

Feeding man's best friends

Global spending on pet foods totals more than US\$70bn, with high pet ownership in Europe and the USA, and fast growing ownership in emerging countries such as Brazil and China. Rendered products can be used safely and sustainably as pet food ingredients but have a negative image in the eyes of some pet owners



IN THE USA, THERE ARE AN ESTIMATED 170M PET CATS AND DOGS, OUTNUMBERING CHILDREN BY FOUR-TO-ONE (PHOTO: ADOBE STOCK)

The rendering industry plays an important role in the production of commercial pet foods, with about 30% of animal protein meals and 15% of animal fats produced in the USA making their way into such products.

Americans currently have an estimated 170M pet cats and dogs, outnumbering children by a 4-to-1 margin, according to the American Pet Products Association (APPA).

The nutrition, health and lifespan of our furry companions are top priorities, as reflected in the steady growth and spending patterns of pet-related products and services.

Although American pet ownership numbers have remained relatively stable over the past few decades, annual pet expenditure in the USA has grown from around US\$17bn in the mid-1990s to over US\$60bn today, the APPA says.

The largest industry serving pets is the pet food and treats sector, which is nearing the US\$25bn mark in the USA and is more than US\$70bn worldwide.

Revenue growth in the USA is not due to a

greater volume being sold but to a shift toward higher-quality products that are more expensive.

Pet food trends are increasingly following that of human food, with terms such as 'natural', 'organic' and 'fresh' being used.

In addition, more owners are scrutinising the ingredient and nutrient profiles of pet foods.

The terminology used on pet food labels is also important, with many owners preferring ingredients similar to those listed on human food labels.

Although domestic dogs are now more omnivorous in nature – they evolved eating high-protein, high-fat diets – cats are still strictly carnivores today.

Therefore, protein is the nutrient class that usually attracts the most attention, with diets containing increased amounts and animal-based proteins being more popular.

While the pet food industry provides many opportunities for sustained or increased revenue for renderers, several challenges also exist and must be considered.

Firstly, on the positive side, consumers continue to demand pet foods containing increased protein

concentrations and are often willing to pay a premium for those of superior quality.

Secondly, animal-based ingredients have a high protein quality in comparison to plant-based sources and are highly digestible if processed in the appropriate way.

Finally, rendered products can be considered sustainable, in that they do not compete directly with human food.

Despite the positives that exist, the rendering industry faces various pressures and challenges from regulatory bodies, animal activists and pet owners. While few take it to the extreme by demanding the use of animals and animal products be eliminated altogether, a considerable portion of the population has developed a negative connotation with the term 'by-product' when it comes to pet food.

Although the pet food industry is still largely based on the use of secondary products of the human food system, a perception of inferiority is often attributed to animal byproducts.

In addition, a few pet food companies have aggressively marketed against the use of these ingredients. ▶

► Major players and channels to market

The US pet food industry is dominated by five major companies that account for over 65% of the market, the president of Pet Food and Ingredient Technology, Greg Aldrich, writes in his paper, *'Rendered Products in Pet Food'*.

These big five are owned by multinational conglomerates that have a primary emphasis in personal care, dry goods, and/or other consumables including Mars (Pedigree, Whiskas, and Royal Canin), Nestle (Purina, Friskies), Proctor & Gamble (Iams, Eukanuba), Colgate-Palmolive (Hills Science Diet, Hills Prescription Diet), and Del Monte (9-Lives, Gravy Train, Kibbles 'N Bits, Nature's Recipe, Meow Mix and Milk Bone).

The remaining 35% of the US market is made up of pet food-exclusive companies, numerous regional brands and new smaller brands and companies.

Grocery stores remain the largest outlet for pet foods, with an estimated market share of 37.4% in 2002, the paper says. Shares in other outlets are mass market (16.4%), pet speciality (17.2%), farm/feed (5.4%), vet/kennel (5%) and other (18.6%).

Pet foods are now more than ever considered packaged goods that are co-mingled with other family food items.

Trends in pet food

More people consider their pets as members of the family, as demonstrated by everything from birthday and holiday celebrations, family photos, health insurance, burial plots, and preparation of special meals, according to Aldrich.

Pets live in 70% of American homes, with 15% of those homes owning both a cat and dog. Specifically, there were an estimated 81.4M cats in 37.7% of households and 63M dogs in 43.5% of households in the USA in 2005.

Other species of speciality pets, such as rodents, reptiles, rabbits, ferrets, exotic birds and fish account for almost 200M more household pets.

"There are a number of different factors that motivate consumers to choose certain foods for their pets," Aldrich writes. "Some are driven by cost, some nutrition, some performance, and still others by their pet's preference. The choices seem to be almost limitless."

Today there are foods for different life-stages (such as maintenance, gestation/lactation, growth or puppy, kitten, adult, senior), price points, formats (kibbles, soft-moist, wet, raw) and packaging styles (such as can, retortable pouch, stand-up pouch, paper or plastic bag, re-sealable bag and tray).

Pet owners are deciding on foods according to their own ingredient biases (eg natural, wheat-free, hypoallergenic), the breed and size of their pet (eg toy breed, large breed, Dalmatian, Persian), nuisance factors (eg hairball) and their pet's predisposition to disease (eg joint health, senior, struvite, weight loss, renal disease).

Pet foods are also becoming more 'humanised' (gourmet, heat and eat, fruits and vegetables) and are tracking human food trends, such as raw, organic, holistic and low-carb.

According to Aldrich, while the number of brands and market segments seem almost limitless, there are some general principles by which all are judged. These are palatability, digestive and stool consistency, and the influence of the diet on the pet's general appearance (skin and coat) and

behavior (vigour).

With this much variety, finding raw materials with the right mix of name appeal, nutrition, functional properties, availability and cost can be a big challenge for the pet food manufacturer.

In many cases, the ingredient statement is driving the decision-making process. This is probably best exemplified in the promotion by some pet food companies that their foods are made with "human-grade" ingredients. While no definition exists for such a claim, this demonstrates the lengths that manufacturers will go to meet the pet owner's perception of quality.

Rendered products

Today, many pet foods are processed not just for the nutrition of the pet, but for their convenience to the pet owner as well, Aldrich writes. This convenience is the culmination of several factors:

- Foods that are nutritionally balanced by experts for pet owners who may or may not have the knowledge of dog/cat nutrition themselves.
- Foods in a form and format that is easy to use.
- Foods that are virtually waste-free.
- Foods that minimise the hassles of storage, spoilage and infestation.

The main requirements in the diets of animals are protein, energy and minerals. Rendered animal products are an excellent source of all three, according to the paper *'Rendered ingredients significantly influence sustainability, quality and safety of pet food'*, written by David Meeker and Jessica Meisinger of the National Renderers Association, with members in Canada and USA.

Rendered protein meals such as meat meal, meat and bone meal, poultry meal, poultry byproduct meal and fish meal are widely used in pet foods.

Nutrient availability and/or dietary utilisation can be hampered by excessive heat treatment, dilution of essential amino acids (AA) with connective tissue, high levels of ash and oxidation. To address these issues, renderers use processing and marketing options to better target appropriate end uses for these materials, the authors write.

Rendered fats and oils such as tallow, lard, poultry fat, and fish oil provide a supplementary source of energy, flavour, texture and nutrients in pet foods.

Whereas energy is commonly derived from the carbohydrates in grain, animal fats provide a concentrated source of calories and remain more stable and palatable than the more unsaturated vegetable oils.

Minerals are important in all animal diets for the formation of bone and cartilage as well as the normal functioning of organs, blood, and muscles. The most important macrominerals, calcium and phosphorus, are essential minerals for dogs and cats and are readily available in rendered products.

"The high availability of phosphorus in rendered products is another contribution to sustainability because phosphate rock is non-renewable and is running out worldwide," Meeker and Meisinger write. "Ingredients such as meat and bone meal with naturally-occurring calcium and phosphorus are superior to meat for some diets, and their use reduces the requirement for additional minerals to obtain the same nutrient profile."

In the USA, a voluntary membership association of state, federal and international regulatory officials

– including the Food and Drug Administration (FDA) and the Association of American Feed Control Officials (AAFCO) – sets guidelines and definitions for animal feed, including pet foods.

The AAFCO defines the composition of all legally used feed ingredients, but contracts between renderers and pet food manufacturers often dictate much more specific terms.

The primary animal protein byproducts are meat and bone meal, meat meal, blood meal, poultry byproduct meal, poultry meal, feather meal and fish meal.

Using meat and bone meal as an example, the AAFCO defines this material as the rendered product from mammalian tissues including bone but exclusive of any added blood, hair, hoof, horn, hide trimmings, manure, stomach and rumen contents, except in such amounts as may occur unavoidably in good processing practices.

Meat and bone meal, as defined by the AAFCO, must contain a minimum of 4% phosphorus with a calcium level not to exceed 2.2 times the actual phosphorus level. Ingredients of lower phosphorus content must be labelled meat meal.

Utilisation of rendered ingredients

According to Aldrich's paper, no easily obtainable figures are available to provide specifics on the amount of rendered products used in pet foods.

However, it may be possible to determine a reasonable volume through some estimates and assumptions.

"If one were to assume the average cost per pound for all pet food sold was US\$0.60/lb, then based on total sales of pet food (US\$14.5bn in 2005), the total tonnes produced each year would be in the neighborhood of 12M tonnes."

If rendered ingredients were 20% of these 12M tonnes across all products (protein meals, fats, other), then the pet food industry would consume around 2.4M tonnes/year. This represents roughly 25% of the total US production of rendered materials during the same period.

"This indicates substantial reliance and connectedness between the pet food and rendering industries. For the pet food industry, the rendering sector is a vital supply of animal-based proteins and fats to meet the demands of their customers.

"For the rendering industry, the pet food market is an important outlet for its products with a tremendous value-added upside," he writes.

Protein meals

Pet food companies write very specific purchasing requirements for their ingredients, including rendered products, according to Aldrich's paper. AAFCO definitions are the starting place for these specifications.

Meat and Bone Meal and Meat Meal

Meat and bone meal has been a staple protein in pet foods and is still used by many manufacturers today. However, its popularity has declined in recent years. Probably the biggest issue is that meat and bone meal is no longer considered 'label friendly' as consumers have been taught to distrust something simply called 'meat'.

A strictly beef or strictly pork meat and bone meal are likely be more acceptable to consumers, but these have not been commonly available until ►

► recently. These meals are now often available for a higher price and are widely used in pet food.

Adding to the challenges are its association with livestock feed rather than human food, recurring issues with bovine spongiform encephalopathy (BSE) or ‘mad cow’ disease, inspections and record keeping for all ruminant meats, and concerns with disease outbreaks such as foot and mouth disease. These issues continue to place downward pressure on the popularity of meat and bone meal.

Nutritionally, meat and bone meal remains a good source of animal-based protein with a fairly consistent protein level of 50%. This is an adequate level for traditional pet food diets with protein levels of between 18-26%.

Fat composition ranges from 10% to as high as 25%, depending on the supplier. The fatty acid profile can vary and resembles the composition of the animal from which the meal originates. Beef fatty acids, for example, are proportionally more saturated than pork fatty acids.

Due to the more saturated nature of the fatty acids in meat and bone meal, it is inherently more resistant to oxidation than many of the other rendered meat meals.

On the whole, the digestibility of meat and bone meal for companion animals is comparable to that of lamb meal and poultry by-product meal. In dog

and cat diets, meat and bone meal has not been reported to negatively affect the intestinal flora, stool consistency, or stool volume.

However, beef is often blamed for food hypersensitivities, so meat and bone meal is one of the first ingredients removed in an ‘elimination’ diet regimen.

Lamb Meal

Lamb meal has been a popular ingredient in dog and cat diets for the better part of the last 15 years. Initially, it was considered a novel ingredient in diets for animals with food-related allergies. Lamb meal and rice diets were some of the fastest growing products offered in the pet food aisle to the point that lamb meal supply was outstripped by the demand.

‘Lamb meal analogs’ made of other protein meals were rumored to have entered the market, but tight controls due to BSE and scrapie issues and new DNA typing technology have all but made this an issue of the past.

Much of the lamb meal used in pet foods is derived from the lamb meat industry in Australia and New Zealand.

Poultry (Byproduct) Protein Meals

Poultry protein meals are a popular, high quality protein source used in pet food. The pet food industry consumes an estimated 23% of the rendered poultry proteins produced each year. However, the ability to make one homogenous statement about this ingredient ends there.

Due to some inconsistent rules regarding ingredient nomenclature, an evolving pet food customer base, and pressures within the poultry industry, a series of names and classifications of poultry protein meals has emerged.

Rendered poultry proteins are defined by AAFCO differently than meat meals.

By definition, poultry by-product meal differs from poultry meal only by the inclusion of “heads, feet and entrails”.

Further, they can be labeled specific to their “kind” and many renderers have accommodated.

Thus, there are numerous products available in the market under this umbrella: poultry byproduct meal, chicken byproduct meal, chicken meal, turkey byproduct meal, and turkey meal.

Adding to this confusion, there are several different grades of rendered poultry products available. ‘Feed grade’ poultry byproduct meal is seldom used in pet food because it contains a higher level of ash and lower protein content.

Standard pet food grade poultry byproduct meal contains less than 14% ash and low-ash poultry meal and/or poultry byproduct meal contains less than 11% ash. The latter is available in limited quantities at a premium price and typically reserved for low-ash cat formulas.

In general, poultry protein meals are well utilised by dogs and cats and make up the biggest share of proteins in many of the premium pet foods. The fatty acid profile complements dog and cat nutrient requirements very well.

Additionally, they contain an enriched level of the essential linoleic acid.

Turkey (Byproduct) Protein Meals

Turkey protein meal-containing pet foods are becoming more popular. However, nutritional information on rendered turkey is not easily obtained nor is the ingredient constantly available.

Most turkey destined for rendering are lumped in with chicken, then processed and labelled as poultry (byproduct) meal. There are only a few companies that produce or trade turkey protein meals. Turkey protein meals are a slightly darker golden brown color with a richer aroma when compared to chicken protein meals.

The nutrient composition of turkey protein meal is usually considered to be somewhat better than meat and bone meal, which has allowed some pet food companies to use turkey protein meal as a modest upgrade to meat and bone meal as a leading protein source.

However, the nutrient profile of turkey meal is slightly less favourable than that of pet food grade chicken protein meal. For example, turkey protein meal ranges from 62-65% protein and ash level ranges from 18-25%, whereas pet food grade chicken protein meal typically exceeds 65% protein with less than 17% ash.

The amino acid and fatty acid profile of turkey meal is very similar to that of chicken meal.

Fish Meal

Fish meal is an increasingly common ingredient in pet foods. While there are a few exclusionary diets in which fish meal is the feature protein ingredient, fish meal is generally added only as a secondary protein source.

Fish meal, relative to most other protein meals, has a high level of protein with a correspondingly high protein digestibility. Besides being a source of high quality protein, fish meal also contains about 8-12% fat which is rich in omega 3 fatty acids including eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA).

Thus, in most diets, its primary purpose is to serve as a vehicle to deliver fatty acids.

While the more direct method for the inclusion of these fatty acids would be through fish oils, the use of fish meal serves an additional purpose. Stabilising the more highly unsaturated oils, like fish oil, can be quite difficult, especially when surface-applied to pet foods.

However, for reasons not fully understood, the volatile omega 3 fatty acids found in fish meal seem to be easier to stabilise in pet food application than those in the surface-applied oil. ►



► Fats and oils

In the diet, fat provides a concentrated source of energy, essential fatty acids, a route for fat soluble vitamin absorption, texture, aroma and flavour. Fat, in and of itself, will increase the palatability of a diet up to a certain point in cats, and without limit in dogs, Aldrich writes in his paper. Addition of fat to the diet to meet label guarantees will often reach 10% of the formula. While energy and essential fatty acids are a concern nutritionally, maintaining food stability is a primary issue. Dietary oxidised fat has been associated with lower metabolisable energy values, slower puppy growth, suppressed immunity, and lower dietary and serum linoleic acid concentrations.

Choosing the right fat source and method to retain freshness are important.

Tallow

Tallow was one of the original fats applied to early commercial pet foods and there are several companies that still use it today. Most of the animal fat sold as tallow comes from federally inspected animals and facilities and has regulated quality and composition, something many other fats and oils cannot claim.

Although other animal fats can be found in tallow, it is, practically speaking, derived from beef because it is the dominant meat in North America and Europe.

Because of the saturated nature of the fatty acids (saturated fats are solid at higher temperatures) in fat from beef animals, it most often meets the definition of tallow – a titer of 40, or a melting point of 40°C.

For many, the 'harder' fats like tallow carry a poor nutritional connotation due to the negative association of saturated fats with cholesterol and coronary heart disease. This is really a human nutritional issue as coronary heart disease is not a prevalent health concern for dogs or cats.

Dogs and cats are considered to be 'HDL species' meaning they have a preponderance of the 'good' HDL in their circulation. The fatty acids in beef tallow are about 50% saturated, with a small amount of linoleic acid (3%) and linolenic acid (0.6%) and none of the longer chain omega 3 fatty acids (EPA or DHA).

Mutton tallow has a similar level of saturation (47%) but with a slightly higher level of LA (5.5%) and ALA (2.3%). Tallow digestibility is high (apparent fat digestibility of 97% or better) and comparable to other fat sources like chicken fat and lard. Among the different fat sources, beef tallow is well known for being one of the more palatable. Mutton or lamb tallow is not quite as palatable, possibly due to the aroma.

Tallow is considered to be more shelf stable than less saturated fats and requires less antioxidant addition to achieve shelf life goals. It also contains a small level of conjugated linoleic acid that is now showing promise as a potent natural element in the fight against cancer.

Tallow is a good platform to provide energy and flavour, but a balanced diet may require a complementary oil enriched with linoleic acid and/or omega 3 fatty acids.

Lard/Choice White Grease

Lard and choice white grease are also common animal fats used in pet foods. They are derived

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primarily from pork and are most often labelled generically as animal fat. Like tallow, most of the lard used in pet food comes from federally inspected facilities and a portion of the available supply is human edible.

Thus, pet food companies may partially compete in the human edible market for this ingredient. Due to its abundance, the cost is not typically beyond that of other fat sources.

The proportion of essential fatty acids such as linoleic acid can range between 3-16%.

Lard is relatively easy to stabilise due to a preponderance of palmitic and oleic acids. Lard and choice white grease are semi-solid to viscous liquid at room temperature. They can solidify during colder weather so transport and handling can be an issue. Further, they must be coated on foods when they are hot in order to get adequate penetration.

Digestibility of lard is high and comparable to other fats. Palatability is good in both cats and dogs.

Poultry Fat

Poultry and, more specifically, chicken fat has become a very popular fat source in pet foods. Poultry fat use in pet foods is probably more than 10-20% of the 888M pounds (0.4M tonnes) of poultry fat that was produced in 2003 in the USA.

There are several different sources from which poultry fat is obtained: rendered, rendered-refined, and low-temperature blanched.

They differ in quality, consistency and cost, and may differ ever so slightly in minor nutrients, palatability and stability.

Stabilising chicken fat in bulk storage is not a big challenge. However, when added to pet food, stability can become an issue. The potency of preservative application must take into account the food and its handling and packaging. Further, the condition of the fat at the time preservatives are added is critical – the lower the moisture content, peroxide value, free fatty acid level and impurities, the better. The trade-off is cost, availability, flavour, and aroma.

Chicken fat is a good source of the essential linoleic acid (19.5%) and about double that of lard. Chicken fat fits very well in dog and cat diets

because it is well accepted by both, having a flavor that is preferred over many other fats. Chicken fat is comparable to other fat sources, such as tallow or pork fat, in digestibility and overall contribution of metabolisable energy to the diet.

Fish Oil

The majority of omega 3 fatty acid research in dogs has been conducted with the longer chain omega 3s from fish oil, such as EPA and DHA.

These oils are derived primarily from pelagic fish like menhaden, anchovy, herring and mackerel. They are known to have a strong oily taste and aroma not appreciated by most people. This does not appear to be a big problem for dogs, although some cats may show a preference for one fish oil over another.

Most fish oils are added to the surface of pet food after extrusion and drying. The application of fish oil to meet the desired omega 3 fatty acid level is typically less than 1-2% to of the formula. This small amount can be challenging to accurately meter without properly designed equipment. Surface application can also lead to palatability concerns.

The fatty acid profile of the different fish oils can vary substantially. Most of the fish oil used in the pet food industry is cold pressed and/or refined. While the more processed oils add to the cost, the trade-off is improved handling, animal acceptability, and shelf life.

Once ingested, the utilisation of fish oil is similar to other fat sources.

Conclusion

Meat consumption among humans is increasing as incomes rise and byproducts from meat production are inevitable, Meeker and Meisinger write in their paper. These byproducts can be rendered into safe and nutritious pet food ingredients.

Feeding animals offers a greater value use for byproducts than other alternative uses such as energy or fertiliser, therefore improving the sustainability of the industries from which the byproducts are derived.

“The AAFCO has come under increased pressure from activists in recent years to ban certain raw materials from pet food for aesthetic and emotional reasons rather than nutritional, environmental or safety concerns,” they say.

“If the AAFCO or the FDA chose to ban some or all of the current food animal production byproducts from the approved animal feed ingredient list, an increased amount of food suitable for humans would have to be used in the manufacture of pet food. This, in turn, would raise the price of many pet food products, raise the price of food for people and force more byproducts into less sustainable uses or less environmentally friendly disposal endpoints.”

New definitions for preferred ingredients can be developed to accommodate customer preferences, but for the long-term sustainability of pet food manufacturing, decisions to exclude certain byproducts for reasons other than food safety need to be very carefully considered, they conclude. ●

This article is based on the paper, ‘Rendered ingredients significantly influence sustainability, quality and safety of pet food’ by David Meeker and Jessica Meisinger of the National Renderers Association; and ‘Rendered Products in Pet Food’ by Greg Aldrich, president of Pet Food and Ingredient Technology