

# **Fermented plant protein Protéger™ — a holistic analysis for companion animal nutrition**

Forward by Jeremy Javers, Ph.D.

Reviewed by Phil Kerr, Ph.D.

**KEYWORDS:**

Isoflavones  
Bioactives  
Protein  
Nutrition  
Fermentation



## **FORWARD to Fermented plant protein Protéger™ — a holistic analysis for companion animal nutrition**

Dr. Jeremy Javers, Ph.D. and Vice President of Technology for Houdek

Though the details have not always been apparent, fermentation of foods and animal feed has played a significant role in human civilization. Preservation of foods by fermentation is an ancient technique utilized still today in products like pickled foods, sauerkraut, yoghurt, sausage, cheese, and kimchi. However, fermentation is also utilized for the production of alcohols, antibiotics, enzymes, specialized fats and oils, nutraceuticals, prebiotics, and postbiotics.

The end result of fermentation is determined by one of three primary sources of the fermentation process — bacterial, yeast and fungal. **In addition to the sources, fermentation occurs in one of two environments — anaerobic (without air) and aerobic (with air).** Though anaerobic and aerobic fermentation are both utilized to create new, positive products, aerobic fermentation is increasingly proving its worth with extraordinary results.

***“...the past decades’  
advancements in medicine  
and nutrition have been  
obtained through aerobic  
fermentation.”***

With the 20th century’s rapid advancements in understanding genetics, DNA, biology, and biotics, better understanding of aerobic fermentation unlockeded new opportunity to develop and produce beneficial products.

*Many of the past decades’ advancements in nutrition have been obtained through aerobic fermentation.*

In aerobic fermentation, specialized tanks up to hundreds of thousands of liters in size are utilized. These tanks (bioreactors) have much stricter design and operational characteristics when compared to the tanks that operate anaerobically. Thus, aerobic bioreactors typically cost 30-50 times more than their without air counterparts. Additionally, aerobic bioreactors are operated within completely sterilized environments while anaerobic bioreactors need only be sanitized. For a different view on the difference between the two terms, think of a surgical instrument as requiring sterilization while a household dishwasher simply needs to sanitize everyday cutlery. Nevertheless, aerobic bioreactors control their processes through highly proprietary methods of mixing, feeding, oxygen, temperature and pH.

Houdek’s utilization of aerobic processes are an essential part of the success in upcycling of plant-based meals and bring previously unreachable goals of sustainability, nutrition and efficiency not only within reach, but readily and economically available!



## Fermented plant protein Protéger™ — a holistic analysis for companion animal nutrition

### Introduction:

In recent years, a significant shift has occurred in the way people perceive and treat their pets - they are now considered integral members of the family. This evolving mindset has led to increased attention on not only their emotional well-being but also their physical health.

Just as humans face health challenges, pets too are susceptible to a range of health conditions, some of which mirror those seen in their human counterparts. This shared experience has given rise to a growing focus on companion animal nutrition to address key health concerns, including weight management, cardiovascular health, and bone and muscle wellness.

***“Protéger is a high-quality protein with naturally occurring bioactives, rich in the aglycone form of isoflavones, genistein and daidzein.”***

### Weight Management:

Obesity is a concern that affects both humans and their pets. Sedentary lifestyles and improper diets can lead to excess weight gain in animals, just as they do in humans. Obesity can result in various health issues for pets, such as diabetes, joint problems, and decreased quality of life. As a result, pet owners are recognizing the importance of appropriate nutrition and portion control to maintain healthy weights for their animal companions.

Protéger, a soy protein with unique isoflavones, may ameliorate diet-induced obesity, as demonstrated in the rodent model. Studies reveal reduction in body weight, plasma lipid levels, and visceral fat area. The isoflavone forms daidzein and genistein are involved in the lipid metabolism of visceral adipose tissue and may reduce lipid accumulation.

### Cardiovascular Health:

Cardiovascular diseases, such as heart conditions and hypertension, are not exclusive to humans. Pets can also suffer from similar issues, with factors like poor diet and lack of exercise playing a role. Owners are increasingly seeking specialized diets formulated to promote heart health in their pets, often featuring ingredients that support healthy blood circulation and overall cardiovascular function.

Soy proteins, such as Protéger, are well-substantiated to support cardiovascular health, in terms of blood pressure, lipid lowering and directly affecting the progression of cardiovascular disease. Soy protein has demonstrated to support blood vessel health in dogs.



## **Fermented plant protein Protéger™ — a holistic analysis for companion animal nutrition, cont.**

### **Bone and Muscle Health:**

Bone and muscle health are critical for both pets and humans to lead active and fulfilling lives. Aging pets, like aging individuals, can experience reduced bone density and muscle strength, which can lead to mobility challenges. Providing pets with appropriate levels of essential nutrients like calcium, vitamin D, and protein becomes essential to support their bone and muscle health.

Protéger is a high-quality protein with naturally occurring bioactives, rich in the aglycone form of isoflavones, genistein and daidzein. Isoflavones usually exist in food forms as glycosides, requiring gut sugar cleavage for intestinal absorption. While reports differ on glycoside vs. aglycon genistein bioavailability, interest lies in comparing them for bone health, given aglycon's positive effects in postmenopausal women. The sugar moiety might influence gut absorption and subsequent body conjugation. Sugar moiety cleavage is essential for effective genistin (glycosylated) absorption in the intestine, whereas genistein (aglycon) absorbs quickly, starting in the stomach. Once the glucoside is hydrolyzed and absorbed, it conjugates mainly with glucuronic acid via intestinal and hepatic enzymes.

Consuming genistein in aglycon form could increase unconjugated genistein in the blood, which has stronger estrogen receptor- $\beta$  binding than glucuronide metabolites, potentially yielding a more estrogenic bone effect. For example, a study in the rodent model showed enhanced aglycon genistein efficacy on bone in an estrogen-depleted rodent model.

Lean, high-quality protein, such as Protéger soy is well substantiated for support of lean mass. High quality protein supports healthy growth and the accretion of lean mass. Muscle protein synthesis is stimulated by the presence of the building blocks of muscle, essential amino acids. Leucine, a branched chain amino acid, and its metabolite,  $\beta$ -hydroxy- $\beta$ -methylbutyrate (HMB), both activate mammalian target of rapamycin complex 1 (mTORC1) and increase protein synthesis. Protéger is distinct among competitive soy protein ingredients particularly based on its leucine content.



### **Next Horizon**

Key opportunities for companion animal nutrition lie in creating specialized diets that address these health concerns. High-quality pet food manufacturers are developing formulations that cater to specific needs, much like dietary plans designed for humans with certain health conditions. These diets often incorporate ingredients that aid in weight management, enhance cardiovascular health, and support bone and muscle strength, and their associated mechanistic actions, related to glucose and insulin metabolism.

## **Fermented plant protein Protéger™ — a holistic analysis for companion animal nutrition, cont.**

The evolving landscape of companion animal nutrition presents promising future opportunities that extend beyond the traditional realms of physical health. As pets are increasingly regarded as integral members of the family, attention is shifting towards holistic well-being, encompassing cognitive health and immune system support. However, it's important to acknowledge that these areas are complex and challenging to substantiate, yet they offer intriguing avenues for exploration and advancement.

### **Cognitive Health:**

Just as humans experience cognitive changes as they age, pets also undergo similar processes that affect their memory, learning, and overall cognitive function. While our understanding of cognitive health in animals is still developing, there is growing interest in exploring how nutrition might influence brain health in pets. Ingredients such as antioxidants, omega-3 fatty acids, and certain vitamins are being investigated for their potential role in supporting cognitive function. Designing diets that focus on cognitive health could contribute to maintaining mental acuity in aging pets, enriching their quality of life and the bond they share with their owners.

***“The evolving landscape of companion animal nutrition presents promising future opportunities that extend beyond the traditional realms of physical health. “***

### **Immune System Support:**

A robust immune system is essential for pets to fend off infections and illnesses. Just as in humans, a balanced diet is thought to play a role in supporting the immune system of animals. Research is delving into the potential impact of specific nutrients, such as vitamins, minerals, and certain bioactive compounds, on pets' immune responses. By crafting diets that bolster immune function, there's a potential to enhance pets' ability to fight off diseases and recover from health challenges.

Protéger serves as a source of essential, high-quality protein with uniquely bioactive soy isoflavones have been shown to support healthy growth and improve immunological status of animals (pigs) even under certain disease challenges including reproductive and respiratory syndrome virus.

While these opportunities hold significant promise, it's important to acknowledge the complexity of substantiating claims related to cognitive health and immune support in animals. Unlike more tangible health markers like weight or cardiovascular health, assessing cognitive function and immune responses in pets poses unique challenges. Controlled scientific studies are necessary to establish causal relationships between specific nutrients and these aspects of well-being.

As the bond between humans and their pets continues to deepen, the demand for advanced and tailored nutrition solutions will likely increase. Just as families take steps to improve their own well-being, they are extending the same level of care to their pets. This trend opens up avenues for research and innovation in the field of companion animal nutrition, ultimately contributing to healthier and happier lives for both pets and their loving owners.



**Fermented plant protein Protéger™ —  
a holistic analysis for companion animal nutrition, cont.**

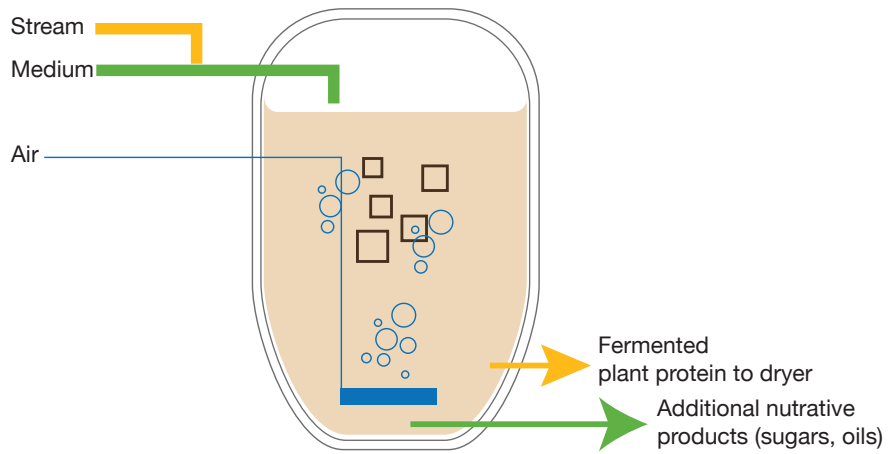
**Summary**

*Fermented plant protein Protéger contains unique bioactives. Third-party research suggests the benefits of bioactives are significant: Improved weight management, Improved cognitive health, Improved cardiovascular health (heart, muscle) and may also support cognitive and immune systems with minimal to no affect on allergenicity.*

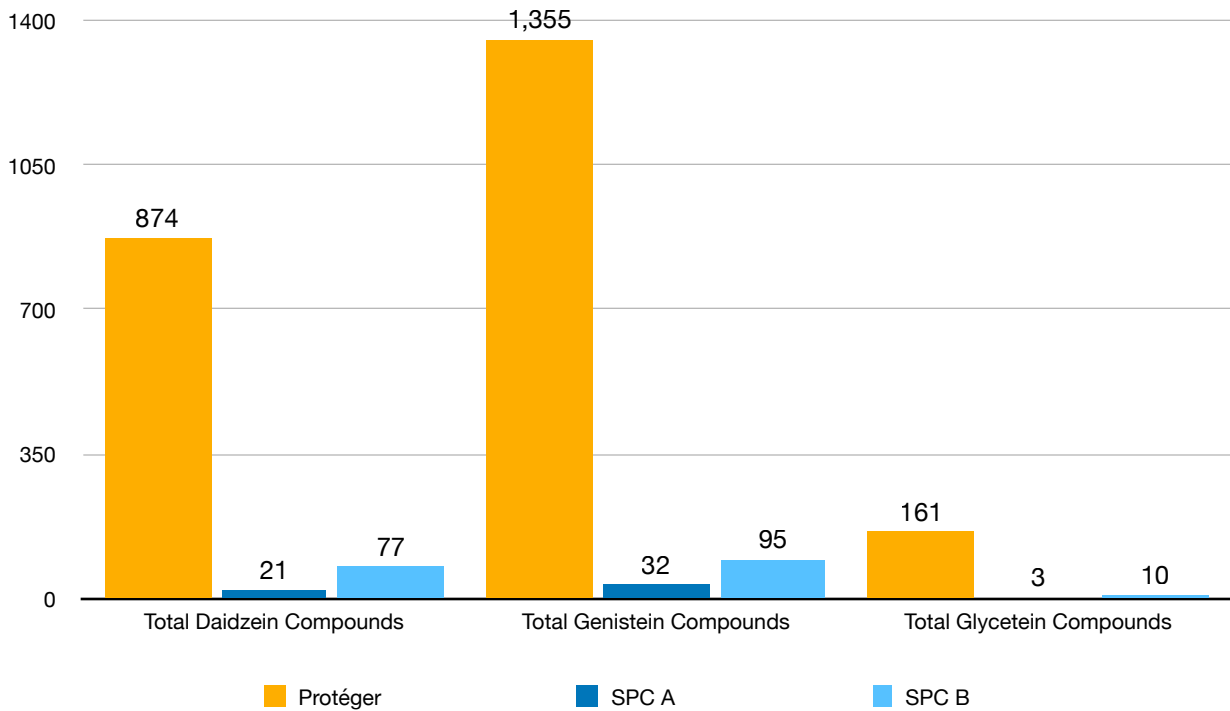


### Graphs

#### Simplified illustration of Houdek's aerobic fermentation bioreactor



#### Fermented soy protein Protéger vs commercially available Soy Protein Concentrates (SPCs)



***Protéger has substantially higher isoflavone content than leading SPCs***



### Fermented soy protein Protéger Typical Analysis

Typical composition	
Crude protein (dry matter)	76.74%
Crude protein (as fed)	74.38%
Moisture	3.59%
Crude fat (as fed)	0.76%
Crude fiber (as fed)	5.22%
Ash (as fed)	1.41%
Calcium	0.24%
Phosphorus	0.29%
Magnesium	0.04%
Iron	124.00 ppm
Copper	19.48 ppm
Zinc	43.78 ppm
AMINO ACIDS	
Alanine	3.55
Arginine	5.82
Aspartic acid	9.29
Cystine	0.95
Glutamic acid	14.48
Glycine	3.39
Histidine	1.97
Isoleucine	3.52
Leucine	6.74
Lysine	4.96
Methionine	0.87
Phenylalanine	4.28
Prolin	5.39
Serine	4.35
Threonine	3.35
Tryptophan	0.82
Tyrosine	3.16
Valine	3.87



**Fermented plant protein Protéger™ —  
a holistic analysis for companion animal nutrition, cont.**

**REFERENCES**

Tan J, et al. Soy Isoflavones Ameliorate Fatty Acid Metabolism of Visceral Adipose Tissue by Increasing the AMPK

Activity in Male Rats with Diet-Induced Obesity (DIO) *Molecules* 2019, 24, 2809; doi:10.3390/molecules24152809

Baumgartner-Parzer SM, Waldenberger FR, Freudenthaler A, Ginouvès-Guerdoux A, McGahie D, Gatto H. The natural antioxidants, pomegranate extract and soy isoflavones, favourably modulate canine endothelial cell function. *ISRN Vet Sci.* 2012 Nov 26;2012:590328. doi: 10.5402/2012/590328.

Izumi, T.; Piskula, M. K.; Osawa, S.; Obata, A.; Tobe, K.; Saito, M.; Kataoka, S.; Kubota, Y.; Kikuchi, M. Soy isoflavone aglycones are absorbed faster and in higher amounts than their glucosides in humans *J. Nutr.* 2000, 130, 1695– 1699

Pawlowski JW, Martin BR, McCabe GP, Ferruzzi MG, Weaver CM. Plum and soy aglycon extracts superior at increasing bone calcium retention in ovariectomized Sprague Dawley rats. *J Agric Food Chem.* 2014 Jul 2;62(26):6108-17. doi: 10.1021/jf403310q.

Kamei Y, Hatazawa Y, Uchitomi R, Yoshimura R, Miura S. Regulation of Skeletal Muscle Function by Amino Acids. *Nutrients.* 2020 Jan 19;12(1):261. doi: 10.3390/nu12010261.

Smith BN and Dilger RN. Immunomodulatory potential of dietary soybean-derived isoflavones and saponins in pigs *J. Anim. Sci.* 2018.96:1288–1304. doi: 10.1093/jas/sky036

For more information:

Sue Lancaster  
Chief Commercialization Officer  
Sue.Lancaster@HoudekNature.com

Phillip Kerr, Ph.D.  
Chief Technology Officer  
Phil.Kerr@HoudekNature.com

Jeremy Javers, Ph.D.  
VP of Technology  
Jeremy.Javers@HoudekNature.com



# Protéger's isoflavones add extraordinary value pet feeds

