

The impact of food/feed composition on canine behavior

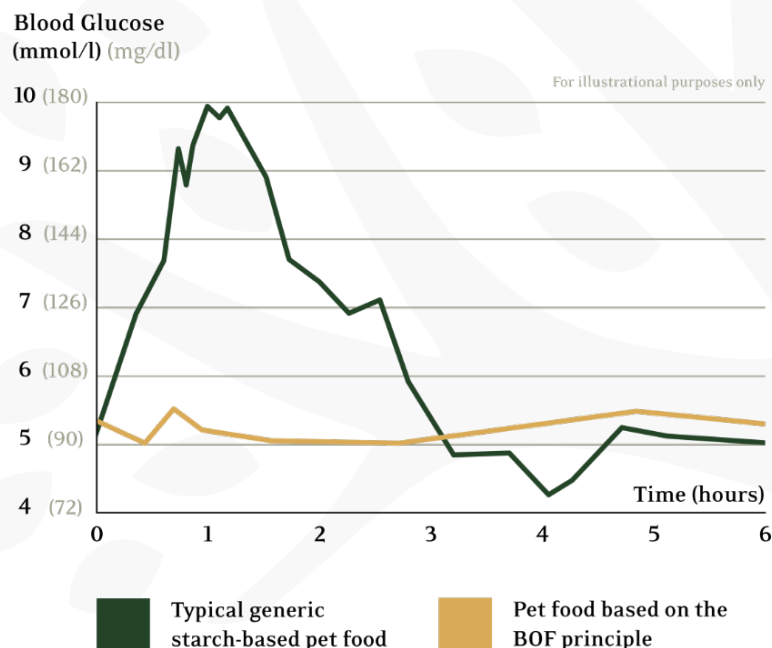
We all can feel the impact of the food and beverages we ingest. Coffee, Sugar and Cocoa are the 7., 8. and 9. most traded commodities around the world respectively. All 3 substances are known for their mood altering qualities [FOREX-2022]. Not only the mood altering substances, but the impact of specific amino acids, fatty acids, carbohydrates and other micro nutrients on the neurotransmitters of humans are well established [Wurtman-1982].

Dogs have similar functions regarding neurotransmitters and their behavior are direct results of their presence and quantity. Especially serotonin plays a crucial role in canine behavior [Leon-2012], [Cocco-2023]. So does glycemic load [Graham-2002]. Low serotonin and high cortisol levels are correlated to aggression and unhealthy social behavior of dogs [Rosado-2010], [Leon-2012].

Unlike humans, dogs depend on the food we provide them with and cannot choose ingredients according to their mood swings and psychological needs. We define their mood and behavioral patterns through our choices. This has a major impact on the social level, especially aggression towards other animals and humans, sometimes with grave consequences like injuries, loss of body parts, psychological trauma or death. Also, many dogs are abandoned, given to the shelters or put down because of their behavioral problems, which is not just a heart-breaking, un-ethical reality, but also a health hazard and economical and psychological burden.

The BOF concept (Behavioural Optimizing Foods) is based on these facts, where the recipes of the dog feed are formulated and adjusted according to the nutritional needs of a healthy mind and psyche, not just to fulfill FEDIAF* requirements and guidelines. The aim is to deliver the highest quality protein, well balanced amounts of fat and carbohydrates, high amount of fibre and slow, but steady energy production to ensure function and satiation.

*European Pet Food Industry Federation (FEDIAF)



What are the key nutritional factors affecting dog behavior?

01 Neurotransmitters

We know how neurotransmitters; especially serotonin, which play major role in behavior and aggression; are impacted by nutrition [Bosch-2007]. Especially amino acid levels and their absorption rates have a major impact [Bosch-2007], [Leon-2012], [Cocco-2023].

The regular influx of key amino acids Tryptophan (Essential) and Tyrosine (Convertible) can help serotonin levels to become stable [Markus-2008] [Aquili-2020] [Barik-2020]. At ESSENTIAL FOODS, higher than average levels of protein assures a high amino acid intake. Well balanced levels of carbohydrates and fats assure better break down of the proteins in the stomach and a slower, more efficient digestion. High starch/high fat, low protein diets are less likely to provide adequate amounts of Tryptophan, which is already a scarce amino acid [Barik-2020].

02 The importance of Fibre, Proteins and Carbohydrates

Fibre is a key factor on satiation for dogs [Bosch-2009], since it has a direct impact on ingested food's passage time and therefore absorption speed. The slow absorption of carbohydrates, amino acids and fatty acids keep the blood sugar levels more stable and increase the positive demeanor in dogs [Graham-2002] ESSENTIAL FOODS strives to keep the Fibre level high at ~4% average, whereas regular extruded dog food is around 1.8-2%.

The reason why most dog food manufacturers prefer not to have more fibre lies in acceptance/taste of the food.

Proteins; or rather amino acids; are the dominant macro building block and energy source for most of the dog breeds. As discussed above, serotonin levels depend on regular influx of amino acids [Markus-2008]. Slower/longer digestion time compared to the basic starches and monosaccharides reduce the glycemic load, therefore insulin spikes and mood swings. Slower digestion also help with longer satiation, therefore less aggression [Bosch-2007].

Carbohydrates; especially starches; play a major role in behavior, depending their Glycemic Load [Graham-2002].

Glycemic Index is a measure of the blood glucose-raising potential of the carbohydrate content of a food compared to pure glucose. Glycemic load on the other hand is obtained by multiplying the quality of the carbohydrate given in the food by the amount of carbohydrate served in the food. This means, GI is used as an estimation of capacity, whereas GL is an estimation of total effect [Higdon- 2003].

Once fibre enters the equation, the GI and GL get's a different perspective, since the total capacity of increasing blood sugar levels are spread over time.

ESSENTIAL FOODS use sweet potato as the starch source, known for it's varying sized starch granules from small to big [Ye-2020], which require more amylase and time for proper digestion, slowing down and regulating plasma level sugar and insulin levels [Qi-2016]. All extruded dog feed depend on starch for it's form and production. Choosing different

starch sources changes the nutritional and digestive characteristics of the feed.

Here are some comparisons in terms of basic constituents between ESSENTIAL FOODS and other similar brands on the market. Please note, declaration of total carbohydrate is not mandatory according to FEDIAF's and European Union's labeling guidelines. When compared with metabolizable energy numbers, the amount of total carbohydrates can be calculated, which have an impact on behavior as discussed above.

BRAND	CRUDE PROTEIN	CRUDE FAT	FIBRE
ESSENTIAL NAUTICAL LIVING	29%	14%	4%
ROYAL CANIN ADULT DOGS LARGE	25%	17%	1.8%
EUKANUBA LAMB & RICE	23%	13%	2%
PURINA PRO PLAN MED ADULT EVERYDAY NUTRITION	26%	16%	2%
SKINNERS WORKING 23	23%	10%	2.2%
PEDIGREE ADULT GRILLED CHICKEN, RICE AND VEGETABLES	21%	10%	4%

Table 1: Comparison chart for ESSENTIAL FOODS and competing products. The competitors' products are chosen randomly from their websites.

The comparison chart above (Table 1) clearly shows how macros and fibre content can vary drastically. As the quality/price of the product goes down, so does the amount of protein. The increase in carbohydrates are a necessity to make up for the loss of calories for cheaper or more profitable product.

Conclusion

ESSENTIAL FOODS are well aware of the impact of every nutrient and ingredient used to produce their dog feed. The BOF claim reflects the commitment not just to the physical health, but the mental health and behavior patterns that not just affect the dog, but all the loved ones around. From choosing the ingredients to fine tuning the macros, BOF is a major factor in decision making.

References

[Aquili-2020] L. Aquili. The Role of Tryptophan and Tyrosine in Executive Function and Reward Processing, International Journal of Tryptophan Research, October 2020

[Barik-2020] S. Barik, The Uniqueness of Tryptophan in Biology: Properties, Metabolism, Interactions and Localization in Proteins, International Journal of Molecular Science, November 2020

[Bosch-2007] G. Bosch, B. Beerda, W. H. Hendriks, A. F. B. van der Poel and M. W. A. Verstegen Impact of nutrition on canine behaviour: current status and possible mechanisms, Cambridge University Press: 01 December 2007

[Bosch-2009] G. Bosch, A. Verbrugge, M. Hesta, J.J. Holst, A.F.B. van der Poel, G.P.J. Janssens, W.H.

Hendriks. The effects of dietary fibre type on satiety-related hormones and voluntary intake in dogs. Cambridge University press 2009

[Cocco-2023] R. Cocco, F. Arfuso, C. Giannetto, G. Piccione, A. Cesarini, G. Pulina, S. Sechi. A Preliminary Study on the Interplay between the Serum Levels of Neurotransmitters and Thyroid Hormones for the Evaluation of the Behavioral Phenotype of Dogs Animals 2023/ Animal Welfare

[Graham-2002] P.A. Graham, I.E. Maskell, J.M Rawlings, A.S. Nash, P.J. Markwell. Influence of high fibre diet on glycaemic control and quality of life in dogs with diabetes mellitus, Journal of Small Animal Practice, volume 43, 2002

[Higdon-2003] J. Higdon, Glycemic Index and Glycemic Load, Linus Pauling Institute, Oregon State University, 2003

[Forex-2022] Forex. Com, Rhyon Thaxton, 21.10.2022
<https://www.forex.com/ie/news-and-analysis/top-ten-most-traded-global-commodities/>

[Jane-1994] J. Jane, T. Kasemsuwan, S. Leas, H. Zobel, J.F. Robyt Anthology of starch granule morphology by scanning electronmicroscopy, Starch/Staerke 1994

[Leon-2012] M. Leon, B. Rosado, S. Garcia-Belenguer, G. Chacon, A. Villegas, J. Palacio. Assessment of serotonin in serum, plasma, and platelets of aggressive dogs Journal of Veterinary Behavior Vol 7, Issue 6, 2023

[Markus-2008] C. Rob Markus. Dietary Amino Acids and Brain Serotonin Function; Implications for Stress Related Affective Changes, NeuroMolecular Medicine 2008

[Qi-2016] X. Qi, R.F. Tester. Effect of native starch granule size on Susceptibility to amylase hydrolysis, Starch/Staerke 2016

[Rosado-2010] B. Rosado, S. Garcia-Belenguer, M. Leon, G. Chacon, A. Villegas, J. Palacio. Blood concentrations of serotonin, cortisol and dehydroepiandrosterone in aggressive dogs, Applied Animal Behaviour Science, March 2010

[Wurtman-1982] R.J. Wurtman. Nutrients that modify Brain Function, Scientific American, April 1982

[Ye-2020] F. Ye, Physiochemical properties of different-sized fractions of sweet potato starch and their contributions to the quality of sweet potato starch, Food Hydrocolloids volume 108, November 2020, Elsevier