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# Evolutionary Versus Evidence-Based Diets

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## Abstract

Evolutionary diets are diets perceived by pet owners as mimicking the natural diet of the wild ancestors of pets. Evolutionary diets may induce serious malnutrition in the hands of pseudo-experts in nutrition. Such problems are highly unlikely to occur in science-based diets, including balanced evolutionary diets, even though the scientific evidence for pet nutrition is rather limited in many aspects. In view of that, scientists should not disregard the traditions and intuitions of experienced, observant dog and cat people.

## Introduction: Why Scientists Do Not Like Evolutionary Diets

The mentioning of so-called evolutionary diets, such as BARF (biologically appropriate raw food), a prominent evolutionary diet consisting of bones and raw food, to small animal nutrition scientists induces the same reaction all over the world: eye rolls, contemptive laughter, annoyed and ironic remarks, in short, a general expression of being fed up with this nonsense. Nutritionists point out the obvious differences between wolves or wild cats and pets in appearance, lifestyle and even metabolism, such as the development of the ability to digest starch during domestication in dogs.<sup>1</sup> We mention the different goals of evolution (reproduction) and pet owners (a long, healthy life, mostly without reproduction). We point out that there is a difference between nature and paradise and that mortality rates may be around 30% in the adult wolf population.<sup>2</sup> We explain that if there is hardly a free-living wolf with a broken tooth, this is not due to wolves never breaking teeth but to wolves starving to death if they do. We refer to the hygienic risks involved, and we report cases of serious malnutrition on such diets.

All this came to my mind when I was asked to give this presentation. Then, I started wondering why scientists react this way. In some cases, the animal suffering by malnutrition of evolutionary diets, such as the induction of skeletal diseases in growing puppies, does not entirely explain the annoyance expressed in this context by nutritionists. Why do the myths and beliefs in context with evolutionary diets make us so angry? Nutrition is extremely complex and giving science-based appropriate nutrition to dogs and cats is short of impossible for lay people. Believing in a “back to nature — evolutionary — what the wolf eats diet”

## Glossary of Abbreviations

**BARF:** Biologically Appropriate

Raw Food

**NRC:** National Research Council

simplifies nutrition. For the believer, this feels like taking a shortcut to knowledge in nutrition that is then perceived as superior to science. This naïve simplification is not unique to nutrition. It leads to unsubstantiated

beliefs and prejudices in many situations. In part, it is attributed to the expansion of human knowledge in general.

Individuals cannot possibly keep up with new knowledge in all areas of expertise. This leads to an increase of “not knowing” in all areas with the possible exception of one’s own specialization. Taking a shortcut around the complexity of the scientific knowledge outside their own expertise and using naïve-simplified ideas relieves the individual from feeling ignorant.<sup>3</sup> In social media, lay people may create a virtual pseudo-expertise around such ideas that multiplies the impact of unsubstantiated beliefs on numerous subjects including nutrition. This kind of pseudo-expertise if applied in practice in nutrition often leads to severe malnutrition and the crippling or killing of animals. It is not surprising that this approach to nutrition annoys the educated nutritionist who goes the opposite way and tries to understand all the details and complexities of his specialty.

## Definition: What Is an Evolutionary Diet?

At first try, it seems rather easy to discriminate between science-based and evolutionary diets. The evidence-based diet takes into account scientific knowledge on the nutrition of the species and life stage of the individuals that are going to eat it. By contrast, the evolutionary diet tries to include certain features of the diet of wolves or wild cats, such as feeding raw and/or to avoid/reduce certain feeds that are perceived as not being major ingredients of natural diets. An evolutionary diet for dogs and cats can be defined as a diet that is perceived by the owner to be as close to the natural diet of the wild ancestors of our pets. This, however, does not mean that scientific knowledge cannot be taken into account as well. It is possible to create a complete and balanced BARF diet without using a “chemical” supplement. It also is possible to buy the ingredients for this diet as human food grade and to handle them in accordance with scientific hygiene rules. Such a diet would then be a science-based evolutionary diet.

Can we transfer the principles of evidence-based medicine to nutrition? The first step in this approach says: “Formulate a clear clinical question from a patient’s problem.”<sup>4</sup> For dietary

treatment of a clinical problem, such as food allergy or chronic kidney disease, this works quite well. The same is true for evaluation of the potential effects of a nutraceutical. But, for a general nutritional approach, what would be our question? What is the best diet for dogs or cats? That is too comprehensive. However, we can break it down into many questions, such as:

- Are energy and nutrient requirements met by the diet?
- Are there nutrient excesses and, if so, are they safe?
- Are there interactions between nutrients or ingredients that alter requirements or tolerance?
- Are there hygienic risks?
- Is there a possibility for feed contamination?
- Are there effects of industrial processing? Are we losing essential or functional substances or reducing their availability? Are new substances produced, and, if so, what are their effects?
- Is there anything new that we may have overlooked, such as the microbiome or epigenetic effects of nutrition?
- Are there behavioral and psychological effects?

The second step would be to “search the literature for relevant ... articles,” and the third one would be to “evaluate (critically appraise) the evidence for its validity and usefulness.” For the latter, there are guidelines ranking meta-analysis as highest, clinical studies second, case reports third, and finally experts’ opinions and experiences. Within these types of evidence, there are indicators for quality, such as the inclusion of control groups, blinding, statistics, and quality of description of treatment. Finally, we “implement useful findings in clinical practice” or, in our case, in feeding practice.

The problem of transferring this concept to general nutrition is not just the comprehensive character of the questions. In medicine in many diseases you can treat a problem or you can choose between treatments. In many cases you can even abstain from major intervention. The major effects expected from the treatment are presumed to be positive. Then, you have to balance potential risks and side effects against positive effects of the treatment. In general, nutrition is different; obviously, abstention from feeding or eating is never a long-term solution. The biggest point, however, is that nutrition can rarely do more than help an organism to function to the best of its potential. By contrast, errors in nutrition can reduce the ability of an organism to function. It is impossible to make a team of Dachshunds win the Iditarod by giving them optimal nutrition, but it is quite easy to stop the best Husky team from winning by malnutrition. Nutrient deficiencies and excesses, insufficient food hygiene, and food contamination can cause life-threatening or crippling diseases. So, in the first place, good nutrition is the absence of the above-mentioned problems and not the addition of something “healthy.” Another point is that with foodborne diseases, you may not even know what you are looking for. There is something new or highly unexpected from time to time, such as the recent melamine problem.<sup>5</sup>

This creates another problem with the evidence-based approach used for medicine. You cannot possibly postpone intervention in the case of a nutritional risk until there are a number of studies

that justify meta-analysis. With the melamine contamination, I would rather presume that for a responsible pet food producer a phone call from an expert that alerts to a potential problem should be sufficient to induce action. In many countries, it would be illegal to wait for meta-analysis before starting damage control. The same is true when other potentially harmful problems come up, such as the lower availability of taurine in canned diets or adverse effects of nutrients. That means we need a different approach in evidence-based nutrition with regard to risk management. We need to reformulate the point. If there is a potential risk in a food, then we need excellent scientific evidence that it is safe before we disregard it.

In evidence-based medicine, there is usually a caution that even if you apply correctly the rules laid down for this approach, you can end up with information that is wrong.<sup>6</sup> Good examples for the truth of this statement are requirement figures, especially for companion animals. They are usually the product of a literature meta-analysis done by a committee of experts in the field. The results are estimates based on the current scientific knowledge. They are prone to change with scientific progress. There are numerous examples for quite substantial alterations of requirement figures in the National Research Council’s (NRC) 2006 Nutrient Requirements of Dogs and Cats,<sup>7</sup> which are not just of academic interest. These include zinc requirements of growing dogs eating high-phytate, high-calcium food, taurine requirements of cats and certain dog breeds, potassium requirements of cats eating acidifying diets, and tyrosine requirements for maximal black hair color. The individual variation of maintenance energy requirements has not been embraced by science until rather recently.

Another excellent example for scientific progress is the change of the paradigm that nutrient requirements are a function of body weight and energy and that protein requirements are a function of metabolic body weight. We now presume that all nutrient requirements are more or less a function of metabolic body weight. For a Great Dane, this may mean a reduction of maintenance requirements of nutrients by 50%. Another point is the intervals between updating reference books for nutrient requirements, which in pet nutrition, so far, are in the range of decades. The number and quality of studies on which requirements and safe upper limits are based is just scary. Like in other specialties, looking critically at the scientific evidence on which we base our nutritional knowledge is a sobering experience.<sup>6</sup> Comparing the gaps in our knowledge and the titles of presentations on recent congresses, I cannot help wonder whether we pick the right questions in our research on pet nutrition.

## **Do We Know Enough on the Effects of Processing?**

With regard to the question of evolutionary diets, the effects of food processing need to be discussed. They go way beyond nutrient availability. At present, there is high interest in the effect of food on the gut microbiota. Starch of different origins in its various stages of processing is an excellent example for very different effects of the same nutrient on digestion including the

gut microbiota. Although cooked cornstarch is highly digestible by amylase, raw cornstarch is more a source of fermentable carbohydrate and raw potato starch has an extremely low digestibility and fermentability in the gut of cats.<sup>8</sup> The different starch types altered not only starch digestibility but also digestibility of other nutrients and fecal parameters indicative of microbial activity, such as pH. In other species, even smaller differences of feed processing have been demonstrated to have strong effects on the microbiota. In pigs, altering particle size of the same feed had strong effects on caecal parameters and even the prevalence of *Salmonella*, which was lower in pigs eating feed with larger particle size.<sup>9</sup> In pigs, particle size can interact strongly with the effects of probiotics.<sup>10</sup> In addition, particle size can have a strong effect on satiety and glycemic response in humans.<sup>11</sup> A counteracting effect of home cooking on population obesity is a well-known feature in human nutrition.<sup>12</sup> It is presumably multifactorial and includes psychological aspects, but effects of processing, such as smaller particle size, may be among the factors. The effect of home cooking on the incidence of overweight appears to exist in dogs too. There is a surprisingly low incidence of overweight of 11.5% in dogs eating BARF diets.<sup>13</sup> The same was true for dogs eating vegetarian diets<sup>14</sup> (incidence of overweight 8%), and it also is true in our clients' dogs that eat predominantly completely or partly home-cooked diets.<sup>15</sup>

There are strong effects of processing on the interactions of food with the immune system. Processed foods may lose or gain allergenicity. Depending on the individual eating the food, both effects are possible in the same food.<sup>16</sup> Maillard products (reaction products of amino acids and sugars) have numerous adverse and some beneficial effects in various species,<sup>17</sup> but this has not been investigated predominantly in carnivores. Maillard products are mainly, but not exclusively, produced during heating. Feeding raw or home-cooked food will reduce the intake of such products. In this context, it is worthwhile to mention that a large number of people feeding BARF diets to their dogs and consulting our service tell us that they do so because the dog otherwise shows either gastrointestinal problems or skin lesions consistent with food intolerance. Another example that there may be a difference between eating a "natural" product or something "artificial" is antioxidants. Fruits and vegetables have been presumed to be healthy foods for a long time, and scientific data have even confirmed a protective effect against cancer.<sup>18</sup> Eating antioxidants, which were perceived as potential mediators of this effect of fruit and vegetables, did not have the same effect and may even promote cancer.<sup>19</sup>

## The Pet Owners' Question

The question for the dog owner when deciding whether to use a science-based diet is not: "Did the scientists do their best?" but rather "Can they do a better job than other experts?" As mentioned above, it is rather easy to beat pseudo-experts fantasizing about wolves' diets. Science-based nutrition will certainly not cripple or kill animals by inducing feeding mistakes that are

scientifically known for decades, such as calcium or thiamin deficiency. There are, however, people other than the above-mentioned pseudo-experts with nonscientific knowledge of nutrition that is based on tradition, experience and intuition. They are not so easy to beat with scientific knowledge. Such a person having the intuition, for instance, the gut feeling that something is wrong, sees an effect without knowing what he or she sees.

An excellent example is the physical appearance of the laminitis-prone horse. Experienced horse people can identify such a horse just by looking at it, but mostly they do not know how they can tell that from the appearance of the horse. In his excellent research on insulin resistance in horses, David Kronfeld and his working group pointed out that laminitis-prone horses have a typical fat distribution with lots of crest fat and stem fat.<sup>20</sup> Laminitis-prone horses are usually easy keepers, a desirable quality for hardworking and military horses. There is, in fact, a description of the appearance of the easy keeper by the Greek cavalry officer Xenophon that is nearly 4,000 years old.<sup>22</sup> Until today, traditional judgment of the appearance of a "good" horse includes this kind of fat distribution. Especially in leisure horses that do not work hard, being an easy keeper and laminitis-prone are not good qualities anymore, and the goals of breeding need to change accordingly. In a changing environment and with changing lifestyle, science can definitely beat tradition. In scientific horse nutrition, we often end up with results that confirm old military rules on horse feeding, which were obtained by generations of cavalry men.<sup>23</sup>

The number of people owning dogs or caring for dogs who have experience with dogs comparable to the horse sense of cavalry men is relatively limited to small groups, such as experienced mushers, hound masters, professional dog handlers of drug, rescue or police dogs, and some dog breeders. Until very recently, cats were partly independent from humans feeding them, which precludes a long tradition. Cat breeders and technicians in cat colonies or homes for rescue cats may acquire lots of experience. The traditional and intuitive knowledge of such people can be a valuable resource in improving pet nutrition. It may include positive experiences with some features of evolutionary diets. Part of our job is shifting the grain of traditional and intuitive knowledge of experienced animal owners from the chaff of unsubstantiated myths and beliefs of virtual pseudo-experts.

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