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THE RAW DOG FOOD – ADVANTAGES AND DISADVANTAGES

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ABSTRACT

In recent years, raw foods have become increasingly popular in the world, for the dog's owners. Contradictory data on this type of diet have been reported in the literature. Some authors note that the use of raw foods has a beneficial effect on the health of the dog, while others point to the food safety and health risks of both the dog and the owner. The purpose of the current survey is to analyze current data on the advantages and disadvantages of raw foods, known as "Bones and Raw Food" or "Biologically Appropriate Raw Food" (BARF)/„Raw meat-based diets" (RMBDs).

Key words: raw food, BARF, RMBDs, dog.

Introduction

Ever since ancient times, the dog has been present in our society. His role in human life is fundamentally changing, leading to a change in his function. It gradually comes to his domestication and the dog turns from a wolf's offspring into a pet. According to the literature, the first steps to domesticate a dog date back more than 30,000 years ago. The result of the progressive change in dog's function is the significant change in his digestive system (Fan et al., 2015).

According to McNamara (2006), the first dogs were fed mainly animal scraps, bones, and other edible animal parts that were not consumed by the humans.

Bosch et al., (2015) noted that the digestive system of the domestic dog has many anatomical and physiological similarities to that of other members of the family Canidae, including the gray wolf.

The feeding of representatives of the Carnivora order, Canidae family

To the Carnivora order, Canidae family, various species of predators belong, most of which hunt in social groups, and rarely alone (foxes for example). Of all the representatives of this taxonomic unit, only the dog is fully domesticated (Clutton-Brock, 1998). Both the domestic dog with the Latin name (Canis lupus familiaris) and the gray wolf (Canis lupus) belong to the Carnivora family Canidae (Wilson and Reeder, 2005). The dog as a classical representative of a predatory order has some specific anatomical features, such as a simple stomach, a short digestive tract, and canine teeth. (Kendall et al., 1982; Peterson and Cuicci, 2003; NRC, 2006).

An interesting fact is that the diet of most of the representatives of this order consists mainly of meat, but it should be borne in mind that in addition to the strictly carnivorous representatives, there are omnivorous and entirely herbivorous animals, which are also classed as predators. (Clutton-Brock, 1998).

Also, over the years, the dog undergoes serious breeding, which in turn leads to serious differences between modern breeds of dogs and their ancestors (Meyer et al. 1999).

The raw foods

The use of raw foods is a widespread practice in feeding carnivorous species, but especially in zoo animals. This diet includes giving raw meat alone or in combination with other foods. The scientific studies on the raw foods and their impact on dogs' health status are scarce, because the major surveys in the literature, are conducted with animals from the Felidae family (Vester et al., 2008; Vester et al., 2010a, 2010b; Kerr et al., 2012; Kerr et al., 2013; Hamper et al., 2015; Iske et al., 2016)

Food production for human consumption and the pet food industry are often linked and follow similar trends. The demand for food with a positive impact on human health is increasing, which also require an increase in the demand for pets (Beaton, 2013). Many owners consider dogs and cats to be members of their family, which inevitably leads to higher food requirements for their pet. (Freeman et al., 2013). According to Michel (2006), the choice of food for family members and for the pet may be influenced by the different factors, such as cultural differences, habits, status in the community, and more.

The raw foods answer to some of these criteria and allow dog and cat owners to feed their pet with an alternative diet other than commercially available dried and canned foods. The owner's motivation for food choices is different. The main causes are the raw materials safety, the lack of heat treatment, foods that are closest to the nutrition of their pet's ancestors (Michel, 2006; Freeman et al., 2013).

The raw foods are found under various abbreviations in the world literature: Raw meat-based diets – (RMBDs) or as (BARF) with two definitions of "Biologically Appropriate Raw Food" or "Bones and Raw Food". Regardless of the name used, these foods contain raw animal ingredients from farm or wild animals and they can be prepared either at home or commercially available. The commercially available raw foods are offered packaged and they usually are chilled, frozen or lyophilized (Freeman et al. 2013).

As early as 1982, Dr Pitcairn began making recommendations for the inclusion of raw foods in the pet's menu. In his book "Dr. Pitcairn's Complete Guide to Natural Health for Dogs & Cats, (Pitcairn 1995) advises dogs and cats owners to replace industrially produced foods with home-made foods with more 'natural' ingredients.

In a UK study, Davies, et al. 2019, registrate a growing interest and demand for raw foods for dosg and cats. Their data shows that the lack of heat treatment of these foods is again a leading motive for owner's choice. the positive effects of food on the digestive system and intestinal microflora are also mentioned. In addition to the aforementioned benefits of the BARF, the authors also point out some problems associated with this diet like the presence of pathogenic microorganisms and parasites in the food. According to them, the microbial contamination also carries a risk to human health and may also be a prerequisite for the emergence of antibiotic resistance of certain strains of microorganisms.

BARF's advantages

Raw pet feeding data appeared in non-specialized publications in the 1990s and early 2000s (Billinghurst 1993, Freeman & Michel 2001). Again, the main motive is to feed dogs and cats more naturally.

Towell (2008) and Freeman et al. (2013) find that the BARF foods have a better effect on animal health than industrially produced foods. They claim that this diet can improve the condition of teeth and skin, prevent some diseases and lead to positive changes in animal behavior.

According to (Bond et al. 1990) dental caries, dental pathologies, muscular atrophy and ill health can be observed in some animals as a result of feeding them food that has undergone heat treatment, especially food rich in processed plant foods.

(Dierenfeld et al. 2002) state that the feeding carnivorous animals with whole raw animal parts satisfies all their nutritional needs and also has a positive effect on their behavior. other authors defend their thesis that the consumption of raw meat leads to an increase in some crude substances of animal origin. These enzymatic substances can improve the intestine health, stimulate microbial commensal growth, and optimize intestine immune function (Plantiga et al. 2011).

Another advantage of the RBMD's foods, cited by many authors, is their much better digestibility in the animal's digestive system compared to that of the commercial diets. There is a lot of literary date to support this claim. Another great advantage of the raw foods that the authors show, is the lack of heat treatment (Kendall et al., 1982; Hendricks et al., 1999; Vester et al., 2008; Vester et al., 2010a, 2010b; Kerr et al., 2012; Kerr et al., 2013; Hamper et al., 2015; Iske et al., 2016).

There is literary data for nearly 4 decades proving that the extrusion reduces food digestibility (Kendall et al., 1982; Björck et al. 1983). A clinical trial with cats by Vester et al., (2010b) prove this claim. The results of their study show that BARF-fed wild cats have a higher digestibility of crude protein, than cats fed high-protein dry foods. Hamper et al. (2015) also found better digestibility of the nutrients of BARF food, compared to canned foods with very similar nutritional composition.

Hendriks et al. (1999) investigated the relationship between heat processing of food and amino acids in the cat intestines. According to them, the high temperature during the producing of canned cat food reduces the absorption rate of the natural ileal amino acid.

The data from these studies support the use of BARF in order to better nutrient digestibility compared to the extruded or canned foods. The observed differences in the digestibility of different types of foods may not be entirely due to the lack of heat treatment and but to their different composition Kerr et al., 2012.

As an advantage of BARF we can mention the reduced amount of feces. According to some authors, the carnivores fed BARF usually consume less food and exude less faeces than the animals fed extruded foods (Crissey et al., 1997; Vester et al., 2010b; Kerr et al., 2012).

In relation to demonstrating the beneficial effects of raw foods on dog's health, Schmidt et al. (2018) examined the presence of gluconic acid in dogs fed BARF. Their results show that much more gluconic acid is found in samples taken from dogs fed BARF than in those fed with dry food. The gluconic acid stimulates lactic acid bacteria in the intestines and plays the role of a prebiotic (Asano et al. 1994; Tsukahara et al. 2002). This acid is mainly found in the raw meat (Ramachandran et al. (2006).

When it comes to the risk assessment and the safety of pet foods, mycotoxin contamination, which caries a serious risk to the health of dogs and cats, must also be borne in mind (Boermans and Leung 2007; Aquino and Correa 2011).

Many of commercial dried and canned pet foods contain quantity of cereal ingridients that can be a source of mycotoxins (Moss, 1996; Brera et al., 2006). These components can also contain heavy metals, due to the fact that their bioaccumulation in plants is higher (Pitcairn 2005). In this

regard, the absence of cereals components in raw foods is one of their advantages. (Billinghurst, 1993).

BARF's disadvatages

In recent years, feeding on raw foods has become more and more popular among pet owners (Michel, 2006). This practice is the cause of a number of contradictions as it caries a potential risk to both human and animal health (Freeman et al., 2013). Most studies of animal feeding are focused primarily on microbial contamination (Lenz et al., 2009). The contamination of raw food with microorganisms is in most cases not a cause for clinical signs of disease in healthy animals. The main problem is the excretion of these pathogens with the animal's faeces, which caries a risk to the human health (Carter and Quinn, 2000; Lenz et al., 2009). Another issue discussed in the publications related to the pets feeding raw foods is the incorrect ratio of ingredients, which could be a prerequisite for a deficiency in certain nutrients (Kawaguchi et al., 1993; Niza et al., 2003; Polizopoulou et al., 2005; Taylor et al.,2009; Zeugswetter et al., 2013).

The opponents of BARF feeding comment that in the process of the dog and cat domestication, the cat remains a strictly carnivorous animal, while the dog is adapted as an omnivorous species. That's mean that the dog's diet may include ingridients with animal and plant origin, wich can be digested and metabolized in his gastrointestinal tract (de-Oliveira LD et al. 2008).

Freeman et al., (2013) consider that one of the major risks of the pets feeding with raw food is the emergence of pathogenic microorganisms, parasites or other contaminants, that may have a negative impact. According to Jenkins et al., (2016) one of the main disadvantage of BARF foods is microbiological contamination with bacteria or viruses. They pay particular attention to *Salmonella spp*., Escherichia coli, Listeria, Clostridium and Campylobacter spp., because these bacteria are related to farm animals, which are a source of raw materials for barf food.

LeJeune and Hancock, (2001) discuss various types of control measures related to the prevention of bacterial contamination of meat products, used in practice, such as carcass washing, etc. In their view, however, these practices are not enough to completely eliminate all potential contaminants in the raw meat. In addition, the contamination of the meat with bacteria, viruses and parasites may go unnoticed during the health check, if changes are not obvious.

Dogs, as generation of predators, have many physiological and anatomical adaptive mechanisms that allow them to tolerate relatively high levels of microorganisms in their diet. As a consequence, usually they do not have clinical symptoms, when they consume the food with the high number of bacterial contaminants (NRC, 2006; Lenz et al., 2009). When these microorganisms are excreted with the dog's faeces, there is a real risk to human health, because these pathogens can cause various diseases in humans (Lenz et al., 2009). The presence of *Salmonella spp.* in the faeces of clinically healthy dogs, regardless of their diet, varies between 1.0 and 18.0%, but it is suggested that much higher levels of *Salmonella spp*. are required to spread the infection (Sanchez et al., 2002).

Again, according to Freeman et al., 2013, the different types of bacteria found in the raw foods can cause disease in dogs, but the most endangered are the immunocompromised or very adult animals (Freeman et al., 2013). The exposure to stress or antibiotic treatment can lead to changes in the intestinal microflora, which can increase the risk of infection with the microorganisms too. (LeJeune and Hancock, 2001).

When it comes to raw food contamination with microorganisms, the most commonly discussed pathogen is *Salmonella spp.* In most cases, it is an asymptomatic carrier that may acquire clinical

symptoms in the event of immune system breakdown (Gruenberg, 2015). The excretion of pathogens by faeces, not only *Salmonella spp.*, is increased in dogs and other animals during illness. It should be borne in mind that dogs fed BARF may increase the excretion of pathogens with faeces. This applies not only to *Salmonella spp.* but also to other pathogens (Cummings et al., 2010; AVMA, 2012).

Clinical cases of salmonellosis in domestic animals caused directly or indirectly by raw food feeding, have been described in the scientific literature (Striver et al., 2003; Morley et al., 2006).

The results of a survey by Joffe and Schlesinger (2002) with a group of dogs showed that not a small percentage of dogs fed BARF, gave a positive fecal sample for *Salmonella spp.*, and nearly 80% of the raw foods tested contained *Salmonella spp.*

Similar are the results of a clinical study by Fredriksson-Ahomaa et al. (2017). with dogs and cats fed RMBDs and dry foods. By PCR, they found *Salmonella spp*. sporadically in some of the faecal samples, but only in animals fed raw food. However, the source of the infection and the route of transmission is not identified. According to the authors, given that this diet is becoming more sought after and popular, the potential risks for pets and their owners should be minimized.

In the scientific literature, together with microbial contamination, a frequently asked question is the extent to which the raw foods are balanced. The available commercially raw foods and home-made foods can be dangerous to animal health if they cannot provide the necessary macronutrients. Dillitzer et al., (2011) summarizes data from a survey conducted in Germany among the pet owners who feed their dogs and cats with raw food. The data show that more than half of the BARF foods tested are unbalanced in terms of some important macro and micronutrients. The owners participating in the study are not indicate any negative effects on their pets related to the unbalanced diet. According to the authors, this is because some of the symptoms may not have been noticed, or the nutrient deficiency may have gone unnoticed during the course of the study.

Dog's health and BARF

One of the founders of BARF Nutrition Dr. Ian Billinghurst claims that BARF-fed pets are healthier and long-lived. According to him, these animals are much more prone to arthritis, pancreatitis and cancer (Billinghurst 1993).

Freeman et al., (2013) also discuss in detail the dog's health dangers associated with BARF. They express their doubts about the nutrient balance of these foods and the health implications of them.

In relation to the imbalance of BARF and the harmful effects on the dog's health, is an earlier study by Freeman, but in another team. The authors use raw, home-made and commercially diets in which they find an incorrect ratio of calcium and phosphorus, and a deficiency or excess of some fat-soluble vitamins (Freeman and Michel 2001).

The similar are the results of Taylor et al. (2009), who traces a clinical case of a growing dog with type 1 rickets and nutritional secondary hyperparathyroidism fed with unbalanced RMBD's.

Freeman et al., (2013**)** also pay attention to the higher fat content in the BARF, compared to the dry or canned foods, which can have a positive effect on the shine and strength of the fur, but can lead to gastrointestinal problems as well overweight.

Schmidt et al. 2018 examine the feeding with Barf and from a slightly different perspective, namely how it affects the dog's metabolism and fecal microbiome. They found that the different food composition significantly changed the microbiome of the faeces of the tested animals, but also

that the dogs fed BARF show much more severe dysbiosis, than those fed industrially produced foods. According to the authors, this is due to the presence of a large amount of *Clostridium perfringens, Coli bacteria, Streptococcal bacteria*, at the expense of reducing Feacalibacterium bacteria.

According to Knight and Leitsberger (2016) every owner must pay particular attention to the animal's health and weight in order to make the right food choice for his pet. Regular visits to the veterinarian should not be overlooked and it is also good to check the information provided on the food label

Regulatory documents related to the BARF safety

Nutrient requirements

The National Research Council (NRC) is the premier source of nutritional recommendations for the of dogs and cats feeding, on which the Association of American Feed Control Official's (AAFCO) is based. For the territory of the United States of America, AAFCO establishes mechanisms for the development and implementation of uniform laws, ordinances, standards in the field of pet foods (Baldwin et al. 2010)

Some developed countries create their own nutrition guidelines that are related to both local law and the AAFCO. For the territory of Europe, such is the Fédération Européenne de l'Industrie des aliments pour animaux familiers (FEDIAF), also known as the European Pet Food Industry. Other similar organizations are the Pet Food Association of Canada (PFAC) for Canada and the World Veterinary Animal Association (WSAVA), which make nutritional recommendations for pet feeding worldwide (Freeman et al. 2001).

National Research Council (NRC)

And on the territory of our continent well known in the dog and cat food industry are the National Research Council (NRC) standards. The NRC is staffed by pet nutritionists who determine the nutrition requirements for cats and dogs. Based on these nutrition guidelines, nutritional standards have been established for dogs and cats, the most recently issued since 2006. (NRC, 2006)

American Association of Feed Control Officials (AAFCO)

Their guidelines have also been created by experts in the field of pet nutrition, but also representatives from industry and academia are involved. In the United States, guidelines provided by the American Association of Feed Control Officials (AAFCO) are binding and are followed in all states.

The European Pet Food Industry /Fédération Européenne de L'Industrie des Aliments Pour Animaux Familiers (FEDIAF)

For Europe, these are some of the best known and best guidelines. Although they are not mandatory, the most pet food manufacturers adhere to and comply with them. These guidelines are based on the latest trends and information about the cats and dogs feeding. The FEDIAF provides instructions on determining the nutritional value of food, the proper labeling of food in accordance with legislation, helping to produce a safe end product for pets and their owners. In addition, they provide tips in regard to their feeding.

Pet food – European and national legislation

According to the European legislation, all types of pet food are subject to control by the responsible institutions in the territory of the country concerned. Pursuant to the Law on Veterinary Activity (amended, SG No. 13 of February 14, 2020). Art 7. (1) (Amended, SG No. 8/2011, effective 25.01.2011) item 3. and Art. 220 (amend. – SG 8/11, in force from 25.01.2011) (1) item 3 and item 4, for our country this control is within the competence of the Bulgarian Food Safety Agency (BFSA).

The production of safe and quality pet food is one of the basic principles that guides their producers, and compliance with European and national legislation is a key moment in achieving these aims. The animal nutrition legislation in our country is based on the European Union (EU) legislation, as the Essential Requirements are for hygienic food production and a safe end product for which the manufacturer cans perform a complete traceability.

For the EU member states, more than 50 are regulatory documents that apply to pet foods (FEDIAF 2018). Some of the main ones are:

1. REGULATION (EC) No 183/2005 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCILof 12 January 2005 laying down requirements for feed hygiene

This Regulation lays down the working standards that all pet food manufacturers must follow. The Regulation summarizes the requirements for feed hygiene with regard to:

- Facilities and technological equipment
- Staff
- Production
- Hazard Analysis Critical Control Points (HACCP)
- Transport and storage
- Record keeping and traceability
- Complaints and product removal

2. REGULATION (EC) No 767/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCILof 13 July 2009on the placing on the market and use of feed, amending European Parliament and Council Regulation (EC) No 1831/2003 and repealing Council Directive 79/373/EEC, Commission Directive 80/511/EEC, Council Directives 82/471/EEC, 83/228/EEC, 93/74/EEC, 93/113/EC and 96/25/EC and Commission Decision 2004/217/EC

This regulation lays down the food safety requirements, labeling rules, packaging and presentation, as well as the responsibilities of the manufacturer. Point 3 of Annex II to that regulation also mentions terms related to pet feeding.

Most raw materials used in the BARF production are based on animal by-products Category 3 that are unfit for human consumption. In our country and in other European countries, animal by-products are controlled by **REGULATION (EC) No 1069/2009 OFTHE EUROPEAN PARLIAMENT ANDOFTHE COUNCILof 21 October 2009laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation).**

This Regulation lays down rules for the use of animal by-products and their derivatives in order to prevent and minimize the risks to public and animal health arising from such products, and in particular to safeguard the safety of the food chain.

3. COMMISSION REGULATION (EU) No 142/2011of 25 February 2011implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at the border under that Directive

Annex XIII, Chapter II lists the general and specific requirements for the pet food production, as well as the microbiological standards for *Salmonella* and *Enterobacteriaceae*.

Conclusion

The information in the literature review is quite controversial. The issue of food safety with regard to microbial contamination and the balance of certain nutrients is discussed in detail. The aforementioned benefits of the raw foods and the potential beneficial effects on the dog's health have been little studied. It is necessary to perform in-depth studies to get a safe end product. The aim is that the choice of the increasingly popular BARF diet does not cary a risk to the health of both the dog and his owner.

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