Functional Foods in Pets and Humans

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ABSTRACT

The role of functional foods in pet diet with a perspective link with human nutrition is the object of our study. Veterinary pet trials clearly indicated that functional foods provide health benefits when administered on a regular basis with adequate active principles in the context of a well balanced diet. Our work hypothesis is that domestic animals might be a suitable model to validate, in some human diseases, a specific food mediated approach for disease prevention and treatment, engaging the whole gut reactivity (ie, enteric hormones, chalones, cytokines, immune gastrointestinal system, lymph flow, and neurotransmitters) to rebalance the health endogenous environment.

Objective: We evaluated and analyzed the role of functional foods in pet diet in order to extend the link of food consumption in human nutrition.

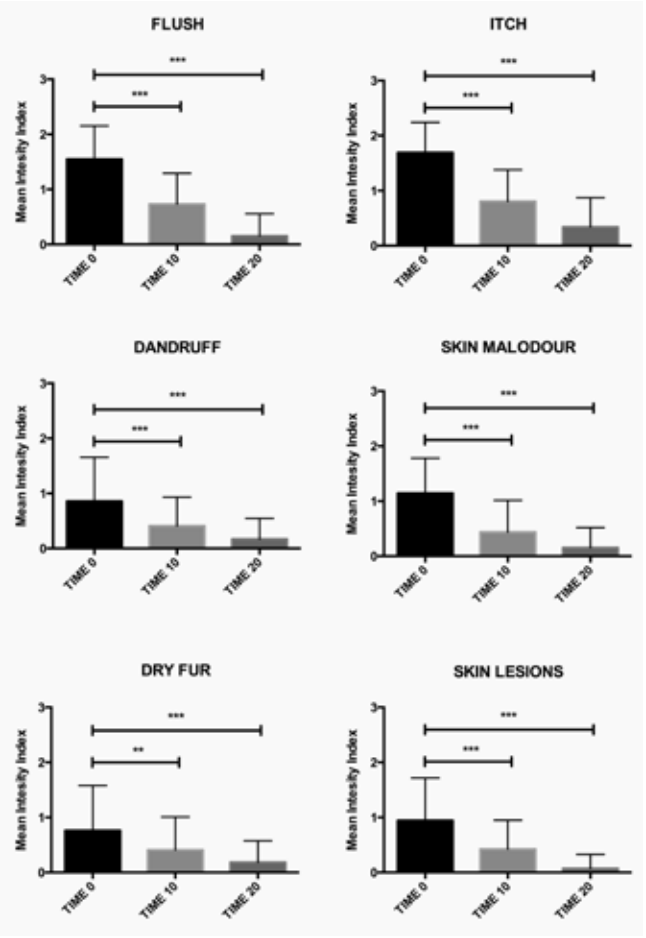
Methods: We analyzed some specific nutrients in pets on the basis of historical literature reports claiming some effectiveness in cancer prevention. Other ongoing focused areas are metabolic and immunological imbalance and chronic joints inflammatory conditions.

Results: Humans and pets might have a very intriguing borderline mutual benefit in the functional food area. The activation of the digestive system involves so many changes and modifications in gastrointestinal physiology and in biochemical parameters, such as glucose and insulin, that some striking effects on health maintainance and diseases prevention are expected.

Conclusion: Based on the achieved information, we encourage the "humanization" of domestic animals as suitable models to study dietary interventions for disease prevention and treatment, keeping the concept that, being the human life span 7-8 times longer compared with the animals. Once, the efficacy of the functional foods can be in very short time transferred from the animals with undeniable advantage on the life quality and

Figure 1. *Food related atopic dermatitis in a dog. (A) Before treatment with the nutraceutical product; (B) after 20 days treatment.*

Figure 2. *Schematic representation of mean intensity symptom trends at 0, 10 and 20 days of intervention; **p < 0.01; ***p < 0.001*



overall survival.

BACKGROUND

Some foods and some food components have been identified as "functional" because they provide health benefits beyond the provision of essential nutrients such as vitamins and minerals, when they are consumed on a regular basis at effective levels as part of a varied diet.[1] The role of functional foods in human nutrition started with investigations in dogs and cats regarding nutritional genomic and proteomic studies in order to better understand the metabolism, thus optimizing companion animal nutritional and health status.[2] A human-pet comparison with regards to nutrition begins with the observation that pet owners provide their pets with alternative foods (such as natural diets, raw food diets or and vegetarian diets) as if they were family members.[3] This evidence supports the concept that pathophysiological studies on pet nutrition and lifestyle might provide a valuable insight in preventing risks and illnesses regarding the family to whom the pets belong to.

Based on this nutritional philosophy, we describe here three examples of functional foods giving remarkable benefits to specific very common dogs diseases, affecting the human beings as well.

From the following pet animals studies we support the concept that a similar nutraceutical approach might be

advantageously extended in the people market, being the food itself a medicine accordingly with Hippocrates ancient greek doctor.

CASE 1 PRESENTATION

Atopic dermatitis (AD), a chronic and relapsing common eczematous skin disease, affects both humans and dogs and requires a combination of treatments. However, current therapeutic options are unsatisfactory in both species.

Seventy-one dogs of different breeds (mean age ± SEM; 6.01 ± 0.11 yr and mean weight ± SEM; 35.04 ± 1.04 Kg; 54% males, 46% females) with clinical AD symptoms (flush, itch, dandruff, skin malodour, dry fur, and skin lesions) were supplied with a regular amount of nutraceutical product over a 20 days period (Fig 1).

The food was a standardized mixture of fish,[4] potato,[5] and natural compounds (Aloe Vera,[6,7] Arctium lappa,[8,9] ,Malva sylvestris,[10-13] and Ribes nigrum[14,15] named FORZA10 Dermo Active™. Dogs received four veterinary inspections, before intervention (time 0); after 10 days (time 10) and at the end of intervention (time 20). Forty-five dogs (63.4%) were previously fed an industrial diet: 22 (31%) a mixed one (both industrial and home-made) and 4 (5.6%) a home-made one.

Results clearly demonstrate that our nutraceutical approach halved the intensity of all investigated symptoms, related to AD, within 10 days since the beginning of the trial (Figure 2). After 20 days, the overall intensity of each symptom wad dramatically reduced.

CASE 2 PRESENTATION

The figures of human otitis externa are supposed to be 4/1,000 persons annually in USA.[16] In the chronic expression, it affects 3-5% of the same population, [17-20] whereas in the acute, which is unilateral in 90 % of cases, it affects people ranging from 7 to 12 years and declines after 50 years.

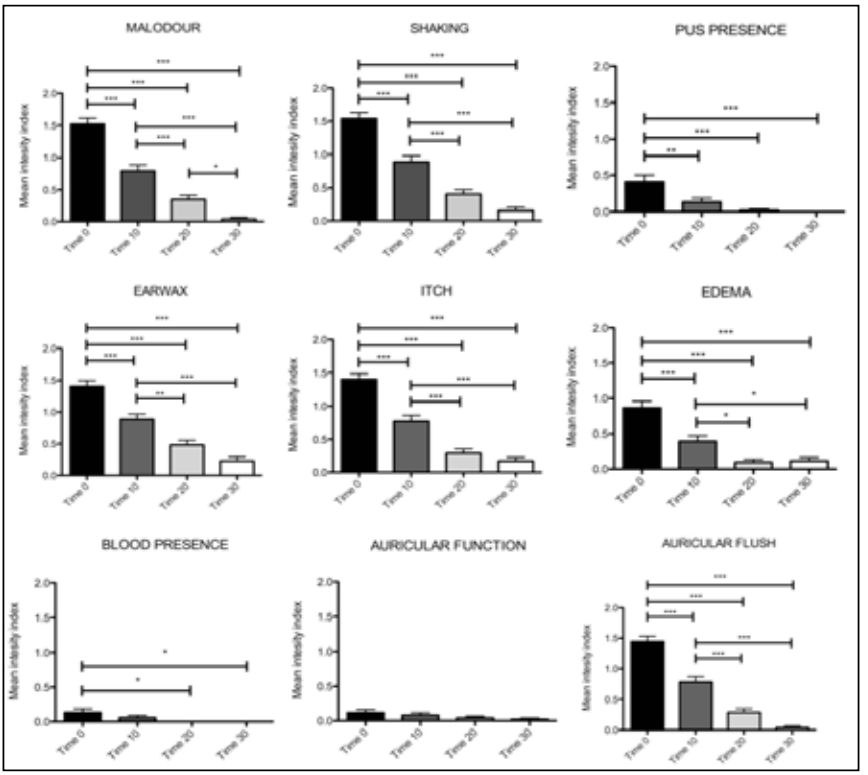
Figure 3. *Food related otitis media in a dog. (A) Before treatment with the nutraceutical product; (B) after 30 days treatment.*

The acute expression of otitis associated with local trauma, warmer temperatures, high humidity, hearing aids, hearing protector use, and swimming.[21] The most common cause of otitis externa is infection (mainly bacterial and occasionally fungal)[22] due both to increased ceruminal pH level,[23] helping the microbial growth,[18,21,22,24] and/or an insufficient amount the same.[21,22] Clinical symptoms start with pruritus, pain, and erythema. As the disease progresses to a moderate stage, the erythema increases and is followed by edema and otorrhea. The untreated disease progresses to a more severe stage, the pain becomes intense, the lumen of the canal obstructed, ending into auricular cellulitis, parotitis or adenopathy with finally conductive hearing loss.[3,6,7] However otitis externa is also one of the more frustrating pathology affecting also pets.[25] Current antimicrobial therapy rely on polymyxin B and miconazole, which resulted to be effective against the main bacterial pathogens (*Staphylococcus spp, Pseudomonas aeruginosa, Escherichia coli* and *Proteus mirabilis*).[26-29]

One hundred seven dogs of different breeds (mean age ± SEM; 6.03 ± 0.15 yr and mean weight ± SEM; 32.01 ± 1.17 Kg; 54.2% males, 45.8% females) with evident clinical chronic otitis externa symptoms received a regular amount of nutraceutical food over a 30 days period (Figure 3).

The nutraceutical product consisted in a standardized mixture of fish and natural compounds (*Melaleuca alternifolia*,

Figure 4. *Schematic representations of the trend of the symptoms intensity index at 0, 10, 20 and 30 days of intervention; *p < 0.05; **p < 0.01; ***p < 0.001.*



Echinacea purpurea, Tilia platyphyllos scapoli et cordata, Allium sativum L., Rosa canina L. and *chelated Zinc*) named FORZA10 Oto Active™. Dogs received four veterinary inspections, before intervention (time 0); after 10 days (time 10); after 20 days (time 20); and at the end of intervention (time 30). Sixty four dogs (60%) were previously fed an industrial diet:; [35] (32%) a mixed one (both industrial and home-made); and [9] (8%) a home-made one.

Our study clearly demonstrated that clinical benefits were achieved for each symptom, except for auricular function, within 10 days of dietary intervention.

Diet is a significant therapeutic option for dogs with otitis who become generally quite aggressive and definitely refuse topical treatments. The product that we used can be considered a useful tool to manage such inflammatory condition (Figure 4).

CASE 3 PRESENTATION

Food allergic reactions, which may include signs of cutaneous and gastrointestinal disease, usually occur following ingestion of the food allergen to which the individual is sensitive, causing immediate and late-phase reactions. Adverse reactions to food (ARF) are known to manifest primarily with gastrointestinal symptoms,[30,31] and are also associated with irritable bowel syndrome, or might be a mechanism for symptoms in a subgroup of afflicted patients.[32-34] Typical signs of food-related gastrointestinal disturbances in humans, for instance, are emesis, diarrhoea, abdominal pain, urticaria angioedema, asthma, rhinitis and, in severe cases, anaphylaxis,[35,36] and are usually treated avoiding food allergens, although supportive medical treatment can be beneficial for severe reactions.[37]

Food allergies are known to cause both

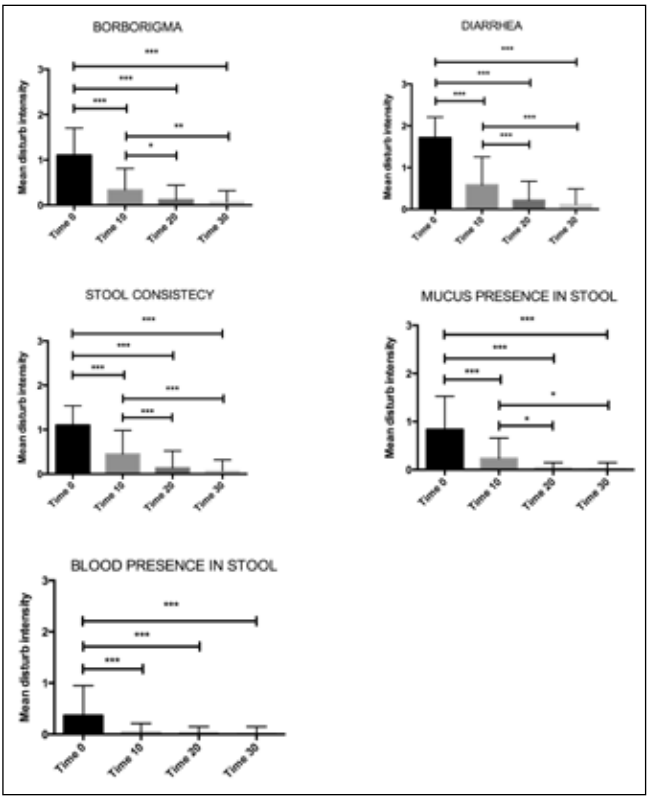
dermatologic and gastrointestinal disturbances in dogs.[33,37-39] Most common food allergens in dogs are lamb, poultry, dairy products, egg, barley, wheat, beef, and fish.[40-43] The gold-standard method to diagnose an adverse food reaction consists in limiting the antigen exposure for a 8-10-week period, and then reintroducing the diet previously fed to demonstrate a relapse of symptoms.[44]

Both home-cooked and commercial diets contain a single source of protein and a single source of carbohydrate, which are usually not used in maintenance diets thus reducing the probability that animal had ever come into contact with them before.[45] A valid alternative to novel protein diets are the hydrolysed protein based ones, because they are made of protein fragments with molecular weights of < 10 kDa that confer higher digestibility and lower allergenicity.[46]

Sixty dogs of different breeds (mean age ± SEM; 6.08 ± 0.14 yr and mean weight ± SEM; 32.05 ± 1.12 Kg; 55% males, 45% females) with clinical gastrointestinal disturbs (dehydration, appetite loss, regurgitation, emesis, abdominal pain, flatulence, borborygma, diarrhea, weight loss, stool consistency, blood, and mucus presence in the stool) were supplied with a regular amount of nutraceutical product over a 30-day period.

Results clearly demonstrated that the nutraceutical product halved the intensity of each gastrointestinal disturbances within 10 days since the beginning of the trial (Figure 5a-5b). Moreover, after 20 days, the overall intensity of each symptom was dramatically reduced.

Figure 5a. *Schematic representations of the trend of the symptoms intensity index at 0, 10, 20 and 30 days of intervention; *p < 0.05; **p < 0.01; ***p < 0.001.*

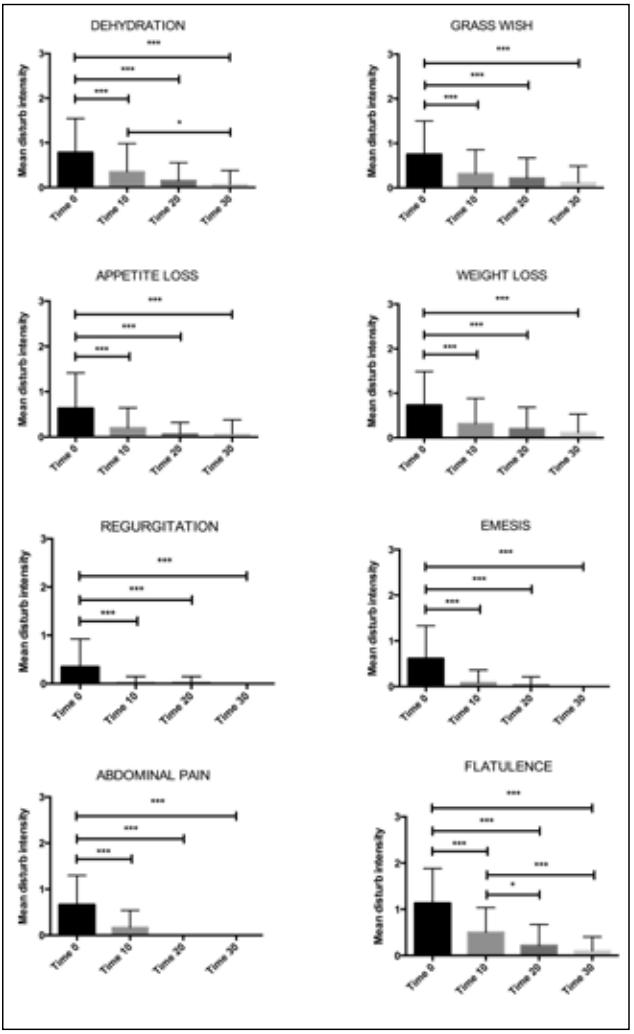


CONCLUSIONS

The lesson of functional foods administration to the dogs might prospectively be addressed to human beings in a very short time. Chronic food ingestion might in fact modify the genetic background and prevent or treat many diseases, rather than acute drugs administration attempting at modifying the body imbalance due to the illness process, without interfering with the organism which is supposed to be simply an innocent bystander.

Functional foods, on the contrary, involve an active interaction between the digestive apparatus and the defense against pathogen agents or morbility causes on a very much integrated basis. In fact, the gut absorption is a complex effector pathway with intrinsic healing properties related to gut hormones liver and biliopancreatite

Figure 5b. *Schematic representations of the trend of the symptoms intensity index at 0, 10, 20 and 30 days of intervention; *p < 0.05; **p < 0.01; ***p < 0.001.*



enzymes secretion haemodynamics, and lymphodynamics modification namely to microcirculation activity, gut cellular, and soluble immune systems, cytokines, microbiota neural network and neutrotransmitters.

Such a complex involvement is quite appealing for health restoration process and our scientific strategy will go deep into this fascinating potential based on the natural resources of herbs plants, fruits and microbes.

LIST OF ABBREVIATIONS

AD = atopic dermatitis

ARF = Adverse reactions to food

COMPETING INTEREST

We achieved from the Sanypet company the food for our studies free of charge, but the whole investigation has been run without financial support exclusively as animal model for future development of similar nutrients in the humans.

AUTHORS' CONTRIBUTIONS

ADC, FC, GG and BP conceived of the study, and participated in its design and coordination and helped to draft the manuscript; SC carried out the animal food administration and veterinary visits. All authors read and approved the final manuscript.

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