (2021), are the ones that most resemble fresh foods, which in turn refer guardians to the feeling of providing health and wellbeing to their pets through the food.



The development of wet food differs from dry extruded on several points, one being processing. Among many process options, we have extrusion, moist or dry heat cooking, autoclave sterilization, and freezing, among other technologies that guarantee the quality and safety of the final product.

But, in addition to the production process, we point out other factors that we consider important in the development of this category of food.

Formulation

Initially, the formulation of wet foods differs in the choice of ingredients. We can use cereals, flours, and bran in the formula, but there is the possibility of using inputs with a lot of moisture,

The factors that drive palatability in wet food still need to be further explored, but it is already known that the use of plants in the formulation has the ability to increase its appeal compared to the same version without them.

such as fresh meats and organ meats, vegetables, and fruits, in addition to other sources of nutrients that are limited in the composition of dry foods.

As the natural moisture of the ingredients is still present in the final product, its energy density is lower since the nutrients are more diluted. Therefore, in moist and semi-moist food, even if they are complete, the metabolizable energy tends to be up to 4 times lower than in dry extruded food.

The metabolizable energy (ME) of cat and pet food is the most accurate measure to express its energy density. The way to calculate the ME of food can be through live digestibility or through prediction equations. Recent studies (Calvez J et al. 2012a, Calvez J et al. 2012b) that compare the precision between the modified Atwater method versus the equations cited by the National Research Council (NRC, 2006) to estimate ME have shown that both provide an equally moderate precision of estimation of the ME, for wet food for dogs and cats.

Therefore, formulating the complete wet feed using the FEDIAF (2021) recommended nutrient profile table, based on caloric content rather than dry matter, is the best option to ensure that the requirements of each essential nutrient will be consumed (every 1000 ME kcal of food intake).

Palatability

The nutritional composition and functional benefit claims attributed that pet food is a strong influence on the owner's purchase decision. However, it is useless to offer pets a correctly balanced food with functional ingredients if it does not consume it.

To ensure the correct consumption of industrialized food, whether dry, semi-moist, or moist, it must be tasty and stimulate the pet's appetite through factors known by the pet food industry as "palatability drivers." For this reason, having scientific proof of dogs' and cats' food preferences is essential to develop a palatability agent and test its performance in the product intended.

Wet food, by itself, is already recognized by guardians as more palatable or attractive to pets than dry foods. However, the basic composition of the product, the type of processing, the palatability, and the type of packaging, in addition to the pet's eating habits and familiarity with this category, still have an influence.



Palatabilizers can be found in liquid or powder form and are produced through the process of enzymatic hydrolysis of animal products and their main function is to attract the dog or cat through the release of aromatic molecules when food is offered. After being applied to the food, palatability measurements must be carried out in specialized panels to verify the increase in performance provided by the additive.

The factors that drive palatability in wet food still need to be further explored, but it is already known that the use of plants in the formulation has the ability to increase its appeal compared to the same version without them.

Water activity (AW)

The control of water activity in dry or wet-processed foods is essential to ensure their quality. The water must not remain entirely in the form of free water since it acts as a means of dispersing nutrients for the development of microorganisms and chemical-enzymatic reactions. To prevent the activity of fungi, yeasts, and bacteria in dry extruded food combined methods are often used, such as drying or dehydration, so that the water activity reaches between 0.6 and 0.62.

In the case of moist food, high water activity is normal, which if not adjusted will approach 1, reducing its shelf life. To reduce these, we can add solutes, pH control, and conservation methods. However, there is still the possibility of increasing the occurrence of enzymatic and non-enzymatic browning reactions, including fat rancidity, which makes difficult its process (and antioxidants and acids are used to lower the pH).

Even so, free water is necessary so that the sensory qualities (softness, chewiness, palatability, among others) are the best possible. In general, in moist and semi-moist products for dogs and cats, we reduce aw with the use of technological additives such as thickeners, stabilizers, and emulsifiers: gums, glycerin, lecithin, propylene glycol, carboxymethylcellulose and even ingredients that also help reduce it, such as starches, sugars and sources of soluble fiber.



THE IMPACT OF THE RUSSIA-UKRAINE WAR ON THE PET FOOD INDUSTRY

Since the conflict between Russia and Ukraine began, the problem of the availability of raw materials has not stopped growing. Its price increase and supply uncertainty inevitably mean that both human and pet food companies must start looking for alternatives to their standard processes.

By All Pet Food

War in Ukraine threatens world food supply

Russia is one of the world's largest wheat exporters; Ukraine follows in its footsteps. Both countries, from 2021-to 2022, were expected to account for almost 30% of global wheat exports, according to data from the US Department of Agriculture, a number that is affected by unexpected events.

The Russian tanks and missiles that besieged Ukraine have since threatened the food supply and livelihoods of scores of people in Europe, Africa, and Asia who depend on the farmland of the Black Sea region, known as the "breadbasket" of the world." As in war zones, Ukrainian farmers had to abandon their fields as millions fled, fought, or tried to stay alive. And just as the ports that ship wheat and other staples around the world are being closed in Ukraine, in Russia there is a huge concern that its grain exports will be increasingly affected by Western sanctions.

A long conflict would undoubtedly have a major impact

There is a reality: wars mean scarcity, and that means price increases. If the Ukrainian citizens have been called to defend

their country, who does the harvesting? Who takes care of the transportation?

If we consider that during the first two days of the conflict, the price of cereals for animal feed increased by 10% on the open market in Spain, what can we estimate for what's left of 2022 if shortages and supply problems continue to increase?

How can we expect, then, that the raw materials industry does not affect the pet food industry, which has a constant interrelation?

Pet Food companies respond to the Russian invasion

The Russian invasion of Ukraine has prompted scores of pet food and treat manufacturing companies to refocus their operations in their respective regions. Regarding the conflict specifically, several companies have decided to either stop their operations or advertisements in Russia as a sanction to the country or to make money and food donations for people and pets seeking refuge in other European countries as well as in Ukraine to resist Russian forces.

Ukraine and Russia are major food producers. Both countries combine almost a third of world exports of wheat and barley. Ukraine is also a major corn supplier and a world leader in sunflower oil, widely used in food processing. And is, in fact, the fourth largest external food supplier in the entire EU. Russia, for its part, is the world's leading exporter of nitrogenous fertilizers and the second leading supplier of potassium and phosphorous fertilizers.

Logically, the global pet food industry may impact some of the main commodities that Ukraine produces; any disruption to its supply could have ripple effects throughout the global ingredients market.

This is insignificant in comparison with the loss of lives and livelihoods in Ukraine, but pet food manufacturers around the world must contend with ever-increasing disruptions to already tangled enough supply chains.

As a result of the conflict, we can name the ships that cannot leave the Black Sea ports, and therefore all exports are stopped. Furthermore, international sanctions on many Russian companies are already having an impact.

In this sense, there is no doubt that pet food companies are already (and must continue) actively searching not only for alternative suppliers for raw materials that they do not obtain as before but also for substitutes. Operations cannot be stopped but rather modified, so that, in the event of a total lack of supply, the different food formulas should be changed with the main objective of keeping on supplying the pet food industry and pet owners who are in constant demand for food.

However, although pet food manufacturers use different raw materials and supply chains, the repercussions for the pet food industry are inevitable. The limited availability of some essential raw materials, such as sunflower oil or white fish, packaging raw materials and cereals, as well as the interruption of logistics and fertilizer and fuel reservation are just some of the factors of the problem.

Summary

We should also consider that the impact of Russia's actions against Ukraine goes far beyond the grain and energy markets: there is the potential (which is already happening in many parts of Europe) to increase global inflation, yet increased as a result of COVID-19. And although Russia and Ukraine are not economic giants like the United States and China, they are important suppliers of certain dairy products.

And while the pet food industry has already successfully overcome the challenges of the pandemic by adapting supply chains and sourcing alternative raw materials, we are once again facing an uncertain present and future.

Any change in raw materials can affect supply chains and availability.



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INDUSTRIAL TRANSPORT

Transport is fundamental within the production process of industries, although it does not add value, it is a key piece to transform raw material into a final product.

by Clivio Solutions



Before beginning to describe the different types of transports, that exist nowadays in industries, with their advantages and disadvantages, it is important to understand the meaning of transportation: transportation is the means by which objects, products, materials, people or data, are moved from point A to point B. Transport is part of the logistics and material handling of a company, and is carried out in all activities of the value chain, but it does not add value, but rather the opposite: it has associated costs. For this reason, it is very important that the materials transportation is as efficient as possible, with the main objective of optimizing the product value chain.

When talking about transport, it is necessary to consider different important points to determine which is the most appropriate system that adapts to the company situation and needs, for example:

1. Product specifications
2. Production line requirements
3. Cleaning, safety and hygiene requirements
4. Lay out and plant spaces
5. Risk of dust explosion

With product specifications we refer, first of all to which product is to be moved, the particle size, temperature, humidity and density, whether it is easy or difficult to flow and if it is or not abrasive. Other product characteristics are its angle of repose, rearrangement and inclination.

Related to the second point, it is essential to define what is the required capacity, if the transport will be continuous, batch, intermittent and its hours of operation.

Additionally, it is important consider the product care, either because it is fragile, has a high degree of explosiveness, it emits gases or because it can be corrosive.

After this brief introduction, we will focus on some of the different types of transport that exist today, we will describe their main characteristics, advantages, disadvantages and applications, mainly in Pet Food, Aqua Feed and Animal Feed industry, considering the raw materials and the final product.

Tubular Conveyors

Tubular conveyors move the products by means of teflon disc that are joined by a taut cable that pulls the movement, the whole set is inside a continuous tube avoiding cross contamination.

Main advantages are: it is an extremely clean equipment, easy to maintain, efficient (low energy consumption), it preserves the homogeneity of the product and there is a wide range of capacities and sizes, it is the ideal type of transport when it comes to delicate products that must maintain their structure protecting them, it is a safe system for food. We must highlight the great flexibility to the plant spaces that the tubular conveyor has, allowing to connect a load and a discharge in different industrial buildings, with angles and inclinations that other conveyors do not have the capacity to do.

The disadvantages of tubular conveyors are: they are not suitable for abrasive products, their high cost and in special cases, when distances are long, is it necessary to install two or more equipment in series.

As mentioned above, these systems have an excellent application for the finished product of Pet Food, Aqua Feed and Animal Feed industries, because it is transported in a delicate way, maintaining the structure of the pellet. It can also be used for the movement of raw materials, as long as they are not abrasive.

With the installation of the tubular conveyor, the manufacturer ensures excellent performance and a high-quality final product.

Z Conveyors

The second equipment to be analyzed is the Z conveyor, it is named for its zeta shape, although also, depending on the layout of the plant, it can be designed in a C shape or with different inclinations for loading, lifting and unloading materials; these systems stand out for being systems with high transport capacities and that achieve very wide routes of long distances. The advantages of these systems are: equipment that adapt to the plant space with vertical and horizontal arrangements, low

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maintenance cost and avoid cross contamination of products.

The disadvantages that these systems have are: the high investment cost, depending on the material of the buckets, the risk of wear when the product is abrasive and, in some cases, the high to medium levels of energy consumption.

These equipment are mainly used to transport granular and solid materials, being suitable for the transfer of animal feed

Bucket Elevators

Bucket elevators are very high-capacity conveyors, used today in the industry, mainly for lifting and transferring raw materials from one site to another. When it comes to finished product, these equipment are not recommended due to their high degree of breakage.

The elevators have, as traction of movement, a band or a chain where the buckets are joined, there the material is loaded and transferred to the corresponding unloading point.

Its two main advantages are: its large capacity and its relatively low investment cost (in relation to other conveyors analyzed in this article).

As negative points, bucket elevators have: little flexibility, difficult maintenance and do not prevent cross contamination of products or materials.

Pneumatic Conveying (dense phase)

Another well-known and widely used transport is the dense phase pneumatic, where the force of the air acts for the movement (it is used for flowable products). The transport is divided into two types:

- Pressurized: used mainly to transport fragile or abrasive materials, at low speeds and long distances. The movement is generated from the "push" of compressed air that forces the material to move to the destination point.
- Vacuum: in this second case the distances are short. A vacuum is generated by means of a pump and "sucks" the product to transfer it.

The main advantages of these equipment are: tightness, so that no waste of the material or emissions are expelled into the environment, the handling of the product is soft and delicate, so the product is damaged very little and it's flexibility to the layout of the plant.

Among the disadvantages of pneumatic transport, we find that not all products can be transported, there are limitations with the size of the particles, the maximum transport capacity and in some cases the distances, finally, the energy consumption is not less and the wear suffered mainly by the curves of the system.

For the transport of raw materials, it is not profitable due to the cost of the equipment, while for the final product it is usually used by companies, despite the small damage that the croquettes suffer.

Pneumatic Conveying (diluted phase)

Continuing with pneumatic transports, we have the diluted phase transport. It is a more direct method and the materials move dissolved along with the air flow. Like the previous case, these systems are also divided in two types:

- Pressurized: a high volume of compressed air is supplied at low pressure to generate the movement of the products. It is commonly used to get the product from a one point to multiple destinations.
- Vacuum: it works in the opposite way; with a pump the vacuum is generated to carry out the product.

A great advantage that the transport has is that important distances are achieved with wide flexibility, high transport capacity and its investment cost is accessible, while its negative aspects are its large consumption of electricity and there is a risk of cross contamination of products or raw materials.

They are used for bulk raw materials where the breakage is not relevant. This break occurs because the materials are suspended in the air and in contact with the pipe, generating friction that affects its homogeneity. Therefore, when we refer to the transport of animal feed kibbles, it is not a recommended system.

Screw Transport

The next transport to analyze is the screw transport, it is one of the simplest that exist today in industries due to its easy manufacturing process and its accessible price. The screws are fed through one or more mouths and the material is moved to the discharge (s) by means of the screw.

The screws are very useful for the discharge of silos in the dosage on scales, where the variable flight is usually used to avoid the compaction of the product. However, when we talk about the transport of animal feed kibbles, the screws are not recommended because it can damage them, generating breakage of kibbles and dust, for this reason the screws are not recommended for the final product.

However, they are considered for the move of raw materials, although the short distance from one point to another is considered as a limitation.

The advantages that can be mentioned of these systems are: their low investment cost and simple installation. While the disadvantages that stand out is its null flexibility for being a robust system, as mentioned above the high probability of breaking the transported material, in many cases its difficult maintenance and its low capacity.

Belt Conveyors

Belts Conveyor are the most common types, as is screw transport. The movement occurs on the belt, which moves thanks to the rotation of the rollers where it rests. Although the operation seems to be simple, today there are great innovative technological developments.

The positive aspects of these equipment are: versatility and adaptability to a wide range of products with great transport capacity, according to the technological level it is considered as a low-cost equipment, significant distances traveled are achieved and it has a low consumption of electrical energy.

Furthermore, by including "floating" sections on load cells and belt speed control, it is possible to measure and gravimetrically control the flow of product to be transported.

As all the equipment mentioned above, this one also has disadvantages, for example damage to the rollers and belt, possible slippage, misalignment and it is not a very flexible system.

Currently several industries use these systems for transportation, however, it is necessary to consider when raw materials are transported because the air can be polluted and when finished products are transported there can be cross contamination.

Chain Conveyors

Another interesting transport to consider when planning an investment project is the "redler" or chain conveyor, the traction is from the chain that moves the modules for the move of materials.

The most notable advantage is its high transport capacity and the distances that can be achieved. While among its disadvantages are the frequent replacement of the sprockets due to their high wear, their high energy consumption, their almost zero flexibility and only slight inclinations can be applied.

Its use for the transfer of animal feed pellets is questioned because product can accumulate between the chains, which would generate a source of bacteriological formation, in addition to the high probability of breakage of the pellets.

Not everything is negative in these transports, because when raw materials must be moved, it is one of the most recommended and used systems for industries having an accessible price.

We will make a conclusion with ponderation of each of the analyzed transports considering the points seen and the following assessment:

We can conclude that, after analyzing each of the main aspects and characteristics of the different conveyors with their advantages, disadvantages and applications in the animal feed industry, among the most suitable and recommended systems are the Tubular and Z Conveyors.

Despite the differences, they all have a good score, so it is key to understand the purpose of their installation, each of the points studied must be considered, its necessary to evaluate the cost / benefit ratio and determine which system is indicated for the existing necessity.

COMPARATIVA DE TRANSPORTES

	Tubular	Tipo Z	Pneumatic Conveying (Dense Phase)	Belt conveyors	De cadenas redler	Pneumatic Conveying (Diluted Phase)	Bucket elevator	Screw transport
Applies to raw materials	4	4	4	3	5	3	5	4
Applies to final product	5	5	2	4	1	4	1	1
High capacity	4	5	4	5	5	3	5	2
Travel flexibility	5	4	4	2	2	4	1	1
Easy maintenance	5	4	4	2	3	4	3	3
Low energy consumption	5	4	2	4	3	2	3	4
Distances traveled	3	3	4	5	5	3	3	2
Avoid cross contamination	5	5	3	2	2	3	3	2
Investment cost	2	2	4	4	4	3	4	5
Score	38	36	31	31	30	29	28	24

■ 5 Highly positive ■ 4 Positive ■ 3 Medium ■ 2 Negative ■ 1 Highly negative

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WHAT IS THE MOST IMPORTANT INGREDIENT IN PET FOOD?

What is the most important ingredient in pet food? The correct answer is: everyone. But, from a pet parent's point of view, we could say that protein always ranks first in consumer surveys (Petfood Industry, August 2018). In short, protein is very important in the development and performance of the dog or cat, as it is in food formulation due to its nutritional and economic value.

By MVZ. Armando Enríquez de la Fuente Blanquet

From the point of view of a pet food manufacturer, the answer would again be everyone. But I want to invite you to reflect for a moment on all the ingredients that make up a balanced meal. It is critical that pet food producers and pet owners maintain confidence in the quality and food safety of all ingredients, as well as traditional and innovative, used in pet food, treats, and snacks.

Let's take the pet owner's ingredient of choice: protein. In fact, protein is a nutrient whose source (which can be of animal or vegetable origin) is responsible for providing the protein in the food formula, so it must comply with quality, correct composition, food safety, and physical characteristics, among others.

We can continue going through every one of the ingredients we use in the food formulas but I would like to dwell on an ingredient of the balanced food formula that is made up of multiple elements inside: the vitamin premix (13 vitamins) and trace minerals (6 minerals). This ingredient is a homogeneous mixture of one or more micro-ingredients, designed to allow uniform dispersion of multiple nutrients within a pet food that must be present at milligram or microgram levels.

Although premix is typically used at low inclusion levels, its role in the feed requires us to pay close attention to this ingredient, as 1 ton of "unsafe" premix could cause illness in many pets and may require tons of pet food to be eliminated from



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stores and pet houses (figure 1). Recalls cause distress to pet owners, have an adverse economic effect on pet food manufacturers, and result in a loss of confidence in the pet food supply chain as a whole.



Figure 1. The example given is based on 1 tonne of premix used in a 5kg inclusion per tonne of dog food. The dog food is packaged in 10kg bags and sold to 20,000 owners, each with 1 dog.

It is essential to use a safe premix, which guarantees risk control at all stages of the food chain, from the selection and approval of ingredients to the packaging of the finished product. Control loss at any of these steps could result in the supply of “unsafe” premixes.

A safe premix starts with design, the core step in achieving a mix with a homogeneous and uniform dispersion of each ingredient to ensure that the pet food provides a good level of nutrition. The design of a premix considers certain ingredient characteristics and interactions that influence nutrient segregation, stability, and biological response (Figure 2).

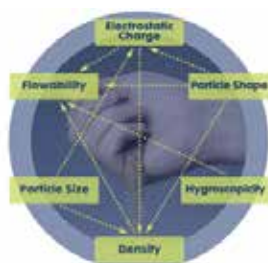


Figura 2. Interacciones entre las características de los ingredientes

A premix is made up of different microingredients with different physical and chemical characteristics that will determine the good performance of the premix in the final feed. Here, the complexity and the importance of knowing each component begins. Within the physical characteristics, there is particle size. Smaller particle size is beneficial if the active ingredient has a low inclusion level per tonne of feed. As the particle size decreases, the number of particles increases, thus improving dispersion. We would then think of looking to work with ingredients with small particles, but as the particle size decreases, the electrostatic

charge also increases. A high electrostatic charge causes particles to be attracted to metal surfaces, such as mixing and conveying equipment. In addition to particle size, there is the particle's shape, which affects the density of an ingredient and, consequently, that of the premix. And density influences the packaging and flow characteristics of the premix. Achieving good flowability is important to ensure that materials are accurately weighed, added, and dispersed within the premix. Finally, the smaller particles have the capacity to absorb more moisture; they are more hygroscopic because they have a larger contact area, and there is more interaction between the particles. Hygroscopic ingredients can cause the premix to cake up or change color, indicating that a chemical reaction has occurred.

After the design, the manufacturing process must be accurate and consistent to meet legal, quality, and safety requirements for the premix. Its manufacturer must subject all ingredients to a risk assessment process that identifies food safety and quality hazards associated with the ingredients, including the source, manufacturing process, and supply chain. The mixing equipment must be in optimal conditions and within a maintenance and cleaning program to ensure the mixing of the components and preserve the integrity, quality, stability, and nutritional value of each microingredient. Finally, before shipping a premix, it must be checked and ensured that the quality of the product meets legal requirements and customer specifications and that all critical control points and operating procedures are completed.

To sum up, we can affirm that all the ingredients that make up a balanced pet food are important and must be subject to strict quality control and assurance. There is a very particular ingredient, the premix of vitamins and trace minerals, which is responsible for providing many nutrients to the final diet. These nutrients go in very small quantities in the feed, in the order of ppm, so having a safe premix is essential. Safe premix is a great responsibility and must have all the control processes in the ingredients and in the manufacturing process.

premix is typically used at low inclusion levels, its role in the feed requires us to pay close attention to this ingredient, as 1 ton of “unsafe” premix could cause illness in many pets and may require tons of pet food to be eliminated from stores and pet houses

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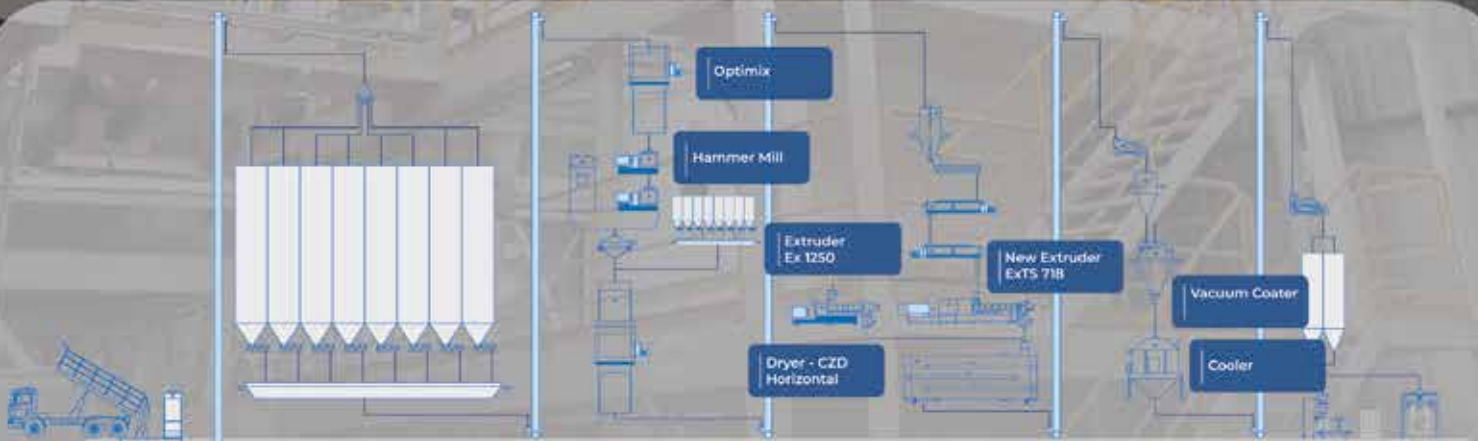
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SPRAY DRIED PLASMA FOR CATS AND DOGS

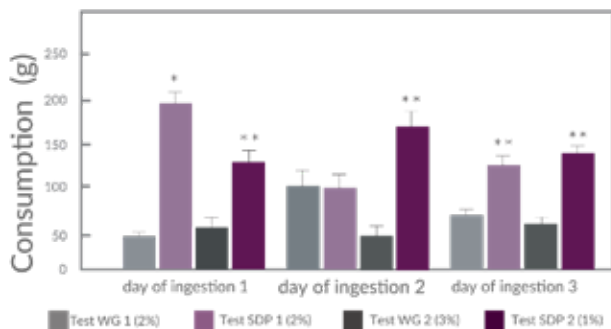
PLASMA SPRAY DRYING FOR DOGS AND CATS

In the last 25 years, spray-dried plasma (SDP) has become a binder ingredient used in canned pet food diets. However, in addition to its functional properties, plasma is an excellent palatant for dogs and cats especially, an attribute that the pet industry is starting to recognize quickly.

Plasma can effectively realize the coarse texture by the time that maintains the cohesion of the different diet ingredients. From the plasma spray drying process, a very fine powder is obtained that retains all the functional properties of the liquid product, such as the ability to

Image 1. Daily and total intake in cats for each diet used in the two palatability studies.

Statistics were done by testing (iso product [1] or iso cost [2]) using the "t" test.



These differences in intake were also observed for the first choice of each diet, as shown in Table 1.

Both studies conclude that there is a clear preference for diets containing plasma.

produce a thermoplastic gel when diluted in water and subjected to high temperature or extreme pH, or its high retention of water and emulsification capacity, to name a few.

Due to these technological properties, plasma is used in products in chunks and treats as well as in cat food. The use of plasma not only contributes effectively to improving the piece texture but also maintaining all the different recipe ingredients.

CATS PREFER RECIPES WITH PLASMA

We carry out different palatability studies with cats. The first study compared plasma with wheat gluten (WG) included at a rate of 20 g/kg (iso-product inclusion) in canned food. The second study analyzed plasma at a similar cost with 30g/kg WG in the recipe (inclusion of 10 g/kg for plasma). The ingredients and processing conditions were similar for all products obtained.

In the two tested recipes, there was a clear preference for palatability in the formula containing plasma (Image 1).

THE DOGS EXPERIENCED A GREATER ATTRACTION TO PLASMA FOODS

We fed 20 Beagles for two days in a test, preferably with

First option	Day 1, %	Day 2, %	Total, %
Iso-Product Formula WG-1 (20g / kg) de SDP-1	10 90*	44 66	21 79*
Iso-Cost formula WG-2 (30 g/kg) SDP-2 (10g/kg)	25 75*	20 80*	22 78*

standard diets with a control digest that contained 5% bovine fat and 1% flavoring or treatment containing the same digested with the addition of 2% of plasma coverage. As we can see in Image 2, the plasma-containing diet had an overall preference of 3.6:1 over the control diet ($P < 0.0001$), and the consumption ratio was 78:22. Plasma preference was similar on both days.

Plasma application provided the dogs with greater attraction to plasma-containing foods.

PLASMA IMPROVES FOOD PALATABILITY, INCREASING CONSUMPTION

In another study, commercially available dog foods were placed in water containing 0 or 20% plasma for 5min before air drying. 20 Beagles received two foods (control and with plasma) for a 2-day palatability test. As Image 3 shows, more dogs chose the coated treatments

with plasma than control foods in all categories studied. Palatability and feed intake increased with the addition of plasma.

Image 2: Preference plasma diet VS negative control

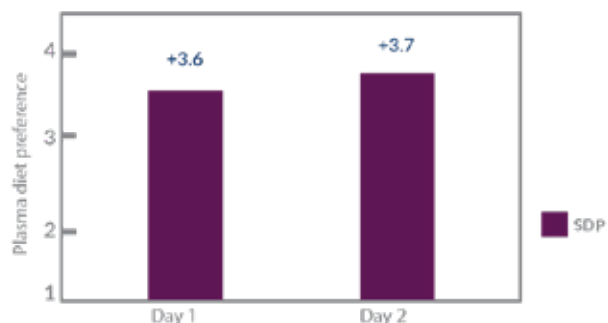
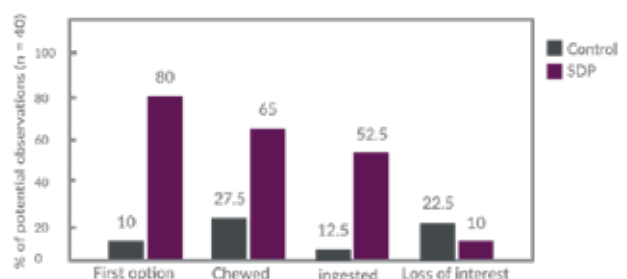


Image 3: Treatments with water that contains Plasma VS negative control





OPEN LETTER TO A FACTORY MANAGER

Assuming that the titles do not mean the same thing in different organizations, this article identifies the figure of the "factory manager" as the person who is directly responsible for the entire food production process until dispatch.

By Fernando Raizer

The functions of the factory manager are carried out right at the point where the company's plans are translated into action. The failure or success of these plans depends on the energy and skill with which human, financial, raw material and equipment resources are applied to the task of developing the products and services provided by the company.

As the economy grows, the need for these resources to be well used increases even more.

In general, business management is currently facing situations of profit margin compression, and this requires strict compliance with the budget, which must be constantly reconciled with the task of cost reduction.

New manufacturing processes require more complicated equipment and tighter controls on quality.

The community, the Ministry of Agriculture and other regulatory bodies at all levels expect the factory to reduce pollution, dust emissions, noise and maintain the quality of its effluents at increasingly demanding levels.

Good manufacturing practices went from "desirable" to "mandatory" status...

In addition, the procedures, reports, audits and controls seem to multiply at a very fast pace.

The purpose of this article is to help the factory manager to list and prioritize this set of responsibilities and duties so that it is easy to understand the relationship between them and to specify the managerial tools that he will need to handle all of this.

We also need to address the basic responsibilities of the factory manager and his relationship with other departments in the company.

PRODUCTION FUNCTION

Production work can be simply defined as "making products of assured quality, in the required time, at the lowest possible cost, safely and with good employee relations".

The factory manager is expected to transmit the knowledge and information acquired in his operation to the competent

areas, which can help in the development of new products and processes, in addition to protecting the company against the obsolescence of equipment and methods.

The factory manager is also expected to be prudent and efficient in applying the resources entrusted to him, and to use money wisely by recommending the purchase of equipment that is labor-saving, reliable, inexpensive, and infrequently maintained, and that, in addition, offer flexibility for future expansion.

Maintaining a good relationship with employees is no longer considered a simple "collateral" or secondary activity of the manager.

It must include, in addition to the employees, a good relationship with the entire community where the factory is located, including neighbors, civil authorities, the professional and business community, minority groups, as well as those related to the environment...

The factory manager is expected to deliver results in six basic areas:

- Production, Quality, Costs, Safety, Maintenance and Relationship with employees.

Another responsibility of the factory manager is to accurately determine the actual production capacity of the plant. This is essential for the company to make the right decisions regarding its market strategy.

When doing this, you must take into account the time losses that naturally occur during the process, preventive maintenance times, cleaning, etc.

QUALITY

The factory manager is responsible for establishing a program that involves and commits all production personnel to follow the standards of the process, without "shortcuts" or personal deviations...

Instilling respect for total quality puts great pressure on the factory manager's leadership skills and is a full-time task...

COSTS

Producing at the lowest possible cost is the most obvious element of the factory manager's responsibility.

Another responsibility is to generate or actively participate in the preparation of the annual budget for all areas of the factory, from the reception of raw materials, production and all its processes, maintenance and even shipping, and then keep track of these expenses. within those established limits, throughout the year.

In fact, the factory manager will only be successful in this task if he creates a strong sense of cost and value consciousness in his team.

Finally, the factory manager needs to participate in the development of the company's capital investment program.

He needs to recommend new factories or equipment to ex-

pand production, reduce costs, increase quality and improve services, meet the requirements of government regulatory agencies, and even propose the replacement of outdated equipment.

SAFETY AT WORK

From a humane standpoint, the factory manager must do whatever is necessary to prevent physical harm or death to his employees.

However, the simple "humanitarian feeling" is not enough. There must be adequate training programs, equipment that minimizes risks, personal protective equipment, etc.

All this must be part of an annual investment program, duly presented and approved by the company's board of directors.

The so-called "house keeping" is also the responsibility of the factory manager.

It is impossible to maintain quality and safety in environments full of dust leaks, spills and piles of garbage and unusable material in the corners...

Workforce morale and efficiency are bad when the factory is not permanently cleaned.

Giving that "general treatment" to the factory sporadically is not a "good practice"...

It seems obvious to say this, but it is very common that there are cases in which factories work at the absolute limit of their capacity without proper maintenance, and therefore, the obsolescence process accelerates terribly.

It is good to remember that the decision to work without performing adequate preventive maintenance is made by the company's Board of Directors, and should not be made by the factory manager.

It is up to him to communicate adequately, and with the necessary frequency to the Board, that the process of working in an "overcapacity" regime can generate a great cost in the future.

EMPLOYEE RELATIONS

It's not the factory manager's job to keep everyone happy; that's impossible, but it's your job to put employee relations on a foundation consistent with company goals.

There are at least 4 result areas (three of them measurable) through which we can judge the performance of the factory manager in the item "Relationships with employees":

- 1- The operation of the factory is not interrupted by events derived from bad relations with the employees.
- 2- The atmosphere that reigns in the factory is not one of abandonment, but of a collective sense of purpose. This is subjective, but easily noticeable to those who know a little about the factory.
- 3- When the company/employee relationship is compromised by conflicts such as strikes, the voice of the factory manager is respectfully heard and taken into account.
- 4- Companies with good relationships with their employees

tend to have a low rate of absences, delays and employee turnover.

THE SCIENCE OF MANAGEMENT

After reading this list of responsibilities and knowing that there are still many more, the factory manager can easily deduce that: "Managing is doing things through people...", and making a high use of morality and commitment to the right thing.

Planning, organization and control are the essential activities for this.

The factory manager sets the "tone" of the work environment by showing how much energy he puts into his own work, how determined he is to achieve his goals, and by demonstrating his ability to plan, organize, and control events.

If the manager demands high performance from his subordinates, he has to set even higher performance standards...

The phrase "Do what I say, not what I do" is not the motto of a successful manager!!!

- Demands the same professionalism from those who report. A maintenance supervisor who can't explain why he spends so much on a certain area or piece of equipment doesn't deserve this position.
- Surround yourself with competent people, because in the end your team is what determines who you are.
- Do not work firefighting, on a break/fix/fire/hire basis.
- Although not required, make an annual budget, detailed

month by month, from maintenance to general factory expenses.

- Have an ally in the nutrition/formulation area. It will need your formal endorsement to justify a thermal process improvement, a new type of extruder die, a new and more efficient type of coated hammer for grinding that contributes to proper DGM (Medium Geometric Diameter), a liquid adder, etc.
- Take advantage of the best of others: you are not an expert in everything. In the training program for your employees, ask the formulator for help in talks for operators.
- Salary is not the only motivating factor for an employee; attention is essential, and nothing better than a well-functioning training program to show that you value your team.
- Invite suppliers' personnel, use consultants available from suppliers of premixes, amino acids, vaccines, acidifiers....
- If you don't already know, learn immediately how to do ROI calculation, PERT network, problem analysis.
- Stay up to date on courses, congresses and everything that can contribute to your development and that of your team.

And above all, replicate what you are learning to your team. For anything that costs money, when you apply, submit a spreadsheet with the expected benefit and your commitment that it will happen.

In the absence of high rates of return on investment, justify what the factory needs based on the argument of QUALITY / SAFETY ASSURANCE, and do it in a formal way, with at least a well-done SENSITIVE ANALYSIS.
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MARKET TRENDS AND THE DEVELOPMENT OF NEW PROTEIN SOURCES IN PET FOOD

There is an increase in global concern in finding solutions to feed a constantly growing population. One of the proposals for this problem is the use of alternative proteins, both for human consumption and for animal feed, which includes pets, since the population of dogs and cats and their food segment is also in constant increase.

Jéssyka Laura Galdino Costa
Ingrid Caroline da Silva
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Ricardo Souza Vasconcellos

According to the United Nations Organization (ONU), the world population will reach close to 9.6 billion in the year 2050 (ONU, 2019). The amount of food needed for this population, with an ever-increasing lifestyle and meat consumption, will be 48.6% more than current production. To meet this demand, an intensification of food and animal production has been promoted, which must be done in a sustainable way to guarantee a healthy planet for a constantly growing global population (FAO, 2017; Liua et al. , 2022).

In this context, the "Sustainable Development Goals" (SDGs) were developed, which is an interrelated strategy for the promotion of sustainable development practices and solutions, from which it is expected that, in the year 2030, all sectors of the developed countries are aligned in this direction (ONU, 2015).

The growth in population and pet ownership contributes to the expansion and greater representativeness of the pet food

segment in the global market, in relation to its trends and the important role that the sector plays in world production, is evidenced , that the sector must also contribute to the achievement of the SDGs in the direction of sustainability in the coming years.

In relation to pets, the term "sustainability" can be defined as the conscious management of resources and waste necessary to meet physiological needs, without compromising the ability of future generations to meet their own environmental, social and economic needs (Acuff et al., 2021).

In the pet food industry, it is common to work with a wide variety of raw materials; however, current debates are focused on protein sources, which is the macronutrient with the highest ecological cost (Berardy et al., 2019), which is an essential compound in diets for carnivorous species such as dogs and cats, and being also, one of the criteria for the choice of balanced feed by the tutors (Laflamme et al., 2008).



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In general, pet food formulations are known for their excess protein, with a great diversity of products in the segment and varieties of products on the market, such as those free of grains and natural foods (Beaton, 2014; Wall, 2018) that promote direct competition with some ingredients of human food (Swanson et al., 2013; Okin, 2017). On the other hand, dog and cat foods are positively associated with the rendering process, which promotes environmental benefits by transforming by-products from slaughtered animals into nutritionally useful ingredients such as animal-derived meals (HOA) (Meeker; Meisinger, 2015; Wilkinson; Meeker, 2021).

Despite the conventional use of HOA in animal feed with its respective environmental benefits, other protein sources are also used in feed formulation, such as soybean meal and corn gluten. Research and development of other types of alternative proteins are interesting, as they have nutritional and sustainability potential that are independent of conventional animal production, contributing to less competition with foods intended for human consumption. In addition, debates must be generated about the need to use increasingly lower amounts that meet their requirements.

In this context, similarly to what happens in human food research (Karmaus and Jones, 2021), the main emerging proteins of interest for pet food have been those obtained or derived from unicellular microorganisms and insects.

Microalgae are a big bet as a sustainable food source, due to their ability to convert sunlight and inorganic and organic carbon sources into biomass of high nutritional and functional quality (Nicolai et al., 2019), which, in turn, some species are rich sources of protein and essential amino acids, with antioxidant effects, and are also sources of lipids such as polyunsaturated fatty acids.

In general, the term of crude protein, within the diverse group that makes up the microalgae, the species can be highlighted: *Spirulina platensis* and *Chlorella vulgaris* that have between 60 - 71% and 51 - 58%, respectively of this nutrient (Souza et al., 2019). However, the ideal nutritional composition of algae depends on its cultivation, processing, and environmental factors, such as pH, light intensity, nutrients, CO₂ supply, and temperature.

Compared with other protein foods, microalgae are presented as competent organisms to synthesize essential amino acids such as leucine, isoleucine, methionine, lysine, threonine, valine and histidine (Guil-Guerrero et al., 2004) and may present similar or even higher values. elevated in terms of lysine and methionine when compared to legumes, corn and soy-based products (Spínola., 2021); however, small deficiencies can be observed among sulfur amino acids such as methionine and cysteine, which are characteristic of plant proteins (Becker, 2004).

Despite having balanced food for dogs and cats on the market, including microalgae, mainly *Spirulina platensis* and *Chlorella* spp. with levels of up to 0.4% (Beynen, 2019), there is still little research evaluating the digestibility and palatability of these elements in balanced pet food. In addition to this and beyond the fact that the use of microalgae in the pet food industry is gaining importance due to the high nutritional values and the

increase in production, obtaining the total biomass is still not enough to meet the enormous needs of the industry, contributing to its inclusion only in premium- and super-premium-rated pet foods.

Within the products of microbial origin, yeasts are by-products of the brewing industry (Butolo, 1991), which are currently being applied in large numbers in fermentation processes (Bourgeois and Larpent, 1995). In pet diets, the use of yeasts has been incorporated due to its high protein and low lipid content, showing beneficial effects on the health of the dog microbiota (Lin et al., 2019); however, little research has been done when they are used as a source of protein in the diet of dogs and cats.

In the pet food industry, yeasts are already being included as a functional ingredient at a low inclusion rate, which can be justified because high inclusion levels are associated with soft and malformed fecal matter, with levels up to 15 being recommended. %, this due to the limited availability and high price in the market, such as that of brewer's yeast (Martins et al., 2013).

In a study (Martins et al., 2013), when comparing the inclusion in diets with 15% of different types of yeast: brewer's yeast, whole sugar yeast and self-lysed yeast (spray-drying process), it was observed that the Brewer's yeast had more protein and tended to be more digestible than the two cane yeasts, however, the digestibilities of all three yeasts were adequate for use in dog diets; In a more recent study, it was concluded that dry cane yeast can be included in canine diets with safe levels close to 30% (Reilly et al., 2021).

Despite the potential for sustainability and the advantages in relation to other microorganisms, mainly due to its ability to assimilate a wide variety of substrates, its high growth rate and ease of separation of its biomass (ICIDCA, 1999), the use of Yeasts as a source of protein in diets for pets is little known, and further studies are necessary.

Regarding the use of insects in animal feed, as an alternative source of protein to those already existing, this can be justified by its nutritional value and benefit to the environment. Edible insects constitute a good source of protein whose concentration can vary between 40-70% in dry matter, depending on the species (Lisenko, 2017; Sosa and Fogliano, 2017) with a good level of essential amino acids (Oliveira et al., 2017); In addition to this, insects are a good source of lipids, which can vary from 10 to 50% in dry matter, with a large amount of linoleic acid (18:2 n-6) and alpha linolenic acid (18:3 n-3) when are compared to other sources (Lucas et al., 2020). In addition, it has adequate levels of vitamins (riboflavin, pantothenic acid, biotin, folic acid) and minerals (calcium, iron, and zinc) (Govorushko, 2019).

It is estimated that close to 50% of the insect industry is dedicated to the pet food segment (Huis, 2022). The investigations have been based mainly on the larvae of the black soldier fly (*Hermetia illucens*), *Tenebrio molitor* (*Tenebrio molitor*) and cricket (*Gryllobates sigillatus*), being processed in the form of flour. In terms of digestibility, measured as fecal nitrogen, in dogs and cats consuming defatted, dried and ground extruded diets of black soldier larvae (BSF), with an average inclusion level of 2%, this digestibility ranged from 73.4 – 87.2% (Bosch and Swanson, 2021; Paßlack and Zentek, 2018; Yamka et al., 2019), and in

in vitro digestibility tests in dogs, its result reached a coefficient of 89.7% (Bosch et al., 2014).

Studies with tenebrio flour had apparent digestibility values of 83.6% for dogs and 80.4% for cats by the conventional method and varied between 91.3 – 92.5% in in vitro digestion for dogs (Bosch et al., 2014; Bosch et al., 2016). With the inclusion of 8-24% cooked, ground crickets in extruded dry dog foods, digestibility ranged from 82.1-86.0% (Kilburn et al., 2020). Regarding the availability of essential amino acids, BSF can be limiting in methionine for cats and threonine for dogs (Bosch and Swanson, 2021).

Fecal quality was also investigated, with an inclusion of 24% cricket meal, no inconsistencies were observed (Kilburn et al., 2020), also being verified with BSF at a level of 30% inclusion in dry extruded feeds (Meyer et al., 2019). Few studies (Kilburn et al., 2020; Paßlack and Zentek, 2018; Yamka et al., 2019) show that, in terms of palatability in dogs and cats, there are different preferences according to the insect species and its level of inclusion in diets, but in general dogs seem to accept food containing up to 10% BSFL meal and 24% crickets, while for cats it is 5% BSF.

It is possible that the nutritional composition of insects allows the complete substitution of some sources of plant origin, such as soybeans, which are used in balanced feed. Bosch et al. (2014) verified that the crude protein content of insect substrates was higher when compared to soybean cake protein and was similar to that of poultry and fish meal.

Además de esto, las dietas basadas en insectos son consideradas hipoalérgicas y surgen como una opción para los tutores de perros y gatos que sufren de sensibilidad alimentaria (Bosch e Swanson, 2020). Otros aspectos interesantes del uso de insectos en el contexto de alimentación de perros y gatos, son la efectividad en la conversión alimentaria, bajas emisiones de gases efecto invernadero y bajas necesidades de agua y uso de la tierra cuando son comparados con otras especies (Van Huis e Oonincx, 2017); además, no son necesariamente competencia con los alimentos para humanos (Liu, 2020; Huis, 2020) y su manejo tiende a ser más sustentable que en los otros animales convencionales como lo son la producción de bovinos, suínos y aves (Bosch e Swanson, 2020; Liu, 2020).

Finally, in order to have a more efficient and more widespread production in pet food, more studies are necessary to better understand aspects such as undigested fractions of insects (chitin), which is present in the cuticle of these species, its prebiotic potential and the impact on pet health (Bosch and Swanson, 2020); In addition, better legislation would have to be developed, the amounts of inclusion determined, research into aspects related to the preference, acceptance and trust of dog and cat guardians for these alternatives, because they are also part of this challenge.

Overcoming barriers to sustainability will require successful production strategies, support from cat and dog guardians, and further research.



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Pet Food formulas & ingredients

PET PARENTS AND THEIR PETS SHARING THE SEARCH FOR WELL-BEING



by Thaila Cristina Putarov, Technical and Product Manager of Biorigin

The concept that health begins with the mouth is already well known among consumers who are increasingly aware of the importance of the health of the intestinal microbiota, and know that taking care of it will result in well-being and general health. Prebiotics have long been used as gut health promoters in dog and cat foods, but only recently have pet owners recognized and sought them out in food. The beneficial effects of prebiotics in animals are similar to those found in humans, with more than 50% of dog and cat owners in the US (55%), Germany (76%) and the UK Kingdom (61%) look for products that support the digestive and intestinal health (Mintel, 2021) of their animals.

Prebiotics are substrates that are selectively used by microorganisms in the host's gastrointestinal tract and have health benefits for those who consume them. Among the main prebiotics used in the pet food industry, we can mention fructooligosaccharides, inulin and mannan-oligosaccharides, some fibrous ingredients can also act as prebiotics in the formula, as long as they are shown to be used selectively by the host microbiota, they promote health (inhibition of pathogens, modulation of immunity, mental health, effects on insulin resistance, among others) and may have evidence of their benefits in the target population.

Mannan-oligosaccharides are derived from the cell wall of yeast, which is made up primarily of protein and carbohydrates. MOS has a complex structure made up of phosphorylated mannose, glucose and protein. Its consumption stimulates the growth and metabolic activity of beneficial bacteria, which results in the production of antibacterial substances and inhibits the proliferation of undesirable microorganisms, such as *Escherichia coli*, *Clostridium* spp. and *Salmonella*.

Beneficial bacteria also produce substances with immunostimulatory properties, interacting with the immune system in various ways, including: production of cytokines, proliferation of mononuclear cells, phagocytic activity, and induction of synthesis of higher amounts of immunoglobulins, especially class A.

A known characteristic of mannan-oligosaccharides is their effect on increasing the concentration of fermentation products in the colon, that is, it is related to the production of short-chain fatty acids.

Short-chain fatty acids: acetate, propionate and butyrate, and lactic acid are considered a source of extra energy for the host, promoting a reduction in the pH of the colon and, therefore, inhibiting the growth of pathogenic microorganisms. Butyric acid is known to be the main source of energy for colonocytes and can represent up to 70% of the energy used by the colonic mucosa. It has an important action in the regulation of cell growth and differentiation in the intestine, and consequently influences the integrity of the mucosa to maintain a normal cell phenotype and reduce the risk of colon carcinomas. Short-chain fatty acids also promote blood flow and muscle activity in the colon, stimulate mucin production, and enterocyte proliferation.

ActiveMOS is a source of mannan-oligosaccharides from *Saccharomyces cerevisiae*, when added to adult dog food it increases butyrate production by 32.5% and contributes to the reduction of biogenic amines by 38%. Biogenic amines can be generated from the metabolism of microorganisms, chemical reactions or other endogenous sources, they have important physiological functions, but at high levels they can cause harmful effects to the host. ActiveMOS contributes positively to the digestion and metabolism of the host, and mitigates the negative effects of the products generated by excessive protein fermentation.

HyperGen has an exclusive production process that guarantees a high content of functional soluble MOS and partial exposure of the beta-1,3/1,6-glucan layer. Its enhanced prebiotic effect gives it modulation of the local intestinal immune response and effective action on intestinal health. HyperGen increases the concentrations of butyrate, in addition to favoring beneficial bacteria: *Lactobacillus* spp. and *Bifidobacterium* sp.

This modulation of the intestinal microbiota improves local immunity and promotes better general health and well-being of the individual, this evidence reinforces the concept that health begins with good nutrition. The inclusion of sources of mannan-oligosaccharides in food formulas for dogs and cats are important tools to guarantee the intestinal health and well-being of the animal.

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