

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

**TWO ESSENTIAL PARAMETERS
FOR PET FOOD LAUNCHING**

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

**UPCYCLING IN
TRADITIONAL PRODUCTS**



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(PART 1)

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

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

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

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

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

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

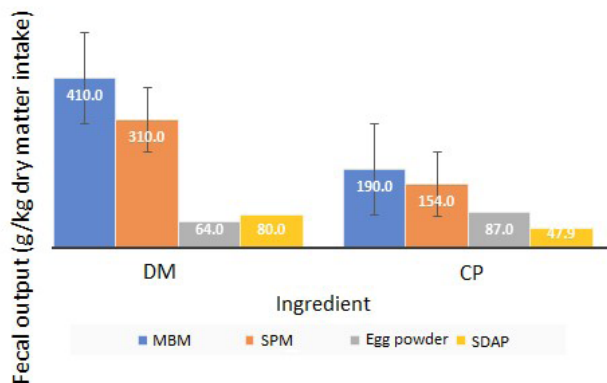


Image 1: Estimated excretion of dry matter (DM) and crude protein (CP) for each kilogram of ingredient ingested, considering the digestibility of the ingredients (Table 1).

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

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

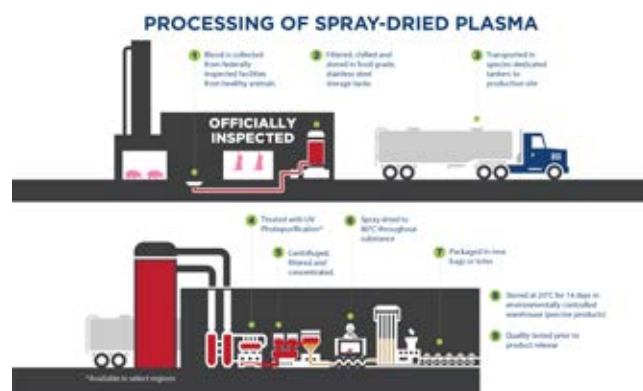
	Meat and Bone Meal	Standard Poultry Meal	Egg powder	SDAP
	Carciofi et al. (2008) ¹	Carciofi et al. (2008) ¹	Andrade et al. (2019) ¹	Song et al. (2015) ²
DMS, %	59,0	69,0	93,6	92,0
DPC, %	81,0	84,6	91,3	95,2

¹Studies in dogs; ²Studies in pigs

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

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

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



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

Function	Parameter	Observed Result/
Technological	Wet Texture Emulsification	- Increases hardness, water retention and juiciness in wet - Prevents the separation of phases in wet foods - Possible improvement in processing in extruded products
	Palatability Digestibility Biological value	- Palatable for dogs and cats - Highly digestible - Essential amino acid profile superior to conventional sources
Functional	Cognition Prebiotic	- Reduces the decrease in cognitive function in aging - Regulates the intestinal microbiota - Improves gut integrity - Improves gut defense mechanisms - Improves passive immunity - Increases immunomodulatory cytokines - Reduces the effects of inflammaging
	Immunomodulator	

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

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

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

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

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

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WHAT DO ALL OF THESE PRODUCTS HAVE IN COMMON? THEY ALL CONTAIN PLASMA



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