RAW EXPERT

Nutritional training package

Natures Menu: Veterinary Division

2. Food production & legislation

Introduction

The production of food is often something we all take for granted. However, as pet owners are becoming more aware of what they feed their own human families, they are asking more questions of what goes into their pet's food and how it is made. Kibble, cans and pouches were first developed over 100 years ago and have become the backbone of the pet food industry. There is now an increased desire for 'natural' foods, fewer additives and less processing, alongside the more traditional requirements regarding nutritional balance, palatability and convenience.

Raw feeding is emerging in the pet food industry as a solution to all these concerns. While raw feeding and BARF (biologically appropriate raw food) diets have been around for many years, they have only more recently gained attention through increased media coverage and changing attitudes towards food. This development has also led to huge improvements in the way raw food is manufactured, with an emphasis on safety and nutritional balance, along with improved convenience. However, not all commercially produced raw food is the same and it is important to know what sets them apart and this often begins with legislation.

Sourcing Ingredients

Sourcing the ingredients to manufacture a pet food is arguably one of the most important steps as inevitably you can only expect to get out the same quality you put in! There are a number of factors affecting how ingredients may be sourced and sometimes confusing labelling and clever marketing will intimidate even the savviest of pet owners. In this section we will break down the legislation, animal welfare issues and traceability to help gain a more critical eye for what really is going into pet food.

a) Legislation

Legislation is law produced by a governing body to aid in the regulation and authorisation of a particular process, e.g. pet food production. Legislation on animal feed originates from the European Union (EU) (rather than coming from the UK).The main principle is centred on hygienic conditions for food production and a safe finished product, which is not harmful to animal or human health, with full traceability. There are more than 50 pieces of legislation governing the manufacture of pet food, we will just run through the top five here:

1. **EU Regulation (EC) No 183/2005** ***Laying down requirements for feed hygiene***

This regulation sets out the operating standards to which **all** pet food manufacturers must comply. The regulation summarises the feed hygiene requirements in terms of:

- **facilities** and equipment
- **personnel**
- **production**
- **quality control** including Hazard Analysis Critical Control Points (HACCP - feed safety management system)
- **storage** and transport
- record-keeping including **traceability**
- **complaints** and product **recall**

2. **EU Regulation (EC) No 767/2009** ***on the placing on the market and use of feed***

This legislation covers matters such as:

- **safety** and marketing requirements
- stringent **labelling**, presentation and packaging requirements including analytical declarations
- manufacturer **responsibilities**

- **substantiation** of any claims, including nutritional claims
- prohibition on the **misleading** of purchasers
- prohibition on making **medicinal claims**

This Regulation also transposes EU provisions on undesirable substances and particular nutritional purposes - for example:

- the maximum levels of various **contaminants** allowable in pet food (for example, arsenic, lead, dioxins and certain pesticides)
- certain substances that must not be used in feed

3. **EU Regulation (EC) No 1831/2003** ***on additives for use in animal nutrition***

These controls relate to the additives (including vitamins, colourants, flavourings, and binders) authorised for use in animal feed and covers matters such as:

- categorisation of feed additives
- authorisation of feed additives
- labelling and packaging of feed additives
- provisions relating to a community register of additives

4. **EU Regulation (EC) No 1069/2009** ***laying down health rules as regards animal by-products and derived products not intended for human consumption***

This relates to **animal by-products** - for example, material of animal origin which are either deemed surplus to human consumption or are not normally consumed by people in the UK, and derived from animals inspected and passed as fit for human consumption prior to slaughter.

5. **EU Regulation (EC) No 142/2011** ***implementing Regulation (EC) No 1069/2009 and Directive 97/78/EC***

Annex XIII, chapter II gives a **restricted list of raw materials** which can be used in the preparation of raw pet foods specifically. It also sets the microbiological standards and **ZERO TOLERANCE** for **Salmonella** in raw pet foods.

Europe vs North America

One very important point to consider when reviewing raw foods and research publications is to look at whether they originate from Europe or North America as the regulations are significantly different, preventing any kind of fair and reasonable comparison. Recently the American Veterinary Medical Association (AVMA) published a controversial 'anti-raw statement' which advised against the feeding of any raw pet food due to the public health risk. The document only discusses the food safety and public health risk with no consideration of any other risks or indeed benefits – there must be a good reason for many people still choosing to feed raw to their beloved family pets in the face of such bad press!

In North America pet food manufacture is regulated by federal government and individual state laws, there is no harmonized legislation as in Europe so rules differ from state to state. The Association of American Feed Control Officials (AAFCO) establishes the nutritional standards for complete and balanced pet foods, and ***it is the pet food company's responsibility*** to formulate their products according to the appropriate AAFCO standard. However, AAFCO does not regulate, test, approve or certify pet foods in any way.

This is in contrast to most of Europe who are governed, regulated, approved and tested under the same umbrella of EU legislation. The European Pet Food Industry Federation (FEDIAF) are Europe's equivalent of the AAFCO, establishing the nutritional standards for pet food, however this is done in a fully co-ordinated and integrated manner with all appropriate EU legislation.

In North America, raw pet foods are produced with little or no regulatory oversight by the state or federal governments. The American Veterinary Medical Association (AVMA) make the following statement to justify this complete lack of regulation:

> *"Bacteria are expected to be present in raw meat, so the presence of Salmonella or other bacteria in raw diets does not trigger the same regulatory process that applies to commercially made canned or kibble pet foods."*

The American Food and Drug Administration (FDA) were motivated by the increasing popularity of raw feeding among companion animals to publish *"Guidance for Industry on the Manufacture and Labeling of Raw Meat Foods for Companion and Captive Non-companion Carnivores and Omnivores"* but the guidance is **voluntary** and **not legally enforceable** by the FDA.

In an effort to improve on this lack of mandatory regulation the FDA have produced their new Food Safety Modernization Act (FSMA) which was signed into law from January 2011. This will not have an immediate effect as the smaller companies have been given up to three years to comply with the new act of regulation. The act will enforce HACCP type controls throughout processing and production to minimise the public health risk from food-borne illness. This is most likely to be achieved through "test and hold" methods prior to distribution or through interventions along the manufacturing process to

reduce risk of contamination. One company is in the process of obtaining a patent for a new and unique process known as high pressure pasteurisation (HPP), which claims to eliminate the contamination risk without altering the nutritional composition of the raw food.

> According to Dr. James Marsden, professor of food safety and security at Kansas State University, the new FDA initiative will greatly improve the safety of food in the U.S. Marsden says that while raw pet diets pose special challenges, most, if not all of the processed (not raw) pet food recalls have been due to recontamination. So the entire pet food industry is looking not only at ways to eliminate pathogens during processing, but also at how to prevent recontamination of finished product before it is packaged.

b) Animal Welfare

The Farm Animal Welfare Council (FAWC) was original created by the British Government in 1979 to safeguard and improve the welfare of animals within the constraints of an effective livestock industry in the UK. The welfare of an animal includes its physical and mental state, therefore good animal welfare implies both fitness and a sense of well-being. Any animal kept by man must, at least, be protected from **unnecessary suffering**.

The FIVE FREEDOMS were eventually established and are now a well-recognised pillar in animal welfare:

1. Freedom from Hunger and Thirst - by ready access to fresh water and a diet to maintain full health and vigour.

2. Freedom from Discomfort - by providing an appropriate environment including shelter and a comfortable resting area.

3. Freedom from Pain, Injury or Disease - by prevention or rapid diagnosis and treatment.

4. Freedom to Express Normal Behaviour - by providing sufficient space, proper facilities and company of the animal's own kind.

5. Freedom from Fear and Distress - by ensuring conditions and treatment which avoid mental suffering.

'Free range' livestock is defined as that which has had access to the outdoors to graze or forage for food. It is believed these animals are happier and livelier leading to a better quality product. Raw pet food manufacturers are able to include free range and even organic ingredients into their produce as ingredients are sourced at the same level as that used within the human food chain. However, traditional pet food manufacturer's deal primarily in the by-products, which no longer have these classifications. Recent concerns have also arisen about by-products used from Halal slaughterhouses where many people feel animal welfare is compromised by the absence of stunning prior to slaughter.

The lack of classification of these by-products means they often become mixed together and commonly used in a range of processed pet foods.

c) Traceability

Traceability is the ability to reconstruct the course taken by a foodstuff through the production, processing and distribution stages (as defined by FEDIAF – the European Pet Food Industry Federation). In pet food production this is usually achieved through **batch numbers** which give details on raw materials used and their source, when the product was made and by whom. This information is recorded daily and is monitored every three months by DEFRA in order to fulfil the licensing requirements to produce pet foods.

Why is traceability needed?

1. To protect animal and human health
2. To enable efficient withdrawal or recall of products
3. To provide information on quality problems
4. To comply with EU legislation

The majority of pet food manufacturers use category 3 animal by-products as the main protein source in their foods. These comprise materials passed fit for human consumption but not needed in the human food chain and can contain poorer quality protein sources such as feet, head, beaks, feathers and blood. They are often all grouped together and transported to the pet food manufacturers which limits the information available on these materials, such as how they were raised and slaughtered. For many pet owners these assurances are important and as we look for evidence of welfare assurance schemes and humane slaughter methods on our own foods, many people wish to have the same guarantees for the food they buy for their pets. As a raw food manufacturer Natures Menu cannot use many category 3 animal by-products for safety reasons, such as the gastro-intestinal tracts of chickens which pose a significant Salmonella risk. This means we can source our ingredients with welfare in mind and use various farm assurance schemes and free-range meats to ensure standards are maintained and traceability runs right back to the farm level.

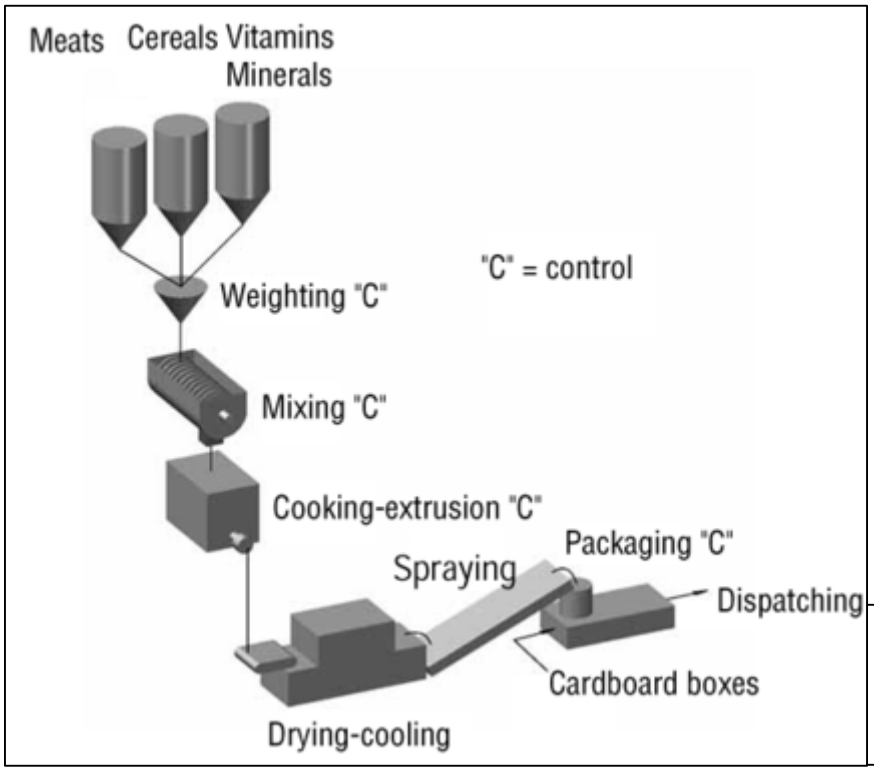
Types of pet food production

1. Kibble

Meat derivatives or meatmeal/bonemeal are among the most common ingredients found in dry kibble. They typically consist of ground up by-products and leftovers e.g. hooves, heads, fur and feathers and can be from any animal. They can often change between batches, giving different protein types, depending on costs at source. They have often undergone a process called **rendering** which involves cooking to remove the water, fats and oils then grinding the residue into a powder.

Nearly all kibble products are made by a process called **extrusion**.

a) A mixed blend of meat meals, meat and bones meals, cereals, powders and supplements are all mixed in a dry powder format
b) Steam is injected into the mix to heat it and soften the product
c) Protein molecules are released which bind the product into a dough
d) The dough is forced under high pressure through a small grinding head to create the kibbles
e) The kibbles are then cooled and sprayed with oils to add palatability



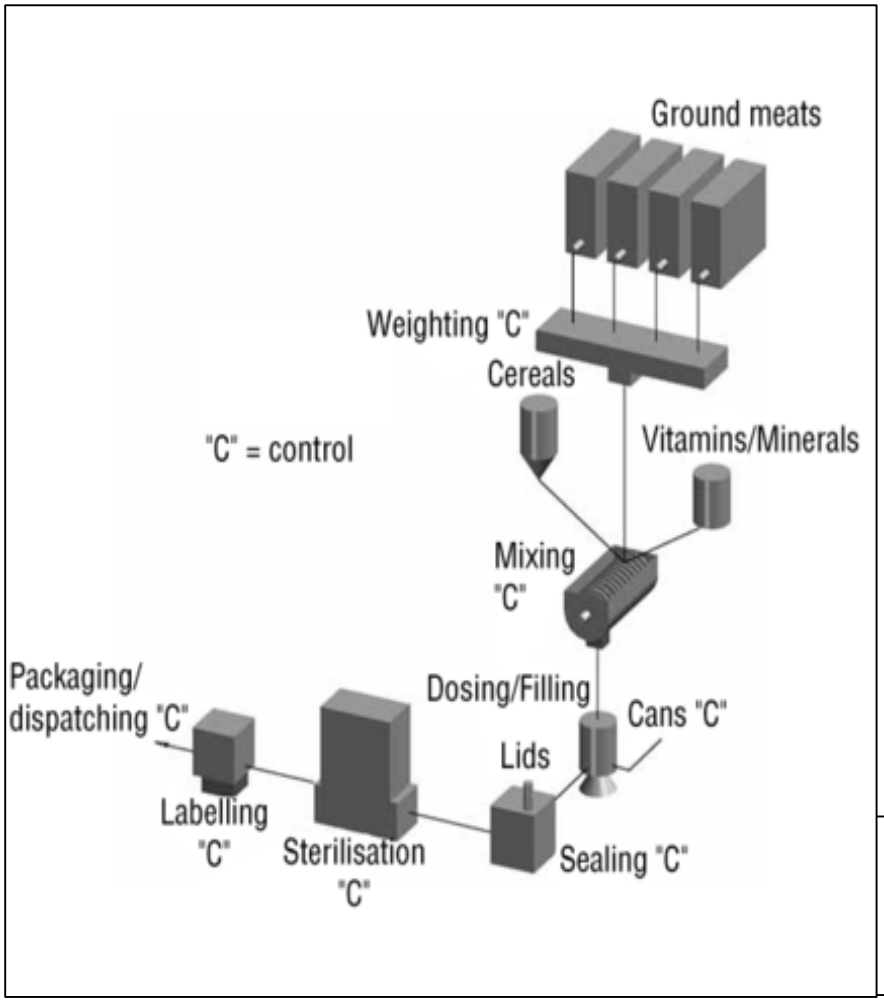
Production technique for dry foods

(Courtesy of FEDIAF)

2. Cans, trays and pouches

The most common method of producing canned pet foods is highly processed, with similar, and sometimes poor, protein sources to kibble. The cooked/rendered ground meats are mixed with cereals and supplements before mixing and placing into cans. The often bland ingredients are formed to look like meaty chunks and bound together by gluten before being covered in flavoured jelly or gravy to provide the palatability and added nutrition. Ever wondered why cats almost always lick the jelly/gravy off first?

Once the cans are sealed they undergo sterilisation which legally requires temperatures in excess of 90ºC to kill pathogenic bacteria such as Salmonella. However new methods are emerging, through manufacturers such as Natures Menu Ltd, whereby high quality ingredients are sealed in raw and gently cooked once to lock in the nutrients and natural flavours.



Production technique for canned foods

(Courtesy of FEDIAF)

3. Frozen raw food

Possibly the simplest of all methods, frozen raw food offers nutrition that has been uncompromised by processing but has the potential to create a risk of food-borne disease and parasitism. Therefore the controls put in place by the manufacturer to prevent these added risks must be heavily scrutinised to ensure both animal and human safety.

Fresh ingredients

Whole carcass is minced and mixed with other fresh ingredients

Product is formed into final shape

Product is frozen and packaged ready for dispatch

When producing frozen pet foods there is another added consideration to help ensure safety and that is within its distribution. It is imperative the food is not allowed to defrost and then re-freeze as this can allow micro-organisms within the food to multiply and cause the food to spoil. Therefore frozen pet food companies should take reasonable steps to guarantee this will not happen, ideally delivery in temperature controlled vehicles.

4. Freeze Dried

Freeze drying, also known as lyophilisation or cryodessication, is a technique for **preserving** perishable foods and enabling easier storage and transport at room temperature. It relies on a chemical process called **sublimation** where under certain conditions water can transform directly from its solid form (ice crystals) to its gaseous form (steam). In this form, through the use of a partial vacuum, the water may be easily removed from a product **without** altering the composition of the original foodstuff.

There are FOUR stages:

1. ***Pretreatment*** – Any method of treatment prior to freezing, may involve altering surface area or concentrating the product.
2. ***Freezing*** – Must be performed rapidly to avoid the formation of ice crystals which damage cell walls and result in poor nutritive content and poor texture.
3. ***Primary drying*** – Pressure is lowered, a partial vacuum applied and just enough heat is applied to cause the water to sublime (change from solid to gas). 95% of water is removed during this stage but it can be slow (several days) as too much heat risks altering the materials structure.
4. ***Secondary drying*** – Further low pressure and a little more heat now removes any unfrozen water bonded with the material. Water content is now 1-4%.

The product is then packaged and sealed whereby the substantially lowered water content will inhibit the action of micro-organisms and enzymes that would ordinarily cause it to spoil or degrade. At room temperature these sealed products are often preserved for years. It is often recommended to add a little water to these products when serving to aid in digestion. The main disadvantage of this technique is the current high costs involved, but over time it is becoming more widespread and affordable.

Labelling

Labelling of pet food is a **tightly regulated** facet of food production. It has an increasingly important function in **consumer communication** as pet owners are questioning diets more and more. With the free movement of goods within the EU it is also of utmost importance to have a standardised legislation to ensure consistency of consumer information and a level playing field within the European marketplace. FEDIAF have produced a Code of Good Labelling Practice for Pet Foods, to be used alongside EU legislation, to create a harmonised understanding. The code addresses the three basic functions of product communication:

a) Consumer information on product use
b) Control and enforcement
c) Marketing and retail

The following features of labelling are mandatory:

- Name and Product Description
- Composition (ingredients list)
- Analytical constituents (% nutrient levels)
- Information about additives
- Best Before Date, Batch Code
- The name of the producer/distributor and contact details for further info
- How to use the product (feeding instructions, storage)
- Weight and/or quantity statement
- All claims must be verifiable and substantiated
- Must not be misleading or ambiguous

It is important to make fair comparisons when looking at labels on different types of dog foods. The nutrient levels are often represented by percentages on an 'as fed' basis which does not account for the vast difference in moisture contents from wet to dry foods. In order to do this in a more representative way we can look at a feature known as 'dry matter basis'. This allows us to compare different types of foods fairly without being biased by the moisture content.

Calculating dry matter:

E.g. Dry Food A: **Protein** = 23% (Moisture = 10%)
Wet Food B: **Protein** = 10% (Moisture = 75%)

Initially the dry food looks to have the better protein content……

Total Dry Matter in A:
100% (total) -10% (moisture) = 90% (dry matter) → Total **protein** dry matter = (23/90) * 100 = **26%**
Total Dry Matter in B: 100% -75% = 25% → Total **protein** dry matter = (10/25) * 100 = **40%**

Once moisture is considered, wet food B is the real leader when it comes to protein!

Food-borne Illness

Food-borne illness describes any illness brought about by consumption of contaminated food, most commonly caused by micro-organisms such as Salmonella and Campylobacter. There is an immediate risk to the animal fed but also a significant **public health risk** to the pet's family and any immuno-compromised, young or elderly people in the vicinity, from contaminated bowls and surfaces. It is estimated around a million people in the UK suffer a food-borne illness each year, costing us nearly £1.5 billion.

All types of pet food are subject to monitoring as part of EU legislation. This is carried out in the United Kingdom by a division of DEFRA known as the Animal and Plant Health Agency (APHA) (formerly AHVLA). The frequency of testing is dependent on a number of factors:

1. Throughput of the plant
2. Length of time in operation
3. Results from previous samples

If the results are unsatisfactory action must be taken. This action involves incineration of the affected batch and review of the Hazard Analysis and Critical Control Point (HACCP) plan which is in place to try and improve safety and prevent outbreaks of disease. The source of the problem is identified and necessary changes are made to the plan to allow continued manufacturing. Within some companies batch testing is carried out before distribution to reduce the risk to the customer ('positive release' method). However, other manufacturers will have already dispatched before results are available and in the event of an unsatisfactory result further investigations must be undertaken.

A further government department known as the **Food Standards Agency** (FSA) have produced their food-borne diseases strategy with the objectives to reduce food-borne disease in the UK and improve public awareness. As little as 1% reduction in case numbers could mean 10,000 fewer cases and save the economy around £15 million per year. The priority pathogens identified for action in the latest report are Campylobacter, which causes the largest number of cases per year, and Listeria monocytogenes, which is responsible for the largest number of deaths. Salmonella and E.coli O157 also remain important pathogens and are closely monitored with a number of interventions in place, such as food hygiene programmes.

Case numbers of **Campylobacter** in humans has gradually risen since 2004 with 60-80% of cases attributed to chicken. Recent surveys suggest that as many as 65% of chickens at retail sale in the UK are contaminated with Campylobacter, recent warnings have even been raised over the presence of

campylobacter on the outer surface of chicken packaging and the risks to the public while out shopping. Increased public awareness and good food hygiene practice at home are expected to reduce levels in the future. There is no compulsory testing for Campylobacter in the production of raw pet food, however, Natures Menu Ltd conduct voluntary testing and, to date, have not had a case (in over 30 years of production). This is attributed to the vulnerability of poultry-derived Campylobacter strains to prolonged periods of freezing sustained during manufacture.

Listeria monocytogenes remains relatively rare in the UK but cases have nearly doubled since 2000 and each year it is responsible for more deaths than Salmonella and E.coli O157 combined. The cause of the increase is not clear but it is thought to be associated with the susceptibility of particular individuals (e.g. cancer patients on chemotherapy) and storage and handling of chilled, ready-to-eat foods rather than raw produce. Pregnant women are about 20 times more likely to get listeriosis than other healthy adults but the reason behind their increased susceptibility is currently unknown. *L. monocytogenes* is widespread in the environment, especially in soil and water, and is still able to grow and multiply at low temperatures. The bacteria can contaminate a variety of foods (before or after cooking), not just raw meat, such as:

- Ready-to-eat processed meat e.g. hotdogs and deli meat
- Raw vegetables
- Prepared or stored salads, including coleslaw and fresh fruit salad
- Melons
- Unpasteurised milk and milk products e.g. soft cheeses
- Ready-to-eat smoked seafood and raw seafood

It is important to note dogs and cats rarely get listeriosis and they usually don't show signs of disease. One reference mentions only six reported cases in dogs from 1947 to 2000, and the dogs showed a wide range of symptoms[1]. Control of human cases is centred on the commission of new research to better understand the risks and increasing public awareness.

Salmonella cases have declined consistently since 2000 and DEFRA hopes this trend is set to continue with the implementation of a number of current and future control programmes. It remains an important pathogen though and subject to close monitoring of cases and outbreaks, with action to be taken if the situation worsens. As previously mentioned DEFRA currently has a zero tolerance of

[1] Läikkö T, Båverud V, Danielsson-Tham, M-L, et al. (2004) Canine tonsillitis associated with Listeria monocytogenes. *Veterinary Record*; Vol.154, p732

Salmonella in raw pet food and commits to ongoing monitoring to uphold this. Contaminated food is a common source of *Salmonella* infection, such as:

- Raw/undercooked meat and poultry
- Raw/undercooked eggs and related products
- Raw/unpasteurised milk/dairy products
- Raw fruits and vegetables

E.coli is a normal inhabitant of the gastrointestinal tract in dogs, cats and humans. Incidence of human infections with **enterotoxigenic E.coli O157** has fluctuated since 2000 but it remains relatively rare compared to Campylobacter and Salmonella. It remains an important human pathogen after causing a number of large and serious food-borne outbreaks. As with many other pathogens it poses a particular risk to the very young and very old, but the risk can be easily minimised through hygienic practices in the home, avoiding contaminated water sources and washing fruit and vegetables thoroughly.

In conclusion, the risk of food-borne illness to both pets and their owners must be a serious consideration for any person choosing to feed raw pet food. While it carries no greater risk than handling fresh raw produce intended for humans, pet owners must be dedicated to good hygiene practices in the home and fully aware of potential sources of contamination. Additional risks to children, the elderly, pregnant women and the immuno-suppressed should be fully evaluated and all possible precautions taken to minimise the risks. It is also important to remember that processed foods are not free from the risks associated with food-borne illnesses and hygiene in the home is crucial to keeping everyone safe. Using a DEFRA-registered raw food manufacturer who is professionally and hygienically preparing meals with appropriate microbiological controls will significantly reduce the risks.

The ever increasing popularity and interest in raw feeding is undeniable but raw feeding has been dividing opinions in the veterinary and scientific world for many years and will likely continue to do so for many years to come. However, keeping abreast of the most current research, new products and evolving recommendations is crucial to finding the most accurate and responsible advice. In this section we hope to address current research as well as start to unravel many of the myths surrounding raw food.

Clinical Research

Clinical research is always dependent on funding and this is no truer than within companion animal nutrition. The current pet food market is dominated by huge companies able to regularly fund large research projects in order to bring credibility and science to their foods. However, it pays to be cautious and maintain a critical eye when looking at such research as it is not always as unbiased as it may first seem. Raw food companies hold a small but significant portion of the market and continue to grow very rapidly but up until this point funding to research raw food specifically, has been lacking.

Natures Menu Ltd, the largest raw food producer in Europe, have recently assembled a research team to begin to address this deficit, and have committed the funding needed to work with a number of organisations to begin developing credible research. Data collection is currently underway for a number of projects so watch this space!

Most of mainland Europe are already very supportive of raw feeding, where you will find raw food in many veterinary practices as a viable, recognised feeding choice. A recently published article from the University of Helsinki, Finland, with a large sample size of 632 dog owners[2], found evidence of a range of perceived health benefits. While the study acknowledges its own limitations there is certainly a case for further in depth and structured follow up.

[2] Hielm-Bjorkman, Virtanen (2014) Exploratory study: 632 shared experiences from dog owners changing their dogs' food to a raw food (BARF) diet. Available online at: www.mushbarf.com/en/information-and-resources-about-barf-feeding

Potential Benefits

In this section we will attempt to highlight, with supportive research, the array of potential benefits seen in raw fed dogs. This is by no means an exhaustive list but will hopefully begin to clarify some common benefits reported. Subsequently we will unravel some of the myths surrounding raw feeding and shed light on some of the concerns shared by many pet owners and veterinary professionals.

We will discuss these commonly reported benefits in more detail below:

- ✓ Enhanced nutrition
- ✓ Better behaviour
- ✓ Superior digestibility
- ✓ Improved dental health
- ✓ Help for anal glands/firmer faeces
- ✓ Healthy appetites

Enhanced Nutrition

The Ellen Dierenfield report[3] confirms that whole prey, as long as the soft tissues and some bones are consumed, meet all the nutrient requirements of carnivores, and at the same time enhance and positively influence behaviour. The report also suggests wild sourced prey are likely to be more nutrient dense than farmed prey. Consumption of whole prey increases intake of raw animal-derived fermentative substances which may **enhance** gut health, **stimulate** growth of microbial commensals and **optimise** immune function[4]. In contrast, as a result of eating heat-treated, largely plant-derived processed foods, animals suffer tooth decay, dental pathologies, muscle atrophy and poor health[5].

Dry processed diets, with low protein:carbohydrate ratios have been linked to obesity in cats. Emerging evidence suggests that microbiota (formerly known as gut flora) are critical to the development of obesity[6] and shifts in the faecal microbiota may be as a result of an increased carbohydrate load entering the large intestine. This is also thought to contribute to increased flatulence for pets on processed foods compared to those on raw diets.

[3] Dierenfeld, Alcorn, Jacobsen (2002) Nutrient composition of whole vertebrate prey (excluding fish) fed in zoos. Published by: US Dept. of Agriculture.
[4] Plantiga, Bosch, Hendriks (2011) Estimation of the dietary nutrient profile of free-roaming feral cats: possible implications for nutrition of domestic cats. *British Journal of Nutrition*; vol. 106, p35-48
[5] Bond, Lindburg (1990) Carcass feeding of captive cheetahs: the effects of a naturalistic feeding program on oral health and psychological well-being. *Applied Animal Behaviour Science*; Vol. 26, p373-382
[6] Bermingham et al (2011) Five-week dietary exposure to dry diets alters the faecal bacterial populations in the domestic cat. British Journal of Nutrition, vol. 106, p49-52

It is hugely important to get nutritional balance right from the start. Even the smaller inaccuracies, while not causing an apparent issue in the short-term, will have a cumulative effect over the lifetime of the pet.

Better Behaviour

Improvements in behaviour are linked to raw diets meeting the psychological needs of a dog as well as the nutritional ones. Many domestic cats still choose to hunt prey and consume the raw carcass whole. We must ask ourselves are we actually neglecting one of the five freedoms of animal welfare – *"freedom to express normal behaviour"* by preventing our pets from chewing on bones and raw food. Improvements in behaviour inevitably lead on to improved relationships with our pets and the formation of a stronger bond.

Recent studies have also demonstrated the benefits of omega-3 fatty acids for both improving trainability in puppies and cognition in seniors. While these delicate fatty acids often become rancid as a result of oxygen exposure in dry foods, raw foods are fresh and frozen which preserves these essential nutrients far more effectively.

Superior Digestibility

Multiple studies repeatedly demonstrate greater digestibility of raw meat diets when compared to rendered or extruded animal by-products used in kibbles and canned foods. One study showed raw food to be nearly 15% more digestible[7]. This benefit can be particularly significant to those dogs and cats who suffer chronic and inflammatory gastro-intestinal and pancreatic disorders. The increased digestibility enables them to gain more nutrition in spite of their less efficient GI tract and aids in the formation of firmer faeces alongside helping improve the microbiota.

Improved Dental Health

The opportunity to chew appropriate raw meaty bones as part of a raw diet has anecdotally been associated with greater dental health. The emphasis must always be on appropriate use of bones to avoid dental damage and gastro-intestinal issues from using incorrect size and density of bones with lack of training and supervision. Cooked bones should never be fed.

[7] Crissey et al (1997) Use of a raw meat-based diet or a dry kibble-diet for sand cats (Felis margarita). *Journal of Animal Science*, vol. 75(8), pp2154-2160

The mechanical action of chewing produces a compression and expansion of the periodontal ligament space around the teeth which, in turn, promotes formation of a dense fibrous suspensory structure by increasing both circulation and fibroblastic activity. The width of the periodontal ligament, a measure of its health, is directly related to the intensity of the mastication function[8]. A common misconception is the ability of dry foods to reduce plaque and calculus; however as the pet bites down into a typical kibble it shatters and crumbles, providing no mechanical cleaning function[9].

The dramatic difference in food form represented by commercial dog and cat foods as compared with the natural prey of wild canids and felids is often implicated as a significant cause of the degree of periodontal disease diagnosed in domestic dogs and cats[9]. One researcher examined 1,157 wild canid skulls and reported that periodontal disease as suggested by alveolar bone destruction was present in only 2% of specimens, compared with today's prevalence, ranging from 60% to over 80%[9].

It is also important to consider the balance of micronutrients in a diet when looking at dental health. Diets that fail to meet the FEDIAF guidelines may be deficient in micronutrients such as vitamins C and E, which have a protective antioxidant function. Vitamins A, D and some B vitamins have also been associated with gingival disease[9].

Many veterinarians have noticed the superior dental health of those cats who hunt and consume their prey on a regular basis compared to those indoor cats, often pedigrees, raised solely on processed foods. Feline odontoclastic resorptive lesions (FORLs) have become a particular concern recently and their aetiology remains unproven in the seventy years since their discovery. Retrospective studies of zoological collections of feline skulls showed a low prevalence of FORLs before the 1960s compared to current prevalence[10]. It leaves us to wonder could this correlate at all with the steady increase in use of processed foods for domestic cats during this time.

Help for anal glands

The transit times for raw foods to pass through the digestive tract compared to processed kibble foods are known to be significantly quicker, and hence the mixing of these is not advised due to the different digestive requirements. Raw food is generally digested more efficiently, forming firmer, drier and less odorous faeces. This is advantageous in aiding pets predisposed to anal gland problems by chronic

[8] Fagan, Edwards (2009) Influence of diet consistency on periodontal disease in captive carnivores, Zoological Society of San Diego, Dept. of Veterinarian Services
[9] Logan, Wiggs, Schert, Cleland (2010) Periodontal disease. In Hand Thatcher, Remillard, Roudebush, Novotny (eds) *Small Animal Clinical Nutrition* (5th ed) Mark Morris Institute, Kansas: 989-1001
[10] Reiter et al (2005) Update on the etiology of tooth resorption in domestic cats. *Veterinary Clinics of North America: Small Animal Practice*. Vol. 35(4), pp913-942

diarrhoea[11], allowing natural expression of the glands when passing firmer faeces. It also makes it easier for responsible owners to clean up after their pets, reducing the public health risks in communal areas from the animal faeces. In addition, raw food also has no need for the added indigestible fibres and filler material (often incorporated into dry food to aid satiety) as the higher protein content leaves a fuller feeling. As a result there is often far less faeces produced as more of the food is digested and utilised by the body with less waste.

Healthy appetites

With a higher palatability and greater psychological satisfaction it is no wonder better appetites are commonly reported on raw fed pets. It is well known that kibble undergoes substantial expansion in the stomach, leaving a lasting full feeling, which suits some insatiable pets but can leave others missing meals due to a persistent bloated feeling. In one study looking at captive cheetahs fed a carcass based diet there were improved appetites, longer periods spent feeding and greater possessiveness of food. Cats in particular can often require a level of persistence with their initial transition onto raw as they are commonly very suspicious of new things but once converted they will rarely choose to return to processed foods.

Unravelling the Myths

Can raw feeding be appropriately nutritionally balanced and complete?

Yes.

However, in order to ensure this is achieved in every meal the guaranteed method would be to choose a complete, commercially produced and professional raw food that has done all the hard work for you! To determine if a UK commercially produced raw food meets the minimum standards in nutrition you should check for membership to the Pet Food Manufacturers Association (PFMA) who are the UK representatives of FEDIAF, who set the nutritional standards in line with current EU legislation. For additional information it is best to contact manufacturers directly to discuss advanced nutrition. Home-made raw diets take a wealth of knowledge to execute effectively and should not be undertaken by a novice in raw food. In a European study[12] that evaluated 95 homemade raw meat-based diets being fed to dogs, 60% had major nutritional imbalances.

[11] Van Duijkeren (1995) Disease conditions of canine anal sacs. Journal of Small Animal Practice. Vol. 36 (1), pp12-16

[12] Dillitzer et al (2011) Intake of minerals, trace elements and vitamins in bone and raw food rations in adult dogs. *British Journal of Nutrition*; Vol. 106, pp 53-56

Does raw feeding pose an unacceptable public health risk?

No.

It is key, however, to ensure any raw feeder is sourcing their ingredients from trusted and responsible producers, and are fully aware of the basic hygiene requirements when handling raw meat in the home. EU legislation has a zero tolerance to Salmonella in raw pet food manufactured in the UK. Some manufacturers, such as Natures Menu Ltd, elect to voluntarily test for further causes of food-borne illness, such as Campylobacter. UK pet food manufacturers should all be registered with DEFRA (this is easy to check by visiting their website). DEFRA registered manufacturers are regulated and monitored, and must have in place HACCP plans (safety protocols) to form interventions during production to minimise any contamination risks.

Is it dangerous to feed bones?

Not if done appropriately.

We would always advise appropriate choice of bones from reliable sources for individuals, full supervision (at least initially) and training. NEVER feed cooked bones.

Is raw feeding for everyone?

No.

While it suits a huge proportion of cats and dogs there are some owners and pets for whom raw feeding is not the best choice. For example, vegetarian owners can find it difficult to handle and prepare, and pets with particular medical conditions may not be best suited.

Will my pet suffer from more parasite problems?

Not if done appropriately.

While there is the potential for increased exposure to intestinal parasites this is easily managed with a routine preventative worming regime and sourcing meat that is passed fit for human consumption. Natures Menu Ltd provide additional assurances by addressing any parasite risk with an evidence-based deep freeze protocol of 10 days at -18ºC, in which none of the parasites can survive. The firmer, drier faeces produced on a raw diet also provide an uninhabitable environment for parasites.

Is raw feeding too expensive and complicated for most people?

No.

While we wouldn't recommend homemade diets for the novice raw feeder, due to the risks of nutritional imbalances, there are now reliably complete and balanced commercially produced brands such as Natures Menu Ltd. Their foods come as frozen nuggets that can be defrosted and served making raw feeding both convenient and simple. Costing of raw feeding will vary hugely dependent on the method used but it is becoming increasingly affordable with recent popularity and demand. For example, the complete and balanced range of Nature Menu Ltd raw is comparable to the cost of feeding a higher quality kibble diet.

Are dogs too far removed from wolves to handle a raw diet?

No.

The domestic dog is an extremely close relative of the grey wolf, differing from it by at most 0.2% of mitochondrial DNA. Changes to classification placed the domestic dog (*Canis lupus familiaris*) in the same species as the wolf (Canis lupus), effectively making it a 'domesticated wolf'. All species of dogs and wolves remain able to interbreed and produce fertile offspring. Dogs left to their own devices will still form packs to hunt and when breeding without human influence their features revert to a 'wolf-type'. Since living closer to humans, dogs have evolved genetically to digest starch more readily than their wolf relatives[13]. However, this does not allow us to conclude that their optimal nutrition resides in a starchy diet when this adaptation only occurred as a means to increase survival and utilise their changing resources.

Do different breeds of dog need different diets?

No.

This recent fad is not much more than a clever marketing trick. While we do accept that every dog is an individual and some nutritional problems do run within particular breeds, not every dog within a breed is the same either. This fad also becomes a little unstuck when feeding mixed breeds and mongrels who cannot have a breed-tailored diet when their breed ancestry is unknown. All dog breeds still have the same dentition and musculature in spite of the different shapes, sizes and colours, their digestive tracts are all identical and so would all suit the same ideal diet.

[13] Axelsson et al (2013) The genomic signature of dog domestication reveals adaptation to a starch-rich diet. *Nature*; Vol. 495 pp. 360-365

When there are so many varieties of kibble out there is there really a need for raw?

Yes.

Kibble, similarly to some canned pet food, is highly processed and often the protein is sourced from rendered animal by-products and left-overs from the human food industry. Raw is an entirely different option to feed unprocessed, natural food with nothing artificial added. It provides a third option and gives pet owners the power to make the choice themselves with the same level of convenience.

Doesn't raw salmon carry a dangerous parasite?

Yes.

Salmonids are the second intermediate host to the common trematode ***Nanophyetus salmincola*** and dogs are commonly the final host. This parasite is a vector for the bacteria Neorickettsia helminthoeca which is the true cause of 'salmon poisoning disease' in dogs fed raw salmon. In order to address this issue raw salmon must be frozen for at least 24 hours prior to feeding as this ensures the salmon is safe to dogs.