

RESEARCH BRIEF

ENHANCING PET IMMUNE HEALTH & PALATABILITY WITH CRAVINGS

COMPANION



Innovation in pet food ingredients that offer additional immune health benefits for pets is not just desirable, but essential. APC's plasma-based protein ingredients for pet food, stand out as the ideal solution for manufacturers looking to differentiate themselves in the market by offering products that meet both palatability and health expectations.



Cravings is a hydrolyzed ingredient derived from porcine plasma, specifically designed to enhance both a palatability and overall health of pets. This innovative hydrolyzed ingredient provides high level (min. 70%) of very digestible protein and bioactive peptides, known for their immunomodulatory and antioxidant properties, as detailed in a recent study¹, demonstrating effects similar to another plasma based ingredient, spray dried plasma (SDP).

The study "Nutritional, molecular, and functional properties of a novel enzymatically hydrolyzed porcine plasma product" published in PLOS One, and referenced in this Research Brief, highlights the benefits of Cravings. The study details different bioactive peptides in Cravings with remarkable properties. Cravings that may have the potential to reduce oxidative stress and inflammation, suggesting significant health benefits for animals.

IMMUNOMODULATORY EFFECT

Cravings and SDP, when consumed orally, can help supporting the immune response, potentially reducing the negative impacts of inflammatory and allergic challenges. This is a significant value for pet food manufacturers targeting owners who are concerned about the long-term immune health of their pets. Various tests in model animals have shown substantial improvements, indicating the promising potential of Cravings and SDP as ingredients for supplements, complete food, and treats to support the overall well-being of our companion animals.

One of these tests revealed that Cravings and SDP mitigated the increase in the expression of pro-inflammatory cytokines associated with inflammation models induced by Staphylococcus aureus enterotoxin B (SEB) and Escherichia coli strain O42. Specifically, the study demonstrated after challenge a reduction of pro-inflammatory cytokine TNF- α and an increase of the anti-inflammatory cytokine IL-10 in the jejunum mucosa, further supporting the immunomodulatory effects of Cravings and SDP (Fig. 1), which is essential for maintaining overall health and preventing chronic inflammation.

In a separate test conducted with mice, researchers evaluated the effects on intestinal inflammation induced by E. coli with promising results. Mice treated with Cravings and SDP not only showed an increase in body weight (Fig. 2) and average daily gain, but also exhibited a reduction in the percentage of activated Th lymphocytes responding to infections. This suggests that Cravings and SDP enhance the efficiency of the immune system, allowing it to combat infections more effectively without overactivation, which can lead to tissue damage and chronic inflammation.

Fig. 1 Anti-inflammatory cytokine IL-10 in mucosa

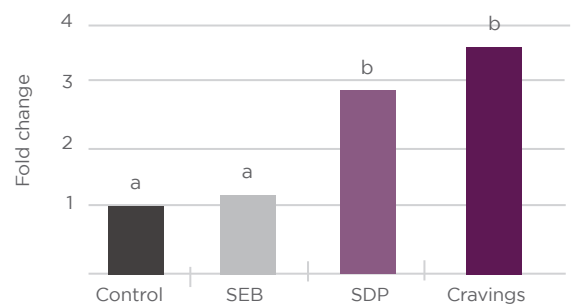
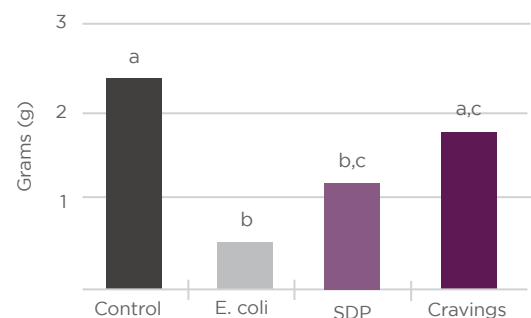


Fig. 2 Body weight change after E. coli admin.





The studies conclude that Cravings and SDP enhance immune efficiency, shown by increased body weight and reduced activated Th lymphocytes in treated animals. This makes Cravings and SDP valuable additions to pet food for long-term health and resilience against inflammation and allergies, allowing for different value to the pet food manufacturer.

BIOACTIVE PEPTIDES SUPPORT

Cravings, a hydrolyzed plasma protein, not only modulates the immune response but also demonstrates significant antioxidant properties due to its bioactive peptides. These peptides, especially those with hydrophobic amino acids like leucine, valine, and phenylalanine, are effective at neutralizing free radicals and reducing oxidative stress, preventing cellular damage.

In a study with the model animal *C. elegans*, the effects of Cravings on inflammation and overall health were tested. The animals were exposed to lipopolysaccharides (LPS) to induce inflammation and then compared to a group treated with Cravings or SDP. The results showed that Cravings and SDP improved survival by 40% and 45% (Fig. 3) respectively, increasing resistance to oxidative stress similarly to the positive control with vitamin C, which showed a 57% improvement.

Moreover, Cravings and SDP have demonstrated potential benefits in models of age-related conditions. For instance, in an age-related paralysis model, Cravings and SDP significantly improved outcomes by reducing motility defects when administered at a concentration of 5 mg/mL (Fig. 4). This indicates that Cravings and SDP not only help to combat oxidative stress but also can support mobility and overall health in aging pets.

PHYSICAL FUNCTIONALITY AND APPLICATION

Cravings is characterized by high solubility and a greater concentration of low molecular weight peptides (> 85% of proteins under 10K Da). The hydrolysis process used with Craving breaks down proteins into smaller peptides and amino acids, resulting in higher protein hydrolysis and lower gelling capabilities. The higher degree of hydrolyzed proteins allows Cravings to be a potential ingredient composed of smaller peptides for hypoallergenic diets, since smaller peptides are less likely to trigger allergic reactions in sensitive pets.

Thus, Cravings could be considered for diverse products and for physical characteristics requiring less gelling such as liquids, gravies or needing less viscous properties while providing beneficial essential amino acids and peptides and support to overall health, while SDP could be considered for gelling applications and support to overall health.

COMPONENT	CRAVINGS	COMPONENT	CRAVINGS
Crude Protein (% m/m)	74.6	Glycine	2.6
Dry Matter (% m/m)	97.1	Histidine	2.5
Ash (% m/m)	15.3	Isoleucine	2.9
Crude Fat (% m/m)	2.6	Leucine	7.5
Solubility (% m/v)	97.0	Lysine	6.1
Crude Fiber (% m/m)	<0.1	Methionine	0.7
Digestible Energy (kcal/kg)	3887	Phenylalanine	4.3
Metabolizable Energy (kcal/kg)	3691	Proline	5.0
Alanine	4.0	Serine	4.4
Arginine	4.8	Threonine	4.7
Aspartic Acid	8.1	Tryptophan	1.3
Cystine	1.6	Tyrosine	3.9
Glutamic Acid	12.0	Valine	5.7

Fig. 3 Oxidative stress response after Cravings (5 mg/mL) treatment and Vitamin C (58 μM)

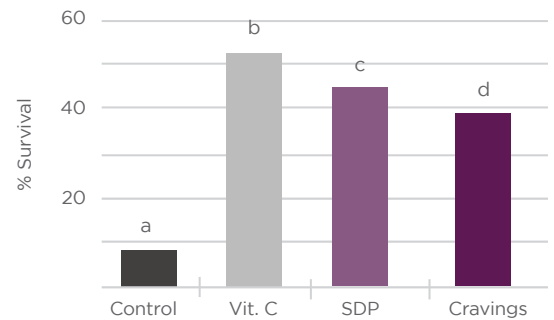
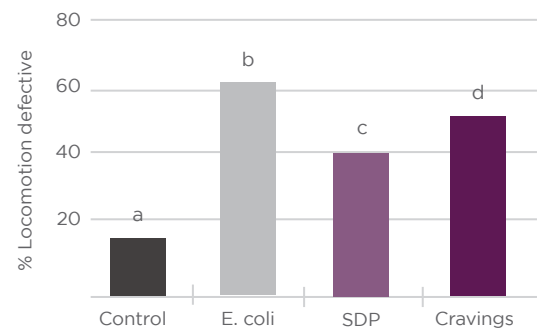


Fig. 4 Effects of Cravings on age-dependent paralysis



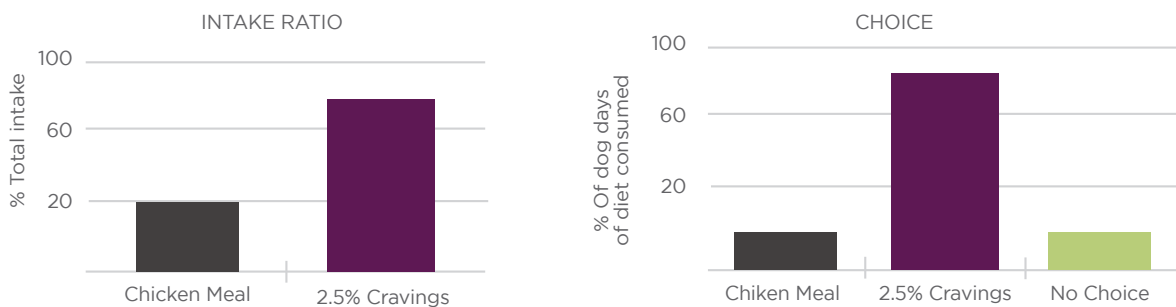


ENHANCED PALATABILITY

Foods designed for health purposes often struggle with palatability, a crucial factor in ensuring that the food can effectively fulfill its function in animals. Cravings addresses this challenge by not only supporting health but also enhancing food palatability. Research has demonstrated that Cravings significantly increases consumption when added to the kibble for dogs compared to various food products, such as chicken meal, potato protein, and pea protein².

In several studies, kibbles for dogs manufactured with either Cravings or other proteins were coated with similar levels of digest on the outside after extrusion. The addition of 2 - 2,5% Cravings resulted in striking differences: the kibbles with Cravings demonstrated an increased intake compared to the control kibbles containing proteins such as chicken meal. These findings, as shown in the following tables (Fig. 5), highlight the significant impact of Cravings on enhancing palatability. By ensuring that pets find the food appealing and are more likely to consume it regularly, Cravings helps achieve the desired health outcomes.

Fig. 5 Chicken Meal vs 2.5% Cravings



APC plasma based products represent a comprehensive solution for the pet food industry, combining significant benefits for immune health and palatability, which are crucial in a highly competitive market. Cravings is an innovative ingredient, derived from porcine plasma and subjected to an enzymatic hydrolysis process, PROVIDING highly digestible proteins and bioactive peptides with immunomodulatory and antioxidant properties. Studies have demonstrated that Cravings and SDP modulate immune responses and reduce oxidative stress in pets. Additionally, Cravings has proven to be highly effective in improving the palatability of pet foods, ensuring regular consumption and health benefits for pets.

In conclusion, Cravings and SDP offer health benefits, with Cravings providing enhanced palatability for dogs, making them both essential ingredients for forward-thinking pet food manufacturers. By incorporating Cravings, SDP or combination of both, manufacturers can provide products that meet the expectations of pet owners concerned about the long-term health and well-being of their pets.

BOTTOM LINE



References:

- Solà-Ginés, M., et al. (2024). "Nutritional, molecular, and functional properties of a novel enzymatically hydrolyzed porcine plasma product." PLOS One.
- APC internal data, 2020