Raw Meat Based Diets: What’s the Evidence?
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Popularity of Raw Meat Based Diets
In the United States and Australia, raw food or bones were reported to be fed at least daily as part of the main meal in 9.6% of cats and 16.2% of dogs. Another 0.9% of cats and 7.4% of dogs received raw meat or bones as a treat or snack at least once weekly. Interestingly, these survey results were collected prior to the melamine pet food recall of 2007. It is reasonable to hypothesize that feeding practices amongst pet owners has changed over the last decade. Raw freeze-dried pet food retail sales increased 64% in 2014 from US$25 million to US$40 million while raw frozen pet food increased 32% from US$52 million to US$69 million. Given the increasing popularity of commercial raw pet food products, it is likely veterinary professionals are encountering pets fed a raw meat-based diet (RMBD) or treat commonly in practice.

Nutritional Adequacy of Raw Meat Based Diets
The nutritional adequacy of commercial RMBDs can be determined based on the Association of American Feed Control Officials (AAFCO) guidelines for formulation or by feed trial. RMBDs labeled for intermittent or supplemental feeding are not nutritionally complete and balanced. The use of whole prey diets may be used by some owners feeding a RMBD. Whole 1-3 day old chicks and adult ground chicken were found to meet macronutrient requirements but were deficient in some mineral requirements, including manganese, copper, potassium and sodium compared to AAFCO requirements for adult cats. These diets were not evaluated for vitamin content. Research kittens consuming a diet solely of whole raw ground rabbit developed dilated cardiomyopathy secondary to taurine deficiency resulting in the death of one kitten. The diet of a prey animals (e.g., chicks, mice, or rabbits) sold for pet consumption may also influence their nutrient profile. Home-prepared diets, raw or cooked, can be obtained by owners through a number of sources including the Internet, pet magazines, and books written by veterinarians and non-veterinarians with varying levels of nutrition training. Several studies have evaluated the nutritional adequacy of home-prepared diets in companion animals finding numerous and significant nutritional imbalances. Evaluation of 200 published home-prepared recipes for adult maintenance in dogs written by veterinarians (64.5%) and non-veterinarians (35.5%) revealed at least one essential nutrient deficiency according to National Research Council or AAFCO guidelines in the majority of diets (95%) while 83.5% of recipes had multiple deficiencies. Analysis of 77 home prepared bone and raw food rations for dogs in Germany found that 76% had one or more nutritional imbalances. Alternatively, a home prepared raw food diet formulated by a now board-certified veterinary nutritionists and commercial raw food diet were determined to be nutritionally adequate based on a 10 week AAFCO feeding trial in kittens.

Animals may develop clinical signs associated with nutrient deficiency or toxicity when consuming an unbalanced diet cooked or raw, commercial or home prepared. Nutritional secondary hyperparathyroidism has been reported in both cats and dogs consuming unbalanced home diets manifesting as spontaneous fracture, muscle twitching, seizures, and limb deformities. A dog consuming an unbalanced home prepared diet with multiple deficiencies including calcium, phosphorus, and vitamin D developed tetanic seizures and hyperthermia during evaluation of bilateral humeral osteochondritis dissecans. Other reported nutrient imbalances resulting in clinical signs include metabolic osteopathy with extensive new bone formation from hypervitaminosis A in a cat consuming raw pork liver, pansteatitis in cats secondary to vitamin E deficiency while consuming a high poly-unsaturated fat raw diet, and hyperthyroidism in dogs consuming raw beef gullet with thyroid tissue.
Potential Benefits of Raw Meat-Based Diets

Owners may choose to feed a RMBD to their pets due to anecdotal health benefits and to provide a more natural or ancestral diet. Many of these benefits remain unproven, although the body of scientific evidence surrounding RMBDs is limited. Cats and wolves in the wild will consume a variety of prey to support survival and reproduction, and some owners may choose to mimic this diet closely. However, this same type of diet may not be optimal for domestic animals expected to live long and healthy lives primarily indoors and reproductively altered.

Some owners may report a benefit of smaller stool volumes, less fecal odor, and improved gastrointestinal health in cats and dogs fed home-prepared or commercial RMBDs. Several studies have demonstrated a high digestibility of RMBDs fed to both exotic and domestic cats when compared to extruded diets. Digestibility of dry matter, organic matter, crude protein, and gross energy was significantly higher in a commercial and homemade raw food diet compared with a canned heat-processed diet in domestic kittens.

Cats consuming whole ground rabbits had significant improvements in stool quality compared to cats consuming a commercial diet. Another study found no difference in total tract energy and macronutrient digestibility in cats fed a commercial raw beef-based diet or the same diet cooked in the microwave to at least 160°F. Significant differences have been noted in the fecal microbiota of cats fed a raw diet consisting of 1-3 day old chicks compared to a chicken-based extruded diet although these differences could not be only attributed to the raw vs extruded nature of the diets as the nutrient composition differed.

Heat processing of pet foods can result in Maillard reactions responsible for the browning of foods when heated. This reaction causes decreased bioavailability of lysine and formation of Maillard reaction products (MRPs) and advanced glycation end-products (AGEs) which may have harmful biological effects. A study found that dog and cats had an average daily intake of one MRP 122 and 38 times higher respectively than the average daily intake for adult humans. Further studies are needed to investigate the long-term health implications of this in dogs and cats.

The Infectious Potential of Raw Meat-Based Diets

Commercial and home prepared RMBDs may be contaminated with potentially harmful pathogens. The concern for public and animal health has led organizations such as the American Veterinary Medical Association and the American Animal Hospital Association to discourage the use of RMBDs. Studies have documented the presence of bacterial contamination in both commercial and home prepared RMBDs. A study by the United States Food and Drug Administration (FDA) in 2011-2012 found that out of 196 commercial RMBDs, 7.7% were positive for Salmonella spp., and 16% positive for Listeria monocytogenes. A study examining 25 commercial raw canine and feline RMBDs found contamination with Clostridium perfringens (20%), Escherichia coli (64%), Salmonella spp. (20%), Clostridium difficile (4%), and Staphylococcus aureus (4%) based on culture. Twenty-three percent of RMBDs for dogs contained extended spectrum cephalosporin-resistant E.coli. Salmonella in raw meats sold for human consumption has reported rates of 44% in chicken and 4% in beef and pork, therefore it is not surprising to find contamination in raw pet food. While the presence of Salmonella is allowed on meat for human consumption by the USDA, the FDA maintains a zero-tolerance policy on Salmonella in pet foods. The FDA lists 26 dog and cat food recalls from 2015 (expanded recalls are counted as 1 with the original recall), with the vast majority from RMBD. Eleven treat products were recalled, 10 of these from Salmonella contamination. Seven of the recalled treats due to Salmonella contamination were beef products including beef gullet, tripe, trachea, jerky, and bone. Twelve of 15 complete and balanced recalled commercial diets were
RMBD. Seven RMBDs were recalled for Salmonella, 1 for Listeria monocytogenes, 3 for both Salmonella and Listeria, and 1 for thiamine deficiency.

Once fed a RMBD containing Salmonella, cats and dogs have been shown to shed the bacteria in their feces. Kittens fed a home prepared and commercial raw food diet had significantly higher globulin levels and red blood cell microcytosis compared to kittens consuming canned heat-processed diet. Positive fecal Salmonella Heidelberg and Clostridium difficile toxin was noted in the raw diet groups. Lab work changes were suggested to be associated with known enteropathogenic exposure. Seven of 16 dogs fed a known Salmonella-contaminated single meal shed the bacteria in their feces within 7 days of exposure. None of the dogs fed the Salmonella-contaminated meal experienced clinical signs. Feeding a commercial or home prepared RMBD is also a risk factor for antimicrobial-resistant Salmonella spp. and E. coli in the feces of dogs. In addition to the zoonotic potential, animals may be clinically affected. Three of twelve cats fed a raw food diet of whole or ground 1-3 day old chicks developed clinical salmonellosis (anorexia and diarrhea). Significant differences in the fecal microbiome were noted in the symptomatic cats including the detection and increased proportions of other potentially pathogenic bacteria. Salmonella bacteriuria was reported in a cat with lower-urinary tract signs fed a Salmonella-contaminated uncooked granular diet by a company that manufactures RMBDs. Septicemic salmonellosis in two cats resulting in death after being fed a diet containing uncooked beef has also been reported. In one of the cases, Salmonella newport was isolated and found to be identical to the bacteria isolated in the diet.

Clinical Recommendations
Veterinarians should evaluate a RMBD for nutritional adequacy and inform pet owners of the possible risks and known benefits associated with feeding a RMBD. The potential for human and animal disease with commercial and home-prepared RMBDs is well documented. Food utensils, feeding bowls, litter boxes, the diet, feces and animals with bacteria present in their mouths or on their coat are all sources of potential pathogen exposure for people. The risk of pathogen contamination is particularly a concern among elderly, young, pregnant, lactating, or immunocompromised pets and people. The author advises pet owners feeding a RMBD to inform those coming into contact with their pet of this risk. Policies to protect veterinary staff and hospitalized animals from pathogens shed in feces are recommended when treating an animal consuming a RMBD. The FDA also has resources on safe handling tips for pet food and treats including recommendations to owners who choose to feed a RMBD. Consultation with a board-certified veterinary nutritionists or individual with similar training for owners wanting to home prepared any diet, cooked or raw, is recommended.

References