

FEED
COMPOUNDER

PET FOOD

Supplement

Strong Immunity. Healthy Living.

We know that pets are special family members, and maintaining a healthy immune system is vital to lead a happy and healthy life. Therefore, we at DSM focus our passion and expertise in delivering solutions in a sustainable and responsible way.

Optimal nourishment combining multiple vitamins, together with the powerful antioxidant carotenoid beta-carotene, along with trace elements such as selenium and zinc, omega 3 fatty acids, ensure strong immune defences to help protect our pets from everyday challenges.

Supported by our pet food market insights, DSM's nutritional concepts use scientifically substantiated, functional ingredients from traceable supply chains that are known to help pets build an effective immune response at each life stage.

Our pet nutrition concepts are designed to help your brand team develop pet foods, treats and supplements that deliver the quality, transparency, and nutritional functionality expected by pet parents to keep their pets safe and well.

If not us, who? If not now, when?
WE MAKE IT POSSIBLE

Follow us on:    

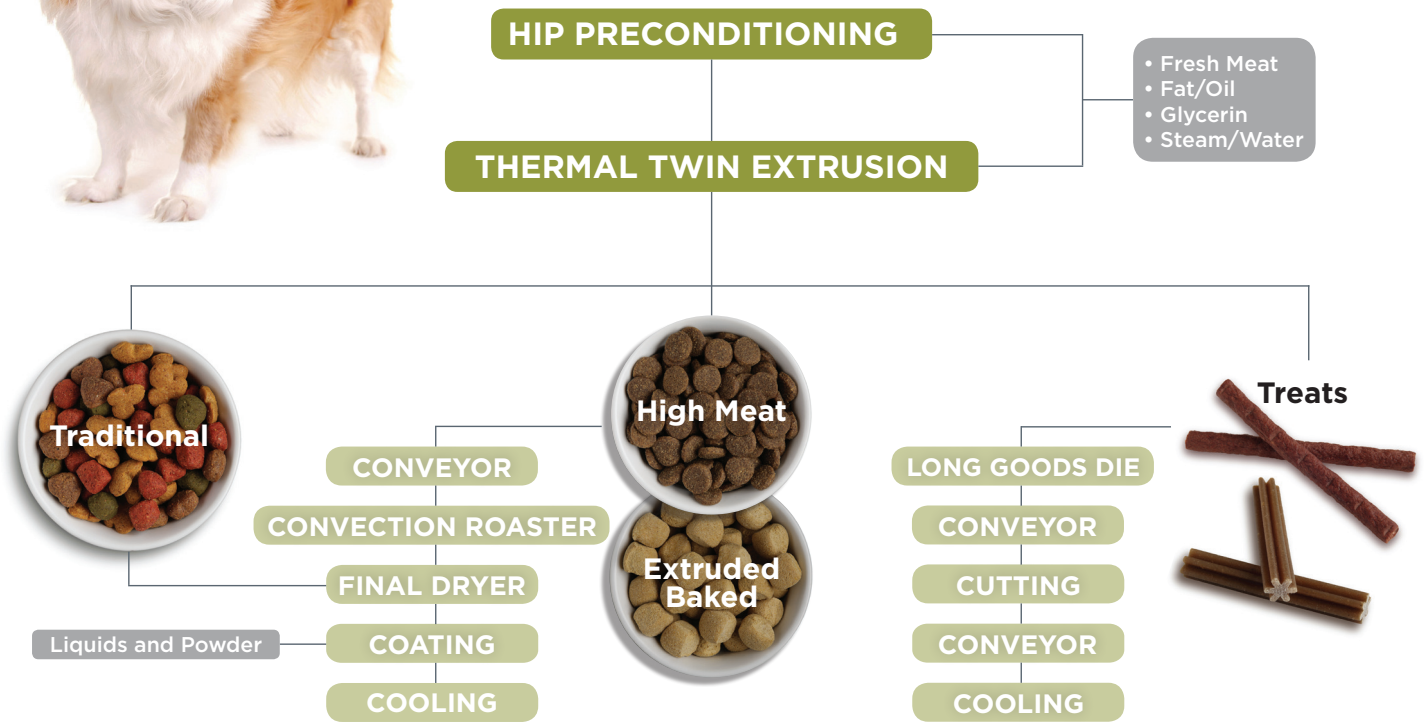
Visit us at:  dsm.com/anh



DSM

BRIGHT SCIENCE. BRIGHTER LIVING.

GAIN ULTRA VERSATILITY AND EFFICIENCY WITH THE **PETFLEX PROCESS.**



With Wenger's new **PetFlex Process**, you can produce standard pet food, high meat inclusions, baked treats and long goods. Centered around our Thermal Twin Extrusion technology, this complete process boasts lower energy costs, less wear and lower environmental impact.

Stretch your production power with the ultra flexible **PetFlex Process**. Email us at info@wenger.com today.



COMPANION ANIMAL DIVISION

PHONE: 785.284.2133 | EMAIL: INFO@WENGER.COM | WENGER.COM

USA | BELGIUM | TAIWAN | BRASIL | CHINA



Published by:

Pentlands Publishing Ltd
Plas Y Coed
Velfrey Road
Whitland
SA34 0RA
United Kingdom
Tel: +44 (0) 1994 240002
Web site: www.feedcompounder.com
E-mail: mail@feedcompounder.com

Editor:

Ryan Mounsey

Advertisement/Sales Manager:

Fiona Mounsey

Subscription rates:

Pet Food Supplement is distributed free of charge, to individuals based in Europe and involved in the pet food sector who have registered to receive a copy. To register to receive future issues, please visit www.pentlandspublishing.com/pfs.htm#register

ISSN 0950-771X

Views expressed by contributors are not necessarily those of the Publisher.

© Feed Compounder 2021

Contents

Pets in Society	2
By Roger W Dean	
The Role of Vitamins in the Immune System of Cats and Dogs	8
By Marijke van de Beek-Weij, MSc and Kevin Truyts, MSc	
Keep the Probiotic Alive	12
By Pauline Rovers-Paap	
The Gut, the Brain and the Well-Being of Pets	16
By Francesca Susca, DVM, PhD	
Mimicking Nature Boosts Trace Mineral Efficiency	18
By Alexandra Wesker	
A Consistent Approach to Brand Differentiation in Pet Food	21
Evolution of Moist Petfood	22
By David Primrose	
Transparency and Collaboration Key to Advancing Food Safety	24
By Tim Harter	
Alternative Protein Sources: Soy Protein Concentrate in Dog Food	28
By Dr. Diana Siebert	
Turning Whisky's Wastewater into Pet Food Rich in Omega-3	30
By Douglas Martin	
The Pandemic Increases Demand for Healthy Pet Foods	32
By Karel Thurman	
Insects: Healthy and Tasty with Less Impact on the Planet	34
By Catharina Nieuwenhuizen	
Pet Subjects	35

Pets in Society

By Roger W Dean

Pet Populations

The Petfood Manufacturers Association (PFMA) is, arguably, the most consistent and reliable source of pet numbers data for the UK. Each year PFMA commissions new research into the UK's pet populations so that both its members and the public can be provided with useful statistics. In addition, a sample of UK adults are interviewed by TNS/Solus Consulting, in face-to-face interviews.

However, in 2021, and due to, what else, the Covid Pandemic, the PFMA survey moved online. The change in methodology meant that the sample size of UK adults, at 5,093 respondents compared with the average 8,000 respondents surveyed in the previous four years, was smaller than usual and thus the current 2021 figures cannot and should not be directly compared to those of previous years. However, in order to substantiate the change in pet population, PFMA have spoken to industry colleagues and participants and it is widely recognized that there has been growth. In addition, PFMA annual Market Data scheme also suggests there has been a population increase over the last year. However, due to the methodology change, it is not possible specifically to quantify the change in numerical terms.

Such as it is, the PFMA's data suggests that, in 2021, there were an estimated 12.5 million dogs in the UK, constituting 33 per cent of all households. A total of 12.2 million cats, constituting 27 per cent of all households was the second largest pet keeping proportion of UK households. However, this is not to forget the vast number of other livestock living within the human orbit. These include a vast array of rodents, rabbits, indoor birds, ferrets, pigeons, horses and ponies and the inevitable hamsters. By and large, however, the latter recorded very small proportions of total UK households, ranging from 2 per cent for rabbits and indoor birds to a miniscule 0.1 per cent for mice.

Looking at PFMA data for the nine years covering 2011-2012 to 2019-2020, it would appear that the proportion of households in possession of a pet as fallen from 47 per cent in 2011-2012 to 41 per cent in 2019-20. However, this largely reflects declines in certain sectors. The only category of household pet ownership that has actually expanded over the periods under review is that of dogs; from 22 per cent of households in 2011-12 to 23 per cent in 2019-20. Since 2017-18, the proportion of households keeping a dog has fallen from 26 per cent to 23 per cent.

The other staple household pet, cats, shows a small decline over time, from 19 per cent of all households keeping a cat in 2012-13 to 16 per cent in 2019-20. The majority of the decline has taken place over the last three years. The proportion of households keeping other pets; from rabbits to guineapigs all show declines, albeit that the proportions in these cases are all in low single figures.

The PFMA is not the only body collecting data on pet populations. The Peoples' Dispensary for Sick Animals (PDSA) also collects data although the latest data relets to 2020, data not have been collected in 2021. The PDSA data identifies 51 per cent of UK adults as owning a pet, with 26 per cent of UK adults keeping a cat with an estimated UK population of 10.9 million pet cats. An estimated 24 per cent of the UK adult population have a dog with an estimated population of 10.1 million pet dogs. An estimated 2 per cent of the UK adult population have a rabbit with an estimated population of 1 million pet rabbits.

Book Review

The publication, on 29 April, of 'How to Love Animals in a Human Shaped World' was lyrically described by its publisher as 'a far-reaching, urgent, and thoroughly engaging exploration of our relationship with animals by the acclaimed Financial Times journalist, Henry Mance'.

Mance starts by describing a day on a beach in San Francisco in 2019, surrounded by no less than a thousand corgis. Mance notes that sand is not the natural environment for dogs '*whose legs are only as long as ice lollies*'. But this was *Corgi Con*, possibly the world's largest gathering of corgis. Mance describes the scene as '*weird*' and '*glorious*'. There were corgis in baby harnesses and corgis under parasols. There were corgis dressed as a shark, a lifeguard, a snowman. There were stalls selling sunglasses and socks for dogs. Mance overheard two people considering whether to buy a corgi-emblazoned cushion, but decided against it '*on the basis that they already had one*'.

For a Martian wishing to understand the depth of humans' obsession with their pets – what Mance describes as the '*the commoditization of animals and the merging of our humans' social lives with theirs*', *Corgi Con* would have been an ideal first stop. Of course, in California, such extravaganza would not be regarded as unusual; San Francisco's newest day care for dogs was charging up to \$25,500 (£18,500) a year, more than the state's minimum wage. Google declared dogs '*an integral facet of our corporate culture*'. But pet worship is worldwide; the Archbishop of Canterbury reportedly has said that pets can go to heaven, while '*Japanese architects have designed a ramp to help dachshunds sunbathe alongside their owners*'.

Mance argues that while our love for our pets is '*easily dismissed as frivolous or private*', in a way, it is revolutionary. Pets represent humanity's closest ties to another species and, '*if they can sensitize us, and make us care for other sentient beings, they could change*

**SPECIFIC
FOR YOUR
SUCCESS**



SELECTED NATURAL MICROBIALS FOR PETS' WELL-BEING



**DIGESTIBILITY
ENHANCEMENT**



IMMUNITY SUPPORT



**OXIDATIVE
STRESS CONTROL**

As a partner, Lallemand Animal Nutrition develops, produces and markets a complete range of high-value yeast and bacteria products –including probiotic and yeast derivatives– specifically selected to help you improve companion animal well-being in a natural way.



the course of history'. An exaggerated claim? For the last two years, Mance has been investigating how we treat other animals, including working in an abattoir and on a pig farm, as well as visiting fish markets and zoos. We push slaughterhouses to the back of our minds. We delay turning to the destruction of forests and coral reefs on which wild animals depend. Compare that with domestic dogs and cats. As Mance observes, *pets are animals whose lives we value, whose emotions we appreciate and whose flesh we wouldn't dream of eating*.

Mance notes that while wild parrots often live-in huge flocks, as pets they are mostly kept alone. Meanwhile, Lockdown has seen a pet boom. As Mance puts it *'deprived of the company of other humans, people are seeking the company of animals instead'*. Britain's dog population has reportedly *'exploded'*, rising by an estimated two million. There have been additional complications. Soaring prices have fueled unscrupulous breeding and thefts. New owners have found themselves unable to *'socialise'* their puppies in a time of social distancing. They have struggled on, hoping that their pets would help their mental health, although, as Mance dryly remarks, *therapy sessions might have been cheaper*. Over a lifetime, caring for a dog can cost a minimum of £4,600 to £13,000, depending on the size of the animal; care costs can take the total above £30,000, says the animal charity PDSA. Americans' pet spending has surpassed a reported \$100 billion a year for the first time. Meanwhile, in anticipation of the end of the pandemic, shelters are preparing for a wave of unwanted animals.

In common with many parents, Mance hoped that having a pet would help to teach his children about nature. Growing up with a terrier, which he fondly remembers as the source of his internet passwords, he now has a cat, which generally lies on his laptop whenever he is trying to work, an experience which is shared by the present author. Yet Mance wonders if pet ownership is not what he describes as *'a missed opportunity'*, saying that mankind *'needed a new relationship with nature'*, instead we ended up with feline Instagram accounts. We love pets, yet accept factory farms and extinctions. Shouldn't pets spur us to treat all animals better?

The first stumbling block is that our love for pets is not as *'pure'* as we would like to think. Pet ownership is so ingrained that we rarely question its implications. The relationship can bring great joy, and not just to us: when was the last time you saw a person happier than a dog chasing a Frisbee? But that's not the whole story.

We have a perception that being owned is an inherently positive experience. Mance is not convinced that it is. He argues that, by owning animals, we take control of their lives. We decide who they live with, when and if they socialize with others of the same species, and whether they can have offspring. Often, we feed them into obesity. Often, we decide when they die

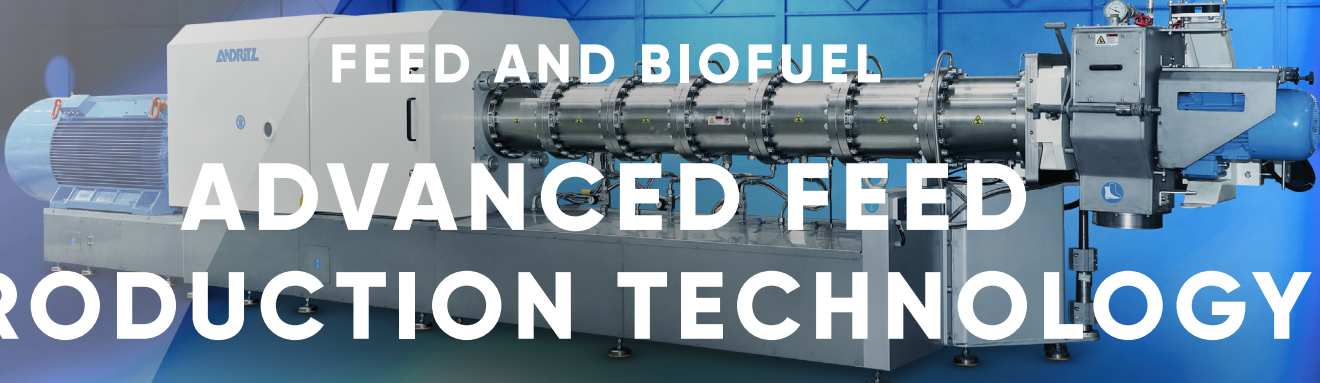
In Chile, many dogs roam the streets in packs. They have more freedom and, perhaps, more fun than their pampered cousins. In Europe and North America, many pets arguably live in a form of

lockdown: they are well fed and safely homed, but they lack social interaction and autonomy. This lockdown lasts their whole lives. Mance notes that *'we love our pets deeply, we want them to be happy, but we struggle to know what they are thinking'*. We also expect them to fit in with our schedules and needs. In reality, many rabbits don't want to be cuddled. It seems a reasonable assumption that pet fish and tortoises probably don't value our company at all. Wild parrots often live in huge flocks, but as pets they are mostly kept alone; one study found that American owners spent only 15 minutes a day interacting with their parrots. Mance asks what are these highly intelligent birds meant to do the rest of the time? Similarly, when devoted dog owners return to their offices and work after lockdown, how are the dogs meant to react? Modern human societies may not be easy places to live: nearly three-quarters of dogs show at least one anxiety-related behaviour, such as sensitivity to loud noises. There is some evidence that free-roaming street dogs which, by definition, have more control over their lives, are less excitable. Heather Bacon, an animal welfare expert at the University of Edinburgh says that *'We have a perception that being owned is an inherently positive experience. I am not convinced that it is'*,

What we love about dogs, in particular, is that they offer us unconditional love. Yet this has *'almost made us lazy about meeting their needs'*, Bacon says. Nowhere is this more evident than in breeding. Dogs were probably domesticated more than 20,000 years ago. Breeds, as we understand them today, have existed for less than two hundred years. They were standardized, often on entirely arbitrary, aesthetic criteria, based on dogs from small gene pools. This was the Victorian age of empire and of social hierarchy. Ideas of pure bloodlines and racial improvement were acceptable. London Zoo was trying, unsuccessfully as it happens, to domesticate wild animals. Dog breeders' ability to manipulate a single species into very different shapes and sizes helped to inspire the proponents of eugenics.

Breeding has had indefensible results. Some of our most popular pets are brachycephalic dogs, such as pugs and French bulldogs, whose flat faces affect their airways and much else. Such dogs are as much as three times more likely to suffer respiratory problems. Some cannot close their eyes. Many cannot give birth without caesarean sections. Yet people find flat faces cute and loving. Some owners also believe that such dogs are low maintenance because they don't require much exercise - in fact, the dogs just cannot breathe properly. One-fifth of dogs in the UK are flat-faced. In March, Lady Gaga offered a \$500,000 reward after her French bulldogs were stolen. Mance observes that *'It's weird to value your dogs' company so much, but value breeding for health so little'*. We regard eugenics as morally beyond the pale; why should we celebrate the canine and feline equivalents?

Our unethical breeding also affects cats too: Scottish fold cats, which Taylor Swift and Ed Sheeran have helped to popularise, suffer a cartilage defect. Most Persian cats have at least one health disorder. Put a cat in a wheelie bin and you become a national hate figure;



FEED AND BIOFUEL
**ADVANCED FEED
PRODUCTION TECHNOLOGY**
THE NEW TWIN SCREW EXTRUDER

TWIN SCREW EXTRUDER

ANDRITZ Twin Screw Extruders developed for increased demands in fish feed and pet food. The Twin Screw Extruder series ExTS616 & 718, is the ideal solution for the extrusion of pet food with high inclusion rates of meat slurries or fresh meat. Many variations in formulas can be controlled and handled without having to change the screw configuration.

The growing demands of today's pet food market require increasingly specialized knowledge, together with advanced processing technologies. As a longtime partner to hundreds of premium pet food producers worldwide, ANDRITZ provides comprehensive processing solutions and aftermarket services to keep your operations ahead of the curve. All to guarantee easy, safe, and efficient

operations that can quickly adapt to the next market trend. Find out how our world-class processing solutions and services can feed your business at andritz.com/ft.

ENGINEERED SUCCESS

ANDRITZ FEED & BIOFUEL A/S / Europe, Asia, and South America: andritz-fb@andritz.com
USA and Canada: andritz-fb.us@andritz.com / andritz.com/ft

create a cat vulnerable to eye disease and you become a potentially wealthy breeder. As Dan O'Neill, a companion animal epidemiologist at the Royal Veterinary College, aptly puts it, 'pets health problems are 'actually human problems'.

Mance says that we could start to solve these human problems. Currently, pet-buyers often seem to be acting on a whim, like the hapless narrator in the novel *Fleishman Is in Trouble*, who panic-buys a miniature dachshund to turn his life around, but wakes up to find the dog urinating on his head. We could do our research, and stop trying to make fashion statements through animals. We could also try to offer our dogs choice - when Bacon walks her dogs, she let them help to choose the route: 'It's their walk, not mine. Advertisers could stop using French bulldogs and other unhealthy flat-faced dogs. Another option would be to push breeders to cross-breed – thus diversifying the gene pool, even though it breaks the supposed purity of the gene line. This is already being trialed in the Netherlands, where the government has restricted the breeding of purebred bulldogs and pugs. Why not be radical, and drop our obsession with pets' appearance altogether? We regard eugenics as unacceptable, why should we celebrate the canine and feline equivalents? Mance argues that we should start, as he puts it, prizing mongrels. We need to think less about how our pets look, and more about how our world looks to them. The problem isn't that we think of pets as almost human-like; it's that we don't think of them as human-like enough.

Even if pet owning is done well, it only brings us close to a small slice of the animal kingdom. At least 1,300 species of mammals, including both species of African elephant and 1,400 species of bird, such as snowy owls, are endangered. Few of these animals would live happily in our homes. To save other animals, humans must shrink their footprint on the natural world – by eating less meat, creating more protected areas, and so on.

The difficulty is that our love for our pets increases our footprint. We need more chickens, cows and fish to feed our pets: US dogs and cats eat as many calories in a year as 62 million American people, according to the UCLA geography professor Gregory Okin. Pets no longer just eat our offcuts, because we want them to have the best. As a result, feeding an average size dog can emit more than a tonne of greenhouse gases a year.

There's more: in the US, cats have been estimated to kill between 1.3 and 4 billion birds and between 6.2 and 22.3 billion mammals each year. It's not clear how big a chunk of the bird population this represents, or whether the cats are taking mainly weaker birds that wouldn't have survived anyway. Mance finds this tricky; while he loves cats and birds, he values cats' individual existence over most birds. He also recognize that cat and dog populations are doing well, while those of birds are not, and that this puts our ecosystems off balance. His cat has rarely brought anything back into the house, but Mance has to admit that his garden is not full of birds. Owners can try training their cats or attaching bells to

their collars. Yet the failsafe way to protect birds is to keep your cat indoors: something that affects the quality of a cat's life.

Dogs, too, impinge on wildlife – as shown by the sad recent incident on the River Thames where a pet dog savaged a seal known as Freddie. Farmers complain about dogs disturbing nesting lapwing and other birds. Other pets can be even more disruptive, Florida's Everglades have been overrun by Burmese pythons and green iguanas, which have escaped or been released by bored pet-owners.

Mance stresses that this is not an argument against pets. It's a call for balance. The world has close to an estimated billion dogs and several hundred million cats. Meanwhile, some of their closest wild relatives are treated entirely differently. Britain has found space for tens of millions of dogs and cats, but no wolves or lynx and ever fewer Scottish wildcats. If we really love animals, Mance argues that we should make sacrifices for them, whether or not they are disposed to curl up on our sofa. If pets represent our deeper love for the natural world, perhaps we could match every pound we spend on them with a pound given to conserve wild animals.

In many places, conscientious humans often refer to their pets as *companion animals*, and constitute themselves as guardians rather than pet owners. For many people, however, this phrasing doesn't quite work. It implies that animals are only our companions if we keep them in our homes. Yet where Mance is concerned, the birds in our cities, the beavers in our rivers, the pine martens in our forests are also our companions too, and our wellbeing depends on their survival.

Due to the pandemic, Corgi Con is not scheduled to go ahead this year. I hope it does, but I also hope pet owners look beyond it. There is more to loving animals than owning them.

This is an important book, for pet keepers and non-pet keepers alike. Mance concludes that our pets should be the beginning of our love for other animals, not the end.

How to Love animals in a human shaped world is published by Cape

New Pet Dog, New Car?

A recent report indicates that a survey of 2,000 drivers with dogs revealed that more than a fifth - 22 per cent - bought or adopted their most recent dog after the start of lockdown.

More than a third - 35 per cent - of recent dog owners said they had to buy a larger or more practical vehicle because of their new pet, spending an average of £7,594.

Manufactured Meat

The reason that many people say that they have given up consuming meat and have turned to a vegetarian diet is that they cannot reconcile their desire for meat with the knowledge that, to eat meat, sentient creatures must die.

If a household makes the decision to go vegetarian or, even, vegan then the family dog can likewise be administered a similar diet.

And the cat? Ah No! Cats must eat meat. They are 'obligate carnivores' which means cats cannot be vegetarian.

Their bodies need certain nutrients which can only be found from animal meat and which they are physically unable to make themselves. An example of these are Taurine and Arginine, which are essential building blocks for your cat's health. Without them, your cat could become extremely ill. Taurine deficiency can cause dangerous heart problems and eye issues that can lead to blindness.

Four further rules for feeding your cat. Choose a cat food that is complete rather than complementary so that your pet gets a complete, balanced diet. Cats like to eat away from other cats. Keep food, water and litter trays in different places so your cat knows that their food and water are clean. Finally, your cat needs fresh water, which should be changed daily.

Missing Moggies

With apologies, and thanks, to the *Camden New Journal*, the local North London newspaper that drew attention to the increasing problem of missing cats.

An increase in the number of pet keepers is responsible for a growing missing cat problem, say pet detectives searching for a lost cat, a Norwegian Forest, a breed of domestic cat originating in Northern Europe. This natural breed is adapted to a very cold climate, with a top coat of glossy, long, water-shedding hair and a woolly undercoat for insulation.

in North London's Belsize Park, a retired police officer turned animal sleuth Tom Watkins, the founder of Animal Search UK – said 'keepers' are generally people living alone and habitually feed cats that don't belong to them. But they then go further by taking them inside and keeping them for a period of time or, even, forever.

Mr Watkins, whose search team was out last week trying to locate a one-year-old Norwegian Forest cat not seen since 5 April, said he believes more people have become 'keepers' due to loneliness during the coronavirus lockdown.

He said 'We've found out over the last twenty-one years of working in this profession, that there are always different reasons that cats, in particular, go missing. These range from sadly being involved in road traffic collisions, losing their way after something spooks them and they run out of their normal territory, becoming locked in sheds and outbuildings by mistake or being 'adopted' – some call it stolen – by persons we refer to in the trade as 'keepers'.

However, for one family, matters ended up on a happier note. One North London family has been reunited with a lost cat, a 14-year-old feline with a thyroid problem, eight weeks after he went missing.

The cat's keeper said, following the recovery, that 'I'd just like to say to people please don't feed cats that aren't your own, don't feed them, and don't keep them, as much as you may want to. You don't know what illnesses they may have and how much their family is going to miss them.'

tastetite
INNOVATION IN SENSES

**A dynamic approach using
flavours & aromas
to maximise pet food
and treat palatability**

30 YEARS
OF EXPERISE
1989-2019



Unlock the possibilities

To find out more about our unique Tastetite and other feed enhancement technologies, visit www.inroadsintl.com, email info@inroadsintl.co.uk or call us on +44 (0) 1939 236 555.

Inroads Intl



The role of



VITAMINS in the immune system of cats and dogs

By Marijke van de Beek-Weij, MSc and Kevin Truys, MSc, DSM Nutritional Products

Making the most of a healthy and enjoyable life is only possible when our body is defended by an immune system that is nutritionally supported to work at its best. For us and for our pets, the immune system fights harmful bacteria and keeps other toxins that have invaded the body from making us ill. It is a complex and adaptive system that consists of many general functions, with complementary action to support optimum health. Through this adaptive functionality and support, it can develop a memory against infections, infectious agents and foreign substances.

Young animals like puppies and kittens are most susceptible to infections as their immune system is not fully developed yet, because they have had little exposure to external threats like bacteria, viruses and foreign substances. A newborn's immune defences are supported

by the mother's antibodies which are transmitted during gestation. This maternal protection becomes inadequate about 4 to 8 weeks after birth as the provided antibodies decrease below a protection threshold, resulting in an immunity gap. Provided the right nutrients via proper nutrition, young animals develop their own immune system over time.

During adulthood the dog's or cat's immune system remains fully functional provided their daily diet delivers an adequate amount of key nutrients. With older age their immune function begins to decline, resulting in poorer antibody response at senior age (1, 2, 3).

Therefore, throughout all life stages, an optimal supply of key nutritional ingredients in a pet's diet is the best solution to ensure a high performing immune defence. Providing the proper nutrients has a significant influence on the ability of the immune system to manage disease challenges. Some examples of how different nutrients can help support the immune system to the benefit of the dog or cat are:

- β -carotene and vitamin A stimulate cellular and humoral immune responses.
- Various B vitamins are associated with improved immunity.
- A high concentration of vitamin C stimulates the effectiveness of white blood cells to destroy foreign bacteria.
- Vitamin D controls the activity of T- and B-lymphocytes, which are important in the adaptive immune system.

Functioning of the immune system

(See Figure 1) The body's natural barriers, such as skin, villi and mucous membranes, play an initial role in the first line of defence against



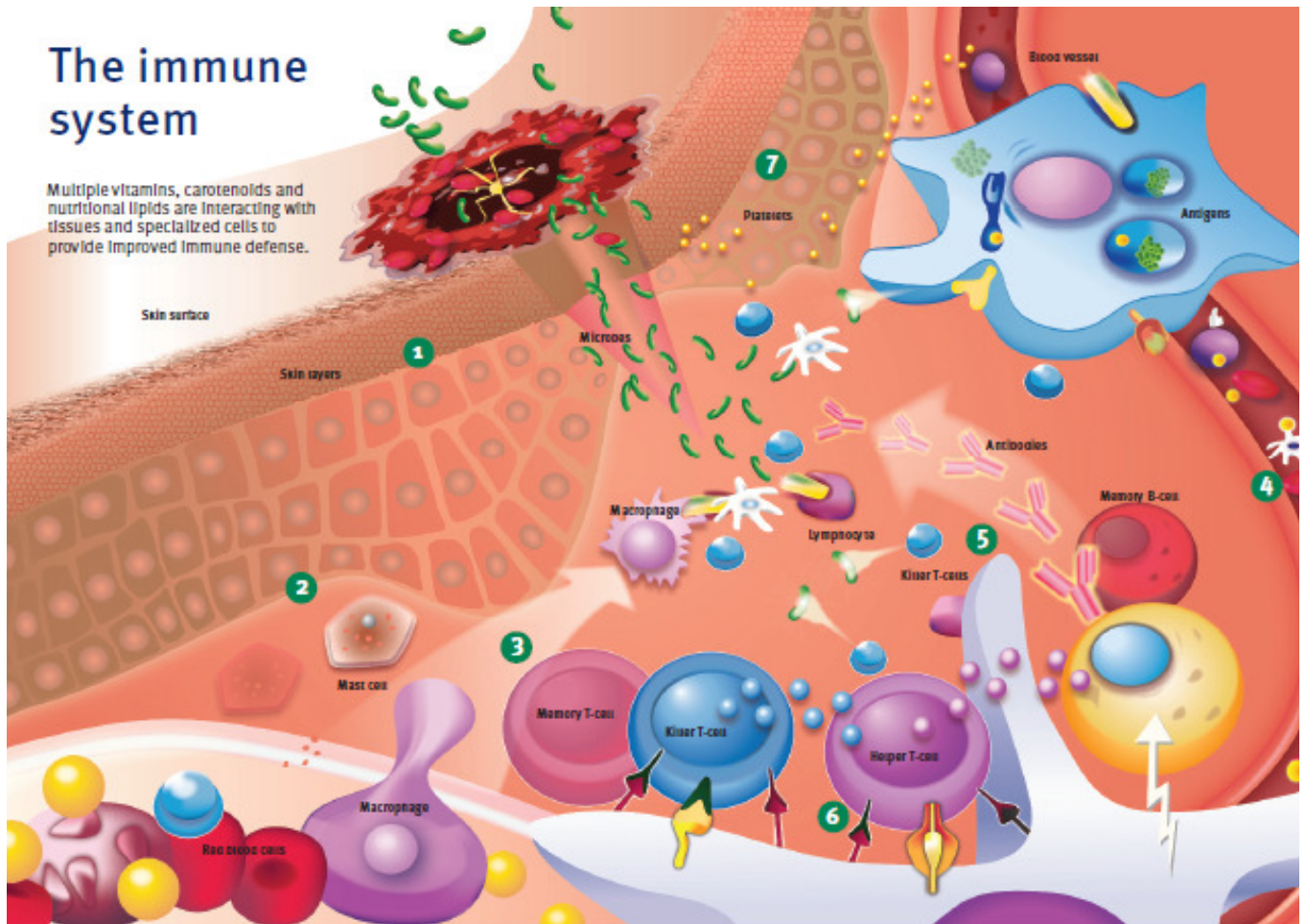


Figure 1: A schematic overview of the functioning of the immune system:

1. Microbes invade the body via a wound.
2. Mastocytes release substances that induce inflammation. This causes other immune cells to go to the infected area.
3. Macrophages remove these microbes.
4. Macrophages bind with B- and T-lymphocytes in the lymph nodes. The B-lymphocytes produce antibodies.
5. Antibodies activate other immune cells, such as macrophages and T-killer cells, to attack the invader.
6. T-helper cells lead antibodies and T-killer cells to the infected area.
7. The immune system is fully active.

disease challenges. They are part of the so called innate (non-specific) immune system. If however, any undesirable substance or pathogen does manage to invade the animal then the body responds by activating the next steps of the innate (non-specific immune) immune system as well as the adaptive (specific immune) defence mechanism.

White blood cells (phagocytes) recognize and destroy pathogens. Specialized phagocytes – macrophages – remove microbes. Natural Killer (NK) cells are large lymphocytes that play a role destroying cells, for example, tumour cells and virus-infected cells. NK cells also secrete cytokines to defend against pathogens. All these activities are part of the innate, immune system.

The specific, adaptive immune system allows the body to respond more efficiently to a repeated attack by similar pathogens. It stores up information, so it can recognize the pathogens should they invade again. The main players in this system are the B- and T-lymphocytes. B-lymphocytes produce antibodies that react with the pathogen. T-lymphocytes activate macrophages when they recognize a threat, which also destroy pathogens.

Table 1: The types of defence mechanism in the immune system

	<i>Innate immune system</i>	<i>Adaptive immune system</i>
Barrier function	Skin, villi and mucous membranes	
Cellular immunity	NK cells Complement system Phagocytes	B-lymphocytes T-lymphocytes
Humoral immunity		B-lymphocytes Antibodies

Vitamin A and β carotene

Vitamin A is crucial for both the innate and the adaptive immune system and is of particular importance for its proper development. Phagocytes and T- and B-lymphocytes cannot function properly without vitamin A. Deficiencies are linked to a weakened and delayed immune functioning, such as reduced effectiveness of



mucous membranes (4). Adding β carotene to the pet's diet has been shown to stimulate the cellular and humoral immune response and acts as an antioxidant (5, 10). Through its antioxidant function it enhances the defence system and has been proven by several studies in animals and humans (6, 7). Studies have also revealed that puppies and kittens given β carotene show better innate and adaptive immune responses. β carotene supplementation significantly restores immune responses in older dogs when compared to their age-matched controls and younger counterparts (8). Important to mention is that cats can convert β carotene to vitamin A, but not in sufficient quantities to be helpful, so pre formed vitamin A is essential (5, 9).

B-vitamins

A number of B vitamins are linked to the immune system. Inadequacies of vitamin B6 result in fewer lymphocytes being produced, slowing



down antibody reaction time.

Niacin (vitamin B3) is important for healthy skin and mucous membranes. It is particularly important to ensure niacin adequacy in cat diets as they are unable to compensate for a shortfall through synthesis from tryptophan.

Vitamins B6, folic acid and B12 are important in protein formation and various aspects of the immune system, including reduced activity of NK cells and lower production of cells (including basophils and mastocytes) which carry messages in the immune system via the signalling pathways of histamine (11, 12). Vitamin B1 is involved in the production of cholesterol and fatty

acids that support the membrane function, the initial barrier against pathogens (12).

Vitamin C

Dogs and cats can synthesize vitamin C. However, many consider this vitamin as conditionally essential given its function in the immune system and powerful antioxidant support, helping to recycle vitamin E. Vitamin C reduces the tocopheroxyl radical that is formed when vitamin E gets into an oxidized state and therefore is capable of restoring the radical scavenging activity of vitamin E (13). When pets are experiencing periods of high stress, additional vitamin C supplementation is required to ensure its protective function. Vitamin C is also indispensable in the production of collagen, which holds cells together for the protective barrier function.

Vitamin E

Vitamin E is the most important fat-soluble vitamin. It acts as the major antioxidant in plasma, red blood cells and tissues. It neutralizes free radicals and prevents oxidative damage to polyunsaturated fatty acids in cell membranes, among others. Responses of free radicals are associated with responses of the innate immune system. Insufficient vitamin E in the diet affects the functioning of the immune system. Although deficiencies are rare, extra vitamin E in addition to the basic needs of the animal can be beneficial, particularly when diets have increased levels of omega 3 fatty acids, important in helping to control inflammatory responses (14). Studies with additional dietary vitamin E have revealed enhanced functioning of the immune system and reduced risk of infection, especially in older animals (15). These effects are explained by the better functioning of T-cells, lymphocyte multiplication, IL-2 production and T-helper cells (16,17). Vitamin E also modulates humoral immunity. Supplementation supports increase of immunoglobulin and plaque-forming cells.

Vitamin D

Various components of the immune system (B and T cells, macrophages and dendritic cells) contain vitamin D receptors (18). Enzymes convert vitamin D3 into the active vitamin D metabolite, which binds to the receptor and can then influence the immune system (19). Vitamin D activates the production of an important bacteria-fighting peptide in macrophages and barrier cells (20). A deficiency is associated with the improper functioning of macrophages, particularly on how they move around and destroy pathogens.

Vitamin D also regulates the adaptive immune response. It fine tunes T- and B-lymphocytes' activity to avoid an overreaction of the immune response. Humans with low blood levels of vitamin D have an increased risk of immune disorders resulting from an overly reactive immune system.

Vitamin-Vitamin interaction and effect on immunity

Next to the functions of each individual vitamin, it is also worth mentioning that some of them work synergistically together and



strengthen the immune function (21,22).

Vitamin A and vitamin E work synergistically in antibody production and phagocytosis. It is important to keep balance as increasing only one can counteract the immune function.

A similar relation exists between vitamin A and vitamin D. When both are added adequately, they increase phagocytic activity and enhance oxidative burst (23).

As described earlier vitamin C works synergistically with vitamin E as it reduces vitamin E when it is in an oxidized state and as such restores its radical scavenging potential. Addition of both vitamin C and E also inhibits the release of arachidonic acid (24) which results in stimulation of immune cell responses and suppression of tumor growth in both animals and humans (25,26).

Summary

Being human we know that it is crucial to keep ourselves healthy by having an immune system that works flawlessly. The same applies to our beloved pets which, through optimal and balanced nutrition, can keep their immune defence in top shape. As a pet food manufacturer a correct fortification of your pet foods with high quality vitamins is therefore an absolute must. To check the right premix composition and adequate nutrient supply for your pet foods, please contact your local DSM representatives to ensure your customers can enjoy all the benefits of an optimal nutrition!

References

1. Banks K.L. 'Changes in the immune response related to age'. Symposium on Internal Medicine and the Geriatric Patient. Veterinary Clinic of North America, Small Animal Practice, 11(4) (1981), 683-688
2. Greeley EH, Kealy RD, Ballam JM, Lawler DF and Segre M. 'The influence of age on the canine immune system'. Veterinary Immunology and Immunopathology, 55 (1996): 1-10
3. Hayek MG, Massimo SP, Burr JR and Kearns RJ. 'Dietary vitamin E improves immune function in cats. In: DP Carey and GA Reinhart (eds), Recent Advantages in Canine and Feline Nutrition, vol. III. IAMS Nutrition Symposium Proceedings (2000): 555-563
4. Kolb E and Seehawer J. 'Utilisation, metabolism, significance and use of vitamin A in the dog and cat'. Translation from: Praktischer Tierarzt 82(2) (2001): 98-106
5. Chew BP and Park JS. 'Carotenoid action on the immune response'. J. Nutr. 134 (2004): 257-261
6. Toll PW, Jewell DE and Novotny B. 'Oxidative stress and the antioxidant defense system: An overview for practicing veterinarians'. Information Service Hill's Pet Nutrition
7. Kearns RJ, Loos KM, Chew BP, Massimino S, Burr JR, Hayek M. 'The effect of age and dietary β -carotene on immunological parameters in the dog'. In: Reinhart GA, Carey DP: Recent Advances in Canine and Feline Nutrition; Iams Symp Proc Vol 3 (2000): 389-401
8. Massimino S, Kearns RJ, Loos KM, Park JS, Chew BP, Adams S and Hayek MG. 'Effects of age and dietary beta-carotene on immunological variables in dogs'. J Vet Intern Med 17(6) (2000): 835-42
9. Schweigert F, Raila J, Wichert B and Kienzle E. 'Cats absorb β -carotene, but it is not converted to vitamin A'. J Nutr 132 (2002): 1610-1612
10. Chew BP, Park JS, Wong TS, Kim HW, Weng BC, Byrne KM, Hayek MG and Reinhart GA. 'Dietary β -carotene stimulates cell-mediated and humoral immune response in dogs'. J Nutr 130 (2000): 1910-1913.
11. Fordyce HH, Callan B and Giger U. 'Persistent cobalamin deficiency causing failure to thrive in a juvenile beagle'. J Small Anim Pract 200041 (2000): 407-410
12. Kolb E and Seehawer J. 'Importance and use of B vitamins in cats and dogs'. Translation from: Tierärztl. Umschau 57 (2002)
13. Niki E. 'Interaction of ascorbate and alpha-tocopherol'. Ann. NY Acad. Sci., 498 (1987): 186-199
14. Jialal I, Devarai S, Venugopal SK. 'Oxidative stress, inflammation and diabetic vasulopathies: the role of alpha tocopherol therapy'. Free Radic. Res. 36 (2002): 1331-1336
15. Harper J. 'Dietary antioxidants in cat and dog nutrition'. WALTHAM FOCUS 9 (2) (1999)
16. Rimbach G, Minihane AM, Majewicz J, Fischer A, Pallauf J, Virgil F, Weinberg PD. 'Regulation of cell signalling by vitamin E'. Nutr. Soc. 61 (2002): 415-425
17. O'Brien T, Thomas DG, Morel PCH, Rutherford-Markwick KJ. 'Moderate dietary supplementation with vitamin E enhances lymphocyte functionality in the adult cat'. Research in veterinary science 99 (2015): 63-69
18. Veldman CM, Cantorna MT & DeLuca HF. 'Expression of 1,25-dihydroxyvitamin D3 receptor in the immune system'. Arch. Biochem Biophys 374 (2000): 334-338
19. Cantorna MT, Zhu Y, Froicu M & Wittke A. 'Vitamin D status, 1,25-dihydroxy-vitamin D3, and the immune system'. Am. J. Clin. Nutr. 80 (2004): 1717S-1720S
20. Kolb E and Seehawer J. 'Utilisation, metabolism, significance and use of D vitamins in the dog and cat'. Translation from: Praktischer Tierarzt 81(7) (2000): 562-572
21. Tengerdy RP, Nockels CF. 'Vitamin E or vitamin A protects chickens against E. coli infection'. Poultry Science 54 (1975): 1292-1296
22. Tengerdy RP, Brown JC. 'Effect of vitamin E and A on humoral immunity and phagocytosis in E. coli infected chicken'. Poultry Science 56 (1977): 957-963
23. Tiami H, Chatau MT, Cabanne S, Marti J. Synergistic effect of retinoic acid and 1,25 dihydroxyvitamin D3 on the differentiation of the human monocytic cell line U937. Leuk. Res. 15 (1991): 1145-1152
24. El Attar TMA, Lin HS. Effect of vitamin C and vitamin E on prostaglandin synthesis by fibroblasts and squamous carcinoma cells. Prostaglandins Leukot Med. 47 (1992): 253-257
25. Lynch NR, Salmon JC. Tumor growth inhibition and potentiation of immunotherapy by indomethacin. J. Natl. Cancer Inst. 62 (1979): 117-121
26. Gelin J, Anderson C, Lundholm K. 'Effect of indomethacin, cytokines and cyclosporin A on tumor growth and subsequent development of cancer cachexia. Cancer Res. 51 (1991): 660-663

Keep the Probiotic Alive

By Pauline Rovers-Paap, Orffa Additives

Probiotics are live micro-organisms which, when administered in adequate amounts, confer a health benefit to the animal. Probiotics support the development of a healthy microbiota in the digestive tract of the dog. As a result, probiotics have a beneficial effect on the health and well-being of the dog and improve various faecal characteristics. To provide pets with adequate amounts of the probiotic, it is not enough to only incorporate a minimum level of the probiotic during production of a petfood, treat or supplement. This implies that the probiotic would survive the production process and the long shelf-life expected of pet products. Additionally, the probiotic must stay alive in the complete gastro-intestinal tract of the animal.



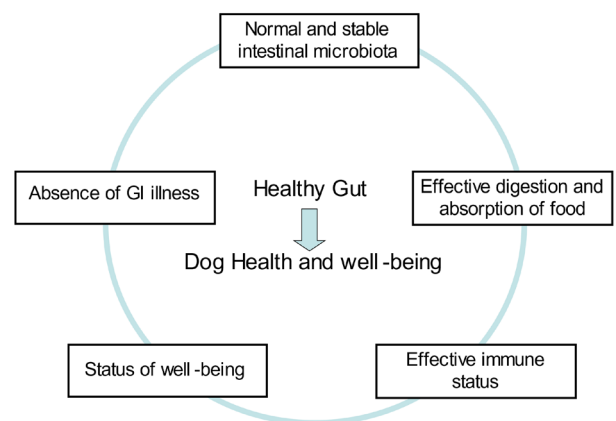
Spore-forming probiotics have the major advantage of being highly stable. The spore is a natural protecting shield of the micro-organism itself. This makes spore-forming probiotics less sensitive to the acidic gastric fluid and the harsh conditions during the petfood manufacturing processes. Also, they are better able to maintain their viability in pet products over a long shelf-life.

Probiotic health benefit

Health and well-being of the dog is closely related to a healthy and stable microbiota in the digestive tract. The microbiota is a large

community of living microbes in the intestinal tract of animals. This microbiota has a symbiotic relationship with the host and supports in the digestion of food, plays an important role in the immune function and helps to protect the animal against infections. Disturbance of the microbiota can lead to discomfort for both dog and owner. The consistency of the faeces can become too watery (diarrhea) or too hard (constipation) and can be accompanied by a strong unpleasant smell. Promoting the development of beneficial bacteria and increasing microbial diversity, supports a normal and stable microbiota, thereby supporting the health and well-being of the dog (Figure 1).

Figure 1: A normal and stable microbiota support dog health and well-being



(Modified from Bischoff, 2011)

Calsporin®, the EU registered probiotic for use in dog food, contains the specifically selected strain *Bacillus subtilis* C-3102. This spore-forming probiotic has been proven to stabilize the gut microbiota in dogs. Providing Calsporin® to dogs results in an enriched microbiota and increased microbial diversity¹. Higher microbial diversity is an important gut health parameter, as it makes the microbiota less susceptible for gut disorders. A greater abundance of the commonly accepted beneficial microbial groups *Bacteroides*, *Faecalibacterium* and *Allobaculum* increased in dogs fed with Calsporin®¹.

Supporting a healthy and more stable microbiota is often characterised by improved digestion of the food. Addition of *Bacillus subtilis* C-3102 to a pet diet significantly improved the apparent digestibility of ether extract and nitrogen-free extract in a study in

dogs. Digestibility of dry matter and organic matter tended to improve and observations reveal positive effects on crude fibre and crude protein digestibility².

As a result of a stable gut microbiota and optimized digestion, Calsporin® improves faecal consistency of dogs and results in more well-formed stools. Droppings are more consistent and easier to pick up^{1, 2, 3} (Figure 2). Odorous components, like ammonia and branched chain fatty acids, are significantly lower in the faeces of dogs receiving the probiotic in their diet^{1, 2, 3}. A panel of volunteers confirmed that the stool of dogs fed with Calsporin® had a less intense odour compared with the faeces of dogs receiving the same diet without Calsporin®¹ (Figure 3). A lower production of these odorous components is not only pleasant for the dog owner but the lower production of harmful gasses also benefits the intestinal health of the dog.

Figure 2: Calsporin® increases the rate of well-formed stools (p < 0.05)

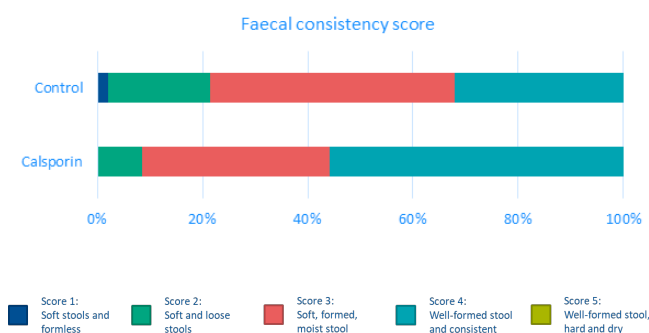
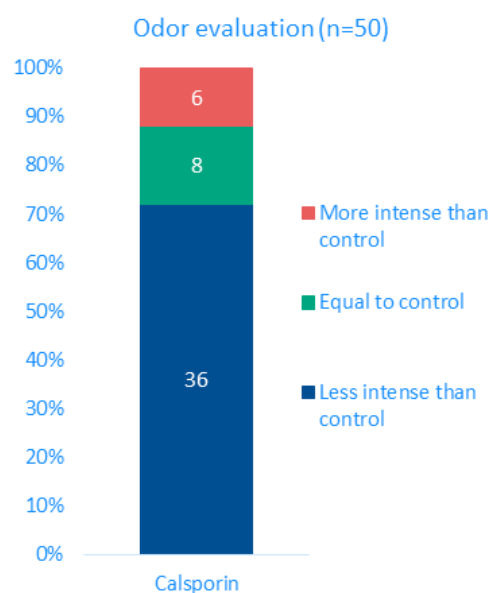


Figure 3: Less intense faecal odour by using Calsporin® in petfood (p < 0.05)



The improvement in faecal consistency is also beneficial for dogs with chronic incidences of diarrhea. In a field-study, dogs with more

severe diarrhea at the start of the trial, showed the best improvements on faecal consistency during the trial period when receiving *Bacillus subtilis* C-3102 in a supplement. The probiotic also positively influenced the coat condition, resulting in a more shiny and bright coat in the Calsporin® treated group⁴.

Gastro-intestinal tract survivors

For a probiotic effect in the animal, the live micro-organism should survive the complete gastro-intestinal tract. Some discussions for example exist about the survival of lactic acid producing species, used in human nutrition, in the stomach environment. In vitro tests, simulating the stomach and small intestinal environment, confirm the resistance of *Bacillus subtilis* C-3102 to gastric acids and bile salts. Measuring colony forming units (CFU) in the faeces of dogs fed with Calsporin®, confirms the survival of *Bacillus subtilis* C-3102 over the complete digestive tract (Table 1). A colony can only be formed and counted in a laboratory, when a micro-organism is alive and able to grow.

Table 1: Addition of Calsporin to a diet increases the *Bacillus subtilis* C-3102 counts in fresh dog faeces, confirming the survival of the probiotic in the digestive tract.

<i>Bacillus subtilis</i> C-3102 counts in faeces (CFU / g fresh faeces)			
	Week 0	Week 1	Week 4
Control	< 10 ³	< 10 ³	< 10 ³
Calsporin®	< 10 ³	2.92 x 10 ⁵	2.28 x 10 ⁵

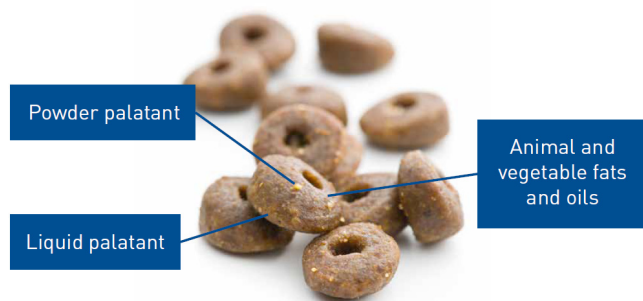
Some questions arise about the viability of probiotics when dogs also receive an antibiotic treatment. Frequently, antibiotics are not only effective against the pathogenic bacterial species, they can also harm the beneficial microbial species. As a result, antibiotic use, can lower variation of microbes and after the antibiotic treatment the microbiota needs to stabilize without development of opportunistic pathogens. Use of a probiotic during or after an antibiotic treatment may be desirable, as a probiotic will help to stabilize the microbiota again by increasing microbial diversity and stimulating the growth of beneficial bacteria. However, if used simultaneously, the probiotic should not be killed by the antibiotic treatment.

A spore-former is a viable solution for petfood

To be effective, the probiotics have to stay alive during the harsh manufacturing processes of food or supplements. Calsporin® is extensively tested in different types of feed and petfood products. The robust spore-forming probiotic is thermostable and resists temperatures up to 100°C. Appropriate for the application in pellets, treats and pressed tablets. This is in contrast to non-spore forming probiotics, which are already killed at lower temperatures.

The spores are more sensitive to extreme high temperatures in combination with rapid changes in pressure, which limits the applicability in the extrusion process. In order to overcome this limitation, application through different coating strategies have been examined and developed. Tested strategies included dry and liquid palatants, different types of fats and oils, and combinations of these topical applications. As a result it is shown that all different types of coatings are applicable for a homogeneous distribution of viable spores of Calsporin® (Figure 4). Cooperation with key manufacturers of palatability enhancers has resulted in direct to use commercial powder and liquid palatants with adequate, viable amounts of Calsporin®. Palatants are a straightforward application for the use of Calsporin® in the production process of extruded kibbles.

Figure 4. Topical solutions for homogenous application of Calsporin® on extruded kibbles



Losses of viability of probiotics can occur during the storage of feed, for example after opening of the package or with storage under more severe conditions with high temperatures and/ or high relative humidity. Findings underscore that the *Bacillus subtilis* C-3102 spores

are highly stable for different applications and forms in which the product is stored. Calsporin® spores have proven to be stable and viable for more than 2 years (Figure 5).

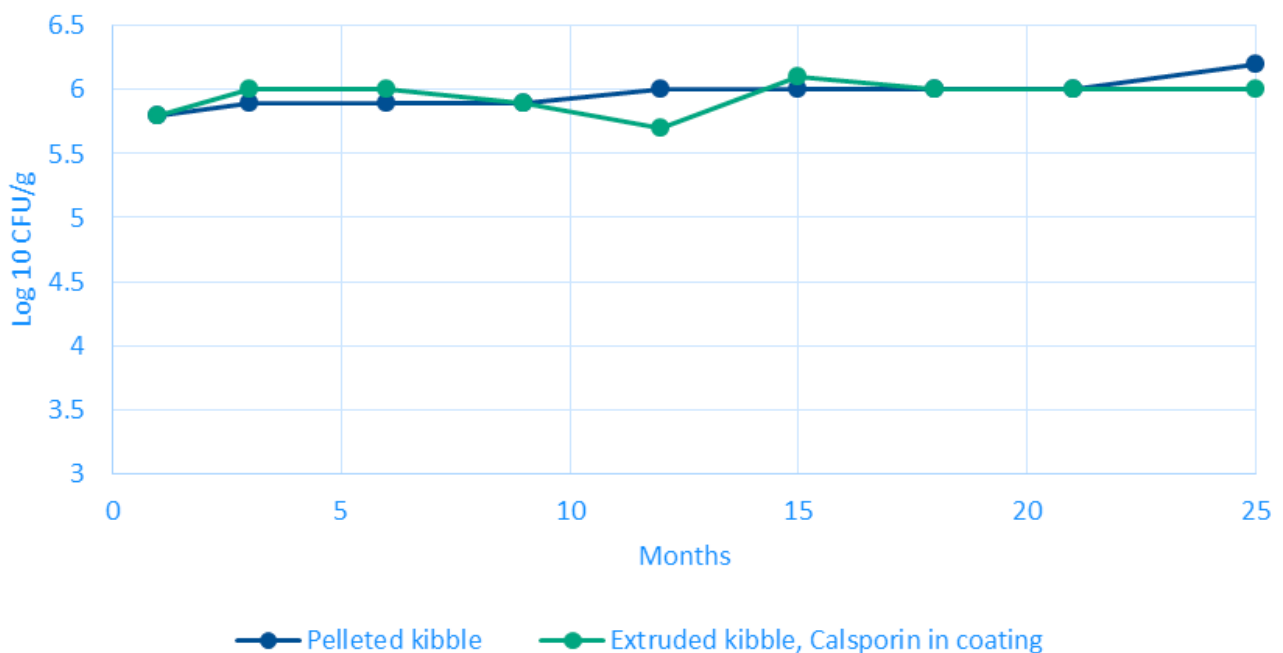
Summary

A well-formulated dog diet containing the stable and viable *Bacillus subtilis* C-3102 supports a healthy and stable gut microbiota in dogs. This will not only benefit the well-being of the dog, firmer stools and lower faecal odour is also highly appreciated by dog owners. A challenge is to keep the probiotic alive in the gastro-intestinal tract and during the harsh production process and long shelf-life of petfood products. The spore-forming probiotic Calsporin® is a viable solution for multiple applications in dog food products!

References

1. Lima, D.C. de, et al. Dietary supplementation with *Bacillus subtilis* C-3102 improves gut health indicators and fecal microbiota of dogs. *Animal Feed Science and Technology*. 270, 2020, 114672, p. 114672.
2. Schauf, S., Nakamura, N. and Castrillo, C. Effect of Calsporin (*Bacillus subtilis* C-3102) addition to the diet on faecal quality and nutrient digestibility in healthy adult dogs. *Journal of Applied Animal Nutrition*. 2019, Vol. 7, e3.
3. Felix, A.D., et al. Digestibility and fecal characteristics of dogs fed with *Bacillus subtilis* in diet. *Ciencia Rural, Santa Maria*. v40, n 10, p 2169-2173, 2010.
4. Paap, P.M., et al. Administration of *Bacillus subtilis* C-3102 (Calsporin) may improve feces consistency in dogs with chronic diarrhea. *Res. Opin. Anim. Vet. Sci.* 6 (8): 256-260, 2016.

Figure 5: Stability of Calsporin® in petfood during shelf-life





ORFFA

TOP SELECT

KEEP THE PROBIOTIC ALIVE

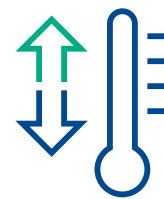
Calsporin[®], a viable solution for petfood



**EU registered probiotic
for dog food, treats
and supplements**



**Support a healthy
and stable microflora
in dogs**



**Robust spores
enable high stability
in petfood**

Engineering your feed solutions

www.orffa.com - Follow us on   



ORFFA

The Gut, the Brain and the Well-Being of Pets

By Francesca Susca, DVM, PhD, Pet Development Manager, Lallemand Animal Nutrition

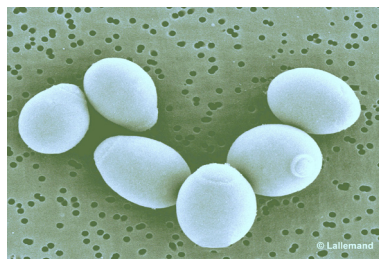
In the last decade pet food has experienced a shift toward premiumisation and humanisation. These strong trends are driven by pet owners who consider their pets to be family members, highlighted even more so over the last year. Pet food manufacturers, combining pet needs and pet owners' desires, have rapidly transferred global food trends from human nutrition to pet food.

According to market research, over 80% of new pet food product launches bear some health-related claims, with 22% being digestive claims (source: Innova Market research, Feb. 2017). In fact, gastrointestinal tract (GIT) disorders are some of the most common reasons for veterinary consultations. Beyond GIT disorders there are some other concerns such as optimal nutrition, obesity, immune defences, healthy aging and stress. The COVID-19 outbreak has emphasised the role that food fortification has on supporting mental well-being and the immune system, the latter already being seen among the top claims in 2019 (source: Euromonitor International, Aug. 2020).

Overall, well-being can be described as a main concern for any pet owner, but what does well-being mean and how can we define pet well-being? There are four main principles commonly used to assess animal well-being: good feeding, good housing, good health and appropriate behaviour. Some of these parameters can be linked to a central organ which is often underestimated: the gut and its billions of inhabitants, the microbiota.

Is there a way to improve pet well-being by shaping their gut microbiota with natural ingredients?

The microbiota: a key player



The digestive tract of dogs and cats harbours a complex community of microorganisms, called the gut microbiota, which plays a crucial role in the host's overall health. Recent developments in the field of sequencing

techniques, with the OMICS revolution, have considerably enlarged our understanding of the microbiota and its potential functions.

The gut microbiota is a dynamic system with great intra- and inter-individual variations. Its three main functions are key to ensuring the maintenance of overall health to the host's gastrointestinal tract (GIT): 1) metabolic function 2) protective function, and 3) structural function.

The complex interactions between the microbiota, the host immune system and host genetics influence the balance between health and disease. Genetics, age, environment, antibiotics and diet, are some of

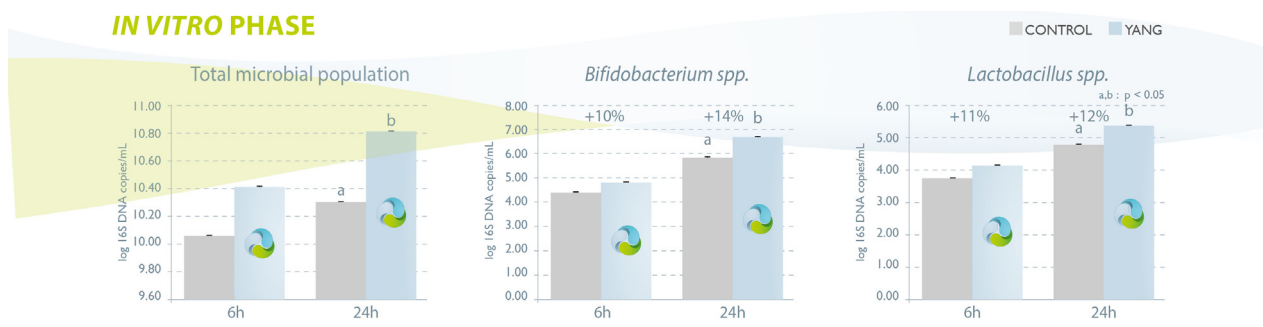
the factors recognised as affecting the microbiota. For example, it was shown in dogs that a relatively small amount of dietary fibre was able to detectably change the structure of the gut microbiota. In the same way, functional ingredients such as prebiotics and probiotics — well documented to influence the microbiota of many species — have shown positive effects on pet microbiota too, as illustrated by a study in dogs with live yeast *S. cerevisiae* var. *bouardii* on the prevention of antibiotic-associated diarrhoea (Aktas *et al*, 2007). Probiotic studies in pets are still scarce, but the volume of literature on the mode of action for many probiotic strains and their effects in humans and other mammals, are a good indicators for their potential in dogs and cats.

Some GIT disorders, both acute and chronic, are well known to be associated with alterations in microbial communities, but it is now increasingly documented that disorders beyond the GIT such as obesity, atopic dermatitis or central nervous disorders, can also be linked to changes in the microbiota. In this context, functional ingredients that are known to influence the microbiota composition such as prebiotics, probiotics, para-probiotics and other nutritional interventions, could offer an alternative approach to tackle these issues.

Interventions: shaping the microbiota

Yeast derivative products are well known for their benefits in animal nutrition: used to help balance the intestinal microflora and help stimulate the host's natural defences. Research has shown that beneficial effects, such as the specific mode of action for immune system modulation, differ according to the strain of yeast selected, as well as the production process used. Not all yeasts are equal, and that's why YANG, an innovative prebiotic solution, was developed following an in-depth research and development programme. YANG is a combination of 3 yeast fractions from different strains/ species, acting synergistically to reinforce natural defences and support digestive care. The three yeast fractions were specifically selected for their distinct morpho-functional features: high amounts of adhesive polysaccharide patches and adhesion strength, resulting in the superior binding capacity of YANG, as seen by pathogen agglutination. Combining these specific yeast strains has also been seen to induce a better and more balanced modulation of the immune system by targeting multiple immune receptors at once.

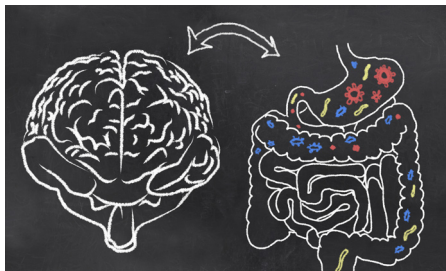
A study conducted in conjunction with the University of Bologna incubated 5 flasks containing canine faecal inoculum and undigested residues from a pre-digested extruded diet, either with YANG at 0.8g YANG/ kg food, or without, in an anaerobic chamber (Biagi *et al.*, 2016; Pinna *et al.*, 2016). Extruded diets were fed for at least 4 weeks prior to faecal collection in order to see an effect on microbiota composition. Total microbial population and beneficial bacteria contents were analysed and



showed a significant increase ($p < 0.05$) after 24 hours when YANG was present. These results are promising for the beneficial effect of using YANG to tailor microbiota balance and support digestive well-being through beneficial microbe populations.

The second brain: control of well-being

The brain-gut axis: this is certainly one of the newest and most promising areas of research into the microbiota and probiotics. In 2013, John Cryan and his team coined the term “psychobiotics” to translate this idea. They defined this new class of probiotics as a “live organism that, when ingested in adequate amounts, produces a health benefit in patients suffering from psychiatric illness” (Dinan et al, 2013).



In a world where an estimated 29% of pet dogs exhibit signs of anxiety (probably a gross underestimate),

and where a large portion of up to 70% of dog behavioural disorders can be attributed to some form of anxiety (Beata et al, 2007), the psychobiotic approach certainly makes sense for pet well-being too.

The crucial role of the microbiota in the brain-gut communication axis has now been demonstrated, as well as its role in anxiety behaviour in humans and rodents. The potential of probiotics to influence this brain-gut axis is a growing field of evidence with the first animal study published in 2006 (Zareie et al, 2006). A few years later the first human studies

demonstrated that a probiotic supplement can effectively alleviate both physiological and psychological symptoms of chronic stress (Diop et al, 2008; Messaoudi et al., 2010). To date, more than 50 published studies have evaluated the link between probiotic supplementation and the brain-gut axis, including at least 17 human clinical studies.

One study indicates that 90% of dogs supplemented with the probiotic *B. longum* showed improvement in day-to-day anxious behaviour including reduction of barking, jumping, spinning and pacing in comparison to a placebo. In addition around 80% showed a decrease in heart rate and an increase in heart rate variability, indicating a more positive response to anxiety (McGowan, 2016). Such a preliminary study is very positive in showing a positive effect on both behavioural and physiological signs of anxiety in dogs.

Conclusion

Such studies presented pave the way for new holistic approaches to modern pet well-being issues by targeting the gut microbiota. Shaping the intestinal microbiota through supplementation with specific functional ingredients could be a way to optimize overall pet health and consequently improve their wellbeing. Lallemand, an expert in the development of microbial based solutions for animal and human nutrition has developed a platform of natural, research-backed pet nutrition solutions to support immunity, alleviate oxidative stress and support digestive comfort targeting pet well-being (see table). We offer specific technical support and expertise in functional ingredients to help manufacturers address the growing market demand for pet well-being products.

References available upon request from: fsusca@lallemand.com

CATEGORIES OF NATURAL MICROBIAL BASED SOLUTIONS AND THEIR POTENTIAL TO TARGET DIFFERENT BENEFITS IN PET NUTRITION		DIGESTIVE CARE	IMMUNITY SUPPORT	ANTIOXIDANT OPTIMIZATION	WELL-BEING
Yeast derivatives (e.g. yeast cell walls)		■	■		■
Antioxidants			■	■	■
Heat treated bacteria (also called para-probiotics)		■	■		■
Probiotics	Yeast*	■	■		■
	Bacteria*	■	■		■

*Not authorized in EU

Mimicking Nature Boosts Trace Mineral Efficiency

By Alexandra Wesker MSc MRSB RNutr RSciTec Pet Customer Technical Adviser, Trouw Nutrition GB

Effective trace mineral nutrition is vital for healthy and active pets. Ensuring minerals are supplied in the most effective form for optimum bioavailability, stability and delivery will greatly improve the supply of trace minerals to all classes of pets.

Remember when you were young and the grown-ups told you to ‘eat your vegetables’? Other than the well-known addition of fibre to your diet, they also provide you with trace minerals. This natural presentation of trace minerals can bring significant benefits to the pet food industry. (Getty images)



Essential – but dangerous

Trace minerals play a role either structurally, catalytically or functionally with nearly every protein and biochemical process. Iron, zinc, manganese, copper and selenium all play essential roles in the body and supplying them effectively is crucial for healthy pets. Zinc, for example, is involved in more than 3,000 proteins in the body and in the very important processes of gas exchange, DNA transcription, redox, pH homeostasis and cell signalling.

As the name implies, ‘trace’ minerals are only required in very small quantities, and even small deviations in cellular content can result in dysfunction, disease and even death. Trace minerals are some of the most tightly controlled nutrients in the body, from both a legislative and nutritional perspective.

Mimicking nature

Trace element supply is a universal challenge across all pet species and all feed types and presentations, especially where the food is high in fat. Trace minerals are highly reactive with other compounds, resulting in the oxidation of fat, degradation of vitamins, or interaction with one another leading to reduced absorption. They need a strong

bond to a partner that still allows them to be absorbed by the digestive system.

In nature, trace minerals begin their journey when rock and soil wear down and the trace minerals literally dissolve. In nature, microorganisms in the soil bind trace minerals to chelating agents. The term ‘chelation’ refers to the act of binding the trace minerals with a favourable organic (i.e. carbon-containing) partner. Strong chelation prevents the highly reactive trace minerals from acting against nutritionally valuable compounds. The now stabilised, yet soluble, trace minerals continue their journey to the roots of plants where they are absorbed.

The similarity between how plants and animals gain access to metals is striking and it is tempting to speculate that this is a general scheme in biology. (See table 1).

Table 1. Mechanisms used for acquiring metals by plants and animals are strikingly similar

Plants	Animals
Weathering processes dissolve metals from the existing minerals in the soil.	Metals are solubilised from pet food during digestion in the stomach.
Chelating agents are generated by the microbes/fungi in the soil to bind with the solubilised metals.	Chelating agents are generated during the breakdown of food during digestion and bind the metals solubilised by the digestive process.
Chelated metals are now not only soluble, but also mobile and more stable to pH, oxidation and other chemical changes. Chelated metals are ready to travel.	Chelated metals are soluble, mobile and are more stable to pH, oxidation and other chemical aggression. Chelated metals are ready to travel.
Chelated metals must make their way through soil and water to the roots of plants and avoid hostile chemical changes.	Chelated metals move out of the stomach (low pH) into the small intestine where the chemical environment is hostile to metal solubility. The small intestine back titrates acidity and increases pH close to neutrality (this is necessary for enzymes to work properly).
Metals need to remain soluble and mobile to become accessible to the plant.	Metals need to remain soluble and mobile to become accessible to the animal.
Plants influence what metals they need. Chelation strength improves the probability that metals will remain soluble and mobile during this difficult journey.	Animals determine what metals and how much they need. Chelation strength improves the probability that metals will remain soluble and mobile during this difficult journey and cooperate with the needs of the pet.

Bound, but free

Trace minerals need to be bound to reduce their derogatory effects to other compounds, but to retain their functionality, they must remain available for absorption by the digestive system despite the bond. For that reason, they must remain soluble as solubility facilitates availability. By mimicking the way metals are delivered in nature it is possible to contain their reactivity throughout production, feed storage and digestion, and deliver them just where they are needed.

Optimins® from Trouw Nutrition are strongly chelated trace minerals which allow delivery in the right part of the digestive system with high bioavailability, delivering significant benefits (See table 2).

Ideally, trace minerals should remain bound in the optimum form until absorbed by the animal. The strength of the bond is highly important. If the bond with the binding partner (ligand) is weak, then it can be broken and a bond will be made with another available ligand, for example fat, which is then oxidised. The loss in nutritional value is two-fold: less nutrition for the animal and money wasted on trace minerals that are not delivered.

Table 2. Benefits of Optimin® organic trace minerals

- Optimins® allow the animal to control how much trace mineral is absorbed, moment to moment, thus more closely matching their exact requirements – Mimicking Mother Nature.
- Optimins® enhance an animal's ability to overcome numerous stressful nutritional and physiological conditions.
- Optimins® support reproductive performance.
- Optimins® are used for partial replacement of inorganic trace minerals or other organic trace minerals to improve availability and utilization of trace minerals.
- Optimins® products are produced by a natural process in a dedicated FAMI-QS and Safe Food Safe Feed facility.
- Quality control procedures are performed on incoming materials and every batch to ensure quality, safety, performance and traceability of Optimins® organic trace minerals.

The challenge in delivering trace minerals

Essential trace minerals are not inert but are chemically active. Commonly used trace minerals in the pet food industry are in inorganic form, commonly sulphates and oxides. Most inorganic minerals disassociate easily during diet preparation, manufacture, or the digestion process. These dissociated minerals (charged ionic forms) can easily be tied up by dietary antagonists (e.g. phytates, tannins, phosphate, molybdenum) rendering the minerals insoluble and therefore effectively depressing their absorption by the intestinal cells (Erdman 1979; Fernandez and Philips, 1982).

Sulphates easily dissociate when in contact with moisture. Sulphates are also hygroscopic and bind moisture from the air, leading to degradation occurring in premixes before the minerals are used for manufacture of finished products. The attracted moisture can also cause lumps in the premix, and accelerate degradation of vitamins and oxidation of fats.

Oxides present concerns regarding availability. Iron oxide is known to have very poor bioavailability. For manganese there is no data in dogs and cats, but other species show lower bioavailability of oxide compared to sulphate, and chelates having enhanced bioavailability (Henry, 1995). Copper oxide has shown to have low availability in dogs (Fascetti AJ et al. 1998).

Zinc bioavailability is greatly affected by other components

in the diet, but there are some studies suggesting zinc oxide has low availability and is prone to antagonistic reactions (Brinkhaus et al., 1998; Lowe et al. 1994; Lowe and Wiseman, 1998, Baker and Ammerman 1995, Lowe, J. A. & Wiseman, J. (1997)), while work in pigs reported similar availability between zinc sulphate and oxide (Baker, 1995).



Building strong bonds

There are various chemical factors affecting the strength of the bond between a trace mineral and its ligand. The major factors are:

- 1.) pH, the master regulator of speciation (choice of ligand)
- 2.) Redox potential, how easily electrons are moved between elements and the electrochemical behaviour with other compounds.
- 3.) Available ligands, types of ligands and ratios of ligands to trace mineral.
- 4.) Ionic strength, common and counter ions.

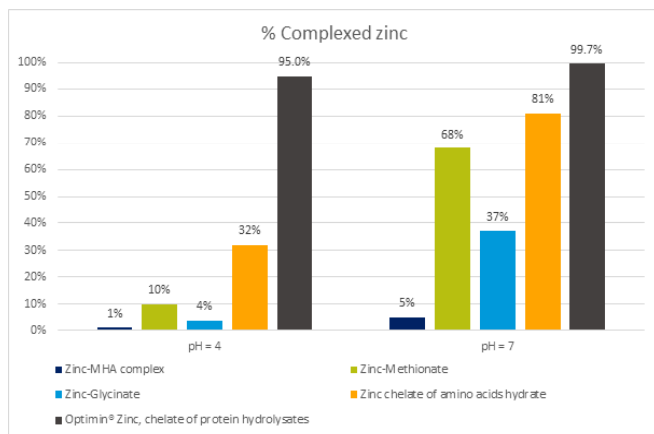
The first, diet pH, is by far the most important regulator for speciation and solubility throughout pet food manufacture and the digestive process. Trace mineral chelates and amino acid complexes that are resistant to pH and redox fluctuations are well suited for pet diets. Redox potential is more important for iron and copper and accounts for many of the shelf-life and feeding problems associated with trace minerals. Manganese can be influenced by pH and redox but this has not yet been found to be a major problem in pet foods. Selenium is less affected by these factors because it prefers covalent bonds.

In the late 1950's organic trace minerals were developed, which were found to reduce many of the problems related to feeding mined minerals. They have several chemical characteristics that make them more suitable than inorganic minerals for pet food such as resistance to chemical changes created by pH and redox fluctuations. In the 1980s, work done by Bo Lonnerdal changed the general thinking about minerals and metal nutrition, leading to the development of organic minerals which more closely replicated natural processes.

It is extremely important to know how different organic sources will respond to a pH challenge. Zinc proves a great subject to illustrate bond strength. Poorly chelated zinc sources can change chemical partners as pH varies during digestion. When changing ligands, zinc

can easily lose its ability to remain soluble, reducing its bioavailability to the pet. Unfortunately, not all commercially available organic zinc minerals are resistant to a physiologically relevant pH challenge (Figure 1).

Figure 1. Proportion of zinc remaining bound to its ligand during a physiologically relevant pH challenge



An organic mineral must be able to maintain its structure at reduced pH levels to have any opportunity to survive the harsh environment of manufacture, the gut environment and digestion. Simple complexes such as zinc methionine, which does not qualify as a chelate, cannot survive the pH challenge. Other organic minerals with less appropriate amino acid partners were partially protected from pH modification and had intermediate stability values. However, only Optimins® remained stable when exposed to different physiologically relevant pH levels.

Optimins® organic trace minerals are unique in being bound to multiple oligo-peptides and amino acids rather than single amino-acid linked compounds. Optimins® are the most strongly chelated minerals on the market. Optimins® trace minerals are therefore stable throughout pet food manufacture and do not affect shelf life of the product, while delivering nutritional superiority.

Conclusion

A major challenge of effective trace metal nutrition in pet foods is bonding with a chemical partner, which can occur during diet preparation and digestion. These exchanges can influence metal solubility, redox activities and ultimately the accessibility of the metal for absorption. Both the source of the metals and the composition of the diet can influence the outcome of these interactions.

The sheer number of inorganic and organic trace mineral choices on the market make the process of choosing a trace mineral source even more confusing. There is no class of supplemental essential nutrients with more choices than those found for trace minerals. Trace minerals made utilising chelation avoid many of the hazards regarding metal solubility that can occur during diet preparation and digestion. Chelation strength is directly correlated to the ability of a natural chelate to evade these hazards and potential problems. Optimins® trace elements deliver optimum nutrition for pets where it is needed most.

References

- Erdman, J. 1979. Oilseed phytates: Nutritional implications. *Journal of the American Oil Chemists' Society* 56:736-741.
- Fernandez, R., and Philips, S. 1982. Components of fiber impair iron absorption in the dog. *American Journal of Clinical Nutrition* 35:107-112.
- Henry, P. 1995. Manganese bioavailability. Pp. 239-256 in *Bioavailability of Nutrients for Animals: Amino Acids, Minerals, Vitamins*, C. Ammerman, D. Baker, and A. Lewis, eds. New York: Academic Press.
- Fascetti AJ, Morris JG, Rogers QR. (1998) Dietary Copper Influences Reproductive Efficiency of Queens. *Journal of Nutrition* 128 (12):2590S-2593S.
- Brinkhaus, F., Mann J., Zorich, C., and Greaves, J. 1998. Bioavailability of zinc propionate in dogs. *Journal of Nutrition* 128 (supplement):2596S-2597S.
- Lowe, J., Wiseman, J., and Cole, D. 1994. Zinc source influences zinc retention in hair growth in the dog. *Journal of Nutrition* 124(supplement):2575S-2576S.
- Lowe, J., and Wiseman, J. 1998. A comparison of the bioavailability of three dietary zinc sources using four physiologic parameters in dogs. *Journal of Nutrition* 128(supplement):2809S-2811S.
- Baker, D. H. & Ammerman, C. B. (1995) Zinc bioavailability. In: *Bioavailability of Nutrients for Animals* (Ammerman, C. B., Baker, D. H. & Lewis, A. J., eds.). Academic Press, San Diego, CA.
- Lowe, J. A. & Wiseman, J. (1997) The effect of the source of dietary supplemental zinc on tissue copper concentration in the rat. *Proceedings of the British Society for Animal Science*, p. 67.
- Baker, D. 1995. Zinc bioavailability. Pp. 367-398 in *Bioavailability of Nutrients for Animals: Amino Acids, Minerals, Vitamins*, C. Ammerman, D. Baker, and A. Lewis, eds. New York: Academic Press.



Alexandra is an animal scientist with an MSc degree in Animal Nutrition from Wageningen University. Her studies encompassed a wide range of areas from nutrition, physiology and genetics, to immunology and anatomy. This has enabled her to think and work more comprehensively in the work she does in animal nutrition.

Following her studies she moved to the UK and established herself as a consultant for equine nutrition from 2012, educating horse owners through personal consultations, newsletters, presentations and magazine articles. Her desire to educate and write combined into her book called 'Natural Feeding for Horses', which allows horse owners to find the nutritional requirements of their horse and what roughage best meets their needs.

Since 2017 she works for Trouw Nutrition as the technical expert for pet premixes in Europe, Middle East and Africa. She advises on premix formulation and legislation and develops products in collaboration with pet food manufacturers.

A CONSISTENT APPROACH to brand differentiation in pet food

How pet food brands can consistently achieve shelf standout to capture market share by harnessing digital tools

The pandemic and associated UK lockdowns have accelerated trends in many industries. In the pet industry, pet ownership has risen dramatically. Recent data from the Pet Food Manufacturers' Association shows 2.1M Brits collected a new pet during lockdown and 1.8M plan to add a pet to their household¹. Increased demand for pets naturally equates to increased demand for pet food. In the historically competitive pet food market, a point of difference is increasingly important to brands hoping to stand out and capture market share.

British consumers are expected to spend an estimated GBP 2.9 billion on cat and dog food alone this year². As start-up brands jostle for shelf space with well-established big players, the need for speed to market with updates and refreshes to existing lines and new product launches is clear. But how can brands reach out and grab the attention of the consumer, ultimately influencing the purchasing decision, in a market where there is a proliferation of similar products from competing brands?

Increase agility by removing admin time

Most pet food brands today are extremely well equipped to act with agility, launching new products and line extensions with lightning speed. But what does this level of organisation look like behind the scenes? There is likely a substantial amount of outdated manual processing behind the product launches, line extensions, and packaging or brand refreshes of most brands. This also applies to big brands and even those that have adopted some level of digital automation.

To be completely free of the headaches associated with the packaging design process, such as hard to locate assets, working from incorrect files or scouring emails for feedback and approvals, brands should adopt a digitalized workflow system. Web-based collaborative workflow tools, such as Esko WebCenter and digital asset management (DAM) solution, MediaBeacon, streamline production workflows and remove all the admin-related tasks that eat into valuable time.

Streamline workflows to increase speed to market

When a brand team can locate all of their digital content and tasks from a single source at any time, it allows them to react to change from a comprehensive starting point. There's no question that modern pet care brands act with agility. However, brands that have a robust DAM and workflow system in place are those that have the edge, getting out of the starting blocks just that bit quicker. And being ahead by just a few days or weeks can make all the difference to capturing valuable sales.

As trends for pet wellbeing and sustainability continue to grow, being able to locate and cross-reference files can make a substantial

difference to key performance indicators. For example, design and marketing materials that promote grain-free and plant-based ranges for increased gut health and breed-specific blends can be used cross-category to eradicate wasted time and drive efficiency. Approved messaging and graphics can be applied with ease, to maintain consistency when working with third party suppliers.

Create pack and image consistency across multiple SKUs

But what if there is no shelf to stand out on? Consistency plays its part when considering the various channels available for product promotion today. The latest figures published by the Office for National Statistics show that British consumers spent £6.9 million in 2019 on pets and related products³. Since then, much has changed. Significant growth in e-commerce has increased the importance of high-quality product and lifestyle imagery online, where the consumer expects to see great imagery and lots of it.

Having the ability to easily create, file and retrieve high-quality imagery from banks containing thousands of product SKUs is a must for brands hoping to grow e-commerce sales. Products that are well-lit, in focus and shot from multiple angles or presented in an aspirational lifestyle setting are best placed to promote packaging that can't be picked up off the shelf. Web-based workflow tools allow designers and marketers to introduce image styling to ranges holistically, apply consistent backgrounds and lighting to allow the product to sing. Importantly, any new additions to product lines can be produced in exactly the same vein, helping to build brand familiarity and trust.

So, what next for pet food brands to whom a digitalized workflow seems like a nice to have, rather than a necessity? With bespoke and turnkey options available to suit all company sizes and budgets, it's easy for brands to adopt a digital system. Making the switch might require a brief mindset change. However, the real value of a streamlined automated workflow process is the years of headaches it could remove in terms of achieving brand consistency against long- and short-term trends. To capture market share, the time to digitalise is now.

References

1. PFMA, PFMA Confirms Dramatic Rise in Pet Acquisition among Millennials
2. Mintel, Four-legged Flexitarians, Feb 2020
3. Statista, Consumer spending on pets and related products in the United Kingdom from 2005 to 2019, Nov 2020

Evolution of moist petfood – A chronicle of opportunities and challenges

By David Primrose, Synergy Petfood

The role of opportunity in the origins of commercially prepared petfood and moist pet food

The domestication of cats and dogs as animals dates back to ancient times with the greatest increase in their acceptance as household pets in the 19th Century. The catalyst for this trend can be linked to three factors: - the Industrial Revolution, the rising status of the middle class and the commercialisation of prepared petfood.

Aligned with this we see the introduction of the first commercial pet food in 1860's by businessman James Spratt. The opportunity for Spratt's "Patented Meat Fibrine Dog Cake" reportedly originated from his observation of street dogs eating sailor's hardtack biscuits in the docks of Liverpool, UK ⁽¹⁾

The birth of canned petfood occurred in 1922, when US businessmen Chappel Brothers saw the opportunity of canning "surplus" horse meat as a source of "lean red meat" for balanced diet food for dogs ⁽²⁾. Whilst no longer widely accepted in petfood in today's society on the basis that horses are seen nowadays as companion animals, consumption of horsemeat by humans was more widespread in the 1920's.

Key points in the history of petfood and the stimulus for commercialisation and market growth are summarised in Table 1.

In recent years, development of innovative new products in the petfood evolutionary process, often arises from a combination of pet owner demand for "premiumization" and "humanization". For example, premium / super premium wet petfood formats that take their inspiration from human foods e.g., wet petfood with a liquid centre looks similar in appearance to "melt-in-the-middle" chocolate souffles; soup for cats that looks like consommé.

The concept of "Premiumization" first originated in human consumer goods e.g., alcohol where consumers wanted products that "provide greater benefits and characteristics" compared to "standard" products. This impression of "premium" quality can be real or perceived in the mind of the consumer. In the context of petfood, this might mean parameters like: -

- GMO free ingredients and products
- Marketing terms e.g., "holistic" create an impression of "greater benefits and characteristics" achieved through combination of factors e.g., natural raw materials, additive free, greater transparency in ingredient inclusion etc.
- Higher protein content compared to "standard" products.

It should also be noted that petfood "humanisation" extends beyond the actual petfood product and includes expectations on

Table 1 - Evolution of petfood – Key innovations and their stimulus

Era	Petfood type	Stimulus for market introduction
1860's	Spratt's "Patented Meat Fibrine Dog Cake"	Businessman James Spratt observation of street dogs eating sailor's hardtack biscuits in the docks of Liverpool, UK ⁽¹⁾
1922	Canned dog food "Ken-L-Ration"	US businessmen Chappel Brothers saw the opportunity of canning "surplus" horse meat as a source of "lean red meat" for balanced diet food for dogs ⁽²⁾
1930's	Canned cat food	Opportunity to can fish for cats in US coastal fisheries
1930's	Initial introduction of separate brands for cats and dogs	Developing understanding of specific nutritional requirements of cats and dogs
1970's	Birth of "Superpremium" petfood	Belief that some "superior quality" petfood e.g., formulated with "higher quality" ingredients should be sold through sales outlets where technical advice available about the products e.g., veterinarians. The basis of premiumization can be real e.g., higher ingredient quality or perceived e.g., (human) lifestyle beliefs.
1980's	Multi-varieties of same catfood brand	Recognition of cats as "fussy" eaters and greater product differentiation to give variety in their diet
1990's - onwards	"Humanized" petfood (health and wellness benefits; petfood inspired by human food e.g., soup / consommé	Strengthening bond "Pets as family members" and the "If it is good enough for me, it is good enough for my pets" belief.

petfood manufacturing business philosophy and product beliefs, for example: -

- Use of human food industry approaches to quality and food safety management systems, giving rise to the “If it’s good enough for me, it’s good enough for my pet” belief.
- Lifestyle choices and beliefs that match their own lifestyle choices e.g., “natural”, sustainable etc.

Extension of human lifestyle choices are also stimulating petfood market growth e.g., the growth of the vegan petfood market.

In recent years, it is clearly evident that evolution of wet petfood has been closely linked to trends in the human food sector. The question is where next for wet petfood evolution?

Will veganism and flexitarianism drive the rebirth of meat analogues in wet petfood?

For many reasons, humans are turning more to the purchase and consumption of meat analogues, as a means of reducing meat consumption. The question is “What is a meat analogue and why is there growing interest in them”?

There are many definitions of meat analogue and one of the most useful is from Dekkers, Boom and van der Goot⁽⁹⁾ : -

“Meat analogues are products that can replace meat in its functionality, being similar in product properties/ sensory attributes, and that can also be prepared by consumers as if they were meat.”

Typically, meat analogues for human consumption are manufactured from sustainable plant-based proteins giving rise to many of their perceived benefits including: - animal welfare, greenhouse gas emissions / carbon footprint and health benefits compared to meat consumption. These factors are contributory to increased interest in veganism and a “flexitarian” approach to eating (consumption of a varied diet based on meat eating and plant-based protein eating on different days, with the overall effect of reduced meat consumption).

Meat analogues are not new and date back to Classical and Medieval times where seitan (based on wheat gluten) and tofu (based on soya bean) were examples. Although these are still used, in the context of human food, a more widely known example of plant-based meat analogues is “Texturized Vegetable Protein” (TVP). Traditionally made using low moisture extrusion, and based on soya or wheat gluten, TVP is available in many forms that mimic either pieces of meat, minced meat, or fibrous steak-like meat pieces. TVP has also been used in wet petfood in the 1980 – 1990’s, where its fibrous structure was designed to mimic beef or chicken steak.

In addition to TVP, the concept of using other meat analogues in wet petfood is not a recent innovation. The petfood industry has seen many other meat analogue technologies developed and patented over the last 60 years, some of which have been implemented on a commercial scale. There are many factors that affect commercialisation



Adifo develops and services sector-specific software tools for the international nutrition industry. We enable you to gain maximum control over your core processes and guarantee the protection of critical business knowledge.

www.adifo.com



Optimize your feed formulation
Get the most out of your quality data

BESTMIX® Software: Profit-driven feed formulation and Quality Control

Staying ahead of the competition requires smart feed formulations. You – as formulation manager – are key in this strategy. But how do you create the best quality and lowest cost recipes – under any conditions and at any time? BESTMIX® provides the answer.

This user-friendly software makes it easy to manage accurate nutritional values, production parameters and recipe specifications. You can adapt instantly to volatile material costs, ingredient stocks and purchasing positions. The results are perfect recipes that can be translated directly into practical products and synchronized automatically with labelling and safety data.

Want the least cost recipe, no matter how challenging the requirements?
Want to make the best decisions based on correct quality data?

Call us today on +32 50 30 32 11 and get BESTMIX®.
The smartest way to beat the competition.



and these include cost and consumer acceptance / perception of meat analogues i.e., are they affordable and do they look like “real” meat. Examples used commercially include: -

- Heat-set emulsion-based meat analogues – this is the basis of both human food sausage manufacture and the widely implemented “Oven Formed Meat” technology used to heat-set meat chunks for use in chunks-in-gravy and chunks-in-jelly products
- Gelled meat analogues – Examples include those based on sodium alginate gelation and also konjac glucomannan gelation. Both technologies have also been used in human food to make imitation glace cherries, pimento pieces and konjac noodles.

Development of “next generation” meat analogues is the subject of extensive science and technology research. Compared to the pioneering early developments, “next generation” meat analogues are designed to better satisfy consumer needs especially cost and sensory appeal (taste, smell, texture). In other words, they must overcome the barriers of cost and authenticity compared to “real” meat, associated with historical forms of meat analogue. With these aims in mind many new technologies are being developed including high-moisture extrusion and shear cell technology⁽³⁾.

Challenges and opportunities in use of “next generation” meat analogues in wet petfood.

The concept of plant-based / vegan petfood is not new and in recent years we have seen both dry and wet complete petfoods enter the

marketplace. If we look at vegan wet petfood, typically the structure often appears similar to “all meat” pate or hybrid meat / cereal products that have been on the market for many years. For product differentiation, some include TVP pieces in the product along with other inclusions like fruit or vegetables.

In recent years, the petfood industry has seen many new start-up’s enter the market. These start-up’s often utilise different business models compared to “traditional” petfood manufacturers. One factor is “disruptive innovation” and this factor could offer a route to market for many of the emerging “next generation” meat analogue technologies once these are ready for commercialisation.

Another factor that opens opportunities for plant-based meat analogues (PBMA) in wet petfood is the supply chain vulnerabilities evident during the recent Covid-19 pandemic. Many experts believe that PBMA offer opportunities to reduce meat supply chain vulnerabilities evident during the pandemic ⁽⁴⁾ that saw a surge in market demand for plant-protein foods. This might result in greater interest in PBMA in wet petfood as pet owners mirror their own buying patterns in what they buy for their pets.

Research by many different groups, for example Dodd et al (2019) ⁽⁵⁾, indicate that more pet owners would be willing to buy vegan petfood but the biggest barrier to overcome is convincing evidence on the (long-term) nutritional adequacy of these products. This is a key research need if we are to see greater acceptance of plant-based petfood.

The petfood industry has thrived on converting opportunities into reality and enjoyed market growth as a result. However, in doing so the industry has had to overcome many challenges.

With the realisation that PBMA or maybe “hybrid” meat analogues based on plant and meat ingredients offer many opportunities there is no escaping the fact that challenges exist. However, if the industry adopts a collaborative approach, involving all stakeholders including pet owners, veterinarians, nutritionists, food scientists and food technologists then there is greater probability that these challenges can be overcome.

References

- 1) *One Nation Under Dog.*, M. Schaffer, 2009, Macmillan, 9780805091465
- 2) Philip. L. Chappell 1923 – Ken-L-Ration viewed online on 4th May 2021 at <https://history.rockfordpubliclibrary.org/localhistory/?p=36608>
- 3) Birgit L. Dekkers, Remko M. Boom, Atze Jan van der Goot, *Structuring processes for meat analogues*, Trends in Food Science & Technology, Volume 81, 2018, Pages 25-36.
- 4) *Protein and produce in a post-COVID-19 world*, viewed online on 12th May 2021 at <https://www.mintel.com/blog/food-market-news/protein-and-produce-in-a-post-covid-19-world>
- 5) Dodd SAS, Cave NJ, Adolphe JL, Shoveller AK, Verbrugge A (2019) Plant-based (vegan) diets for pets: A survey of pet owner attitudes and feeding practices. PLoS ONE 14(1): e0210806.



Inovitec



Inovitec Ltd
Unit 5A, Tarporley Business Centre,
Nantwich Road, Tarporley,
Cheshire, CW6 9UT.

E: info@inovitec.co.uk T: +44 (0)1829 730407

TRANSPARENCY and COLLABORATION

Key to Advancing Food Safety

By Tim Hartter, Project Manager, Corporate Project Services, Wenger Manufacturing, Inc.

The CDC estimates 48 million people suffer from food borne illnesses each year in the United States, that's one in six exposed and sickened by food contaminants. Among them, 10,000 are hospitalized and 3,000 die because of the illness.

Statistics like this make it no surprise that food safety is a top priority for anyone involved in food production; everyone from farmers to food manufacturers and regulators, and every other entity within that food value chain.

For a division like Corporate Project Services and the broader company we're part of, Wenger Manufacturing, we do not manufacture the food, but we manufacture the equipment and create the processes that do.

Food safety is a top priority for our clients so it's a priority for us. In 2011 and in response to several extensive food recalls, the U.S. Food and Drug Administration (FDA) rolled out the new Food Safety Modernization Act (FSMA), the first major federal food safety legislation since 1938, and the only legislation to date that encompassed food for both humans and animals. As a result of this new law, rules surrounding human and animal food safety had some bite for the first time ever, quickly propelling food safety to become a focal point for companies that produce these products.



There is much at stake, not the least of which is the seriously detrimental effect these crises have on a company's reputation. And in a day when social media can magnify a negative story into a worldwide frenzy in a matter of minutes, there's no margin for error.

The industry needs to keep getting better at food safety.

We do need to develop industry-wide best practices for food safety; but finding what is best for today is not an end goal. It must go beyond achieving best-practice level. It's about continuous improvement.



While food contamination may never be eradicated completely, as an industry our role is to implement methods that ensure contamination is not a direct result of negligence or process errors. We must work constantly to eliminate chances for errors that allow contamination to occur.

We do this because it's the right thing to do, but these steps are also required for food manufacturers to stay in business. CPS has process know-how to help clients navigate these challenges. Today, food manufacturers must have an effective food safety program in place, so we're here to support the development of these programs. Global Food Safety Initiative (GFSI) auditors, FDA and USDA inspectors will be onsite conducting checks, so we help clients make sure their programs, practices and procedures are effective in an effort to prepare them for audits.

Food safety should not be a competitive advantage.

In today's environment, food safety is a complex issue that all companies must address.

There is a critical need for more transparency. In many cases, industry has knowledge and expertise that can enable FDA to better

understand how pathogens are controlled via legacy technologies; but competing industry players are naturally resistant to divulging such insight.

We cannot look at safety as a competitive advantage. If we find highly effective processes or technology that keeps food safe, then that knowledge needs to be shared... even though that's easier said than done.

We have a responsibility as an industry to collaborate and further develop technologies and control measures to keep food safe. Foodborne illnesses are preventable, and we must continue to get better.

Research and industry collaborations have made headways and improvements.

Extrusion, cooking, baking, canning, frying and drying are all legacy food processing technologies that require scientific validation of each respective processing method today.

Extrusion cooking, being one of these legacy food processing solutions, has proven to be an effective processing tool in manufacturing high capacity, continuous production of food safe pasteurized products via its short-time, high temperature processing capability. And even though the technology has been used safely for generations, under FSMA it is required that industry be able to scientifically validate the efficacy of this proven technology.

Several companies in our sector came together, including Wenger and CPS, and engaged in collaborative efforts very early in the FSMA development to validate extrusion as a viable technology to produce safe human and animal food. Our company engaged in the opportunity to study and demonstrate the role extrusion technology plays in a food-safe production environment. The only problem was there was no safe way to rigorously study the pathogens involved; you can't bring pathogens into a live production environment to validate the process.

Through collaboration with the University of Nebraska-Lincoln, which was equipped with biosecurity level 2 (BSL-2) testing capabilities and had extrusion equipment capable of performing validation testing, a cocktail including five (5) strains of salmonella was introduced into a typical pet food recipe and extruded as a means of providing scientific data as to how much heat is required to achieve a desired log reduction of the pathogen, at a given moisture level.

Further testing was undertaken by inoculating a raw material recipe with *Enterococcus faecium* to further determine the effectiveness of extrusion when inoculating a typical pet food recipe utilizing a surrogate.

Ongoing validation testing involved collaboration with the Institute for Food Safety and Health (IFSH), a food science research consortium that includes the Illinois Institute of Technology, FDA, and members of the food industry. Through this collaborative effort,

further testing was undertaken to better understand the efficacy of the extrusion process as a method of controlling pathogens.

These steps provided further scientific evidence confirming extrusion is a viable food processing tool in achieving desired and effective log reduction of pathogens in the food processing environment. A further benefit to these collaborative efforts allowed the FDA to see first-hand the efficacy of extrusion as a food safe



pasteurization technology that could be scientifically validated.

Beyond research, another very critical component in creating a safe food environment is effective training and education. Through collaborative efforts with universities, industry partners, and the FDA, more advanced programs are becoming available to train and educate food processing personnel in plant environments—all focused on making a safe food supply. The focus with these programs is not simply to show food processing personnel what to do, but to help them understand WHY these processes are important.

We must continually improve.

Much is being done but there is much more to do. Addressing food safety to protect our food supply and strengthen and sustain public trust will be an ongoing priority requiring collaborative efforts among the regulators, academia and commercial entities along the food supply chain. CPS continues to be an integral part of driving continuous improvement for the industry.

If you'd like to learn about our structured approach to helping clients understand and navigate those ever-developing food safety regulatory requirements, please reach out to our team and we'd be happy to show you more.

Corporate Project Services, a division of Wenger Manufacturing, is a dynamic group of planning specialists backed by Wenger's more than 80 years of process system supply to the industry. Our knowledge base and breadth of experience in extrusion processing and facilities construction is unsurpassed – and our commitment to excellence is recognized around the world. Corporateprojectservices.com

Alternative protein sources: Soy protein concentrate in dog food

By Dr. Diana Siebert, Technical Center, CJ Europe GmbH.

Introduction

Even though soybean meal and other soy products are commonly used in feed production, soy, in part, still has a negative image in pet food. However, soy is about to experience a renaissance in the pet food industry, which is possibly related to a new generation of pet owners without prejudices, an improvement in quality of soy products, and an enhanced knowledge about soy products as ingredients for companion animals. Although, in Europe, soybean is still a minor component for pet food, in the US approximately 3 % of their soybean production is used for pet food (Hill, 2004).

A variety of soy-based products are available on the market. Soybean meal (SBM) is a by-product of the soy oil industry with a high CP level. Soy protein concentrate (SPC) is produced to further increase the protein content of SBM, as well as to reduce remaining anti-nutritional factors. Therefore, SPC is an ingredient with high amino acid digestibility in dogs. Moreover, SPC has proven good extrusion functionality.

What is the difference between Soybean meal and Soy protein concentrate?

SBM is produced from the residue left after oil extraction from soybean. In general, SBM is already a safe ingredient, which is mainly used as a protein source in animal feed. SBM is attractive for the pet food industry as a vegetable protein source because its amino acid profile is relatively close to the profile of meat (see Table 1).

Soybean contains trypsin-inhibitors which can interfere with the protein digestion. To denature the trypsin-inhibitors, soybean meal must be heat-treated during the production process. However, high processing temperatures and duration of heat treatment can drastically reduce the amino acid digestibility of the final product. Furthermore, soybean

contains non-starch polysaccharides (e.g. stachyose and raffinose) which cannot be removed by heat-treatment, which are known as anti-nutritional factors.

Consequently, there has been intensive research into improving the digestibility of soy through processing. After the oil extraction, the remaining SBM will be treated with ethanol instead of heat (toasting) to flush out anti-nutritional factors. In the case of CJ Selecta SPC, the product also gets micronized to produce the optimal particle size. This processing is suitable for all origins of soy, so the final product can be GMO SPC or a NON-GMO SPC. With the ethanol extraction method, it is possible to remove most of the carbohydrate fraction (including stachyose and raffinose) and to enhance the nutritional value (see Table 2).

Functionality in extrusion process

Venturini et al. (2018) evaluated the processing traits of increasing amounts of SPC against a diet based on poultry by-product meal. Regarding the extrusion parameters, extruder motor amperage and the temperature of extrusion was lower for the diet based on poultry by-products rather than the diets based on SPC. The inclusion of vegetable protein also leads to changes in the kibble formation and to a favourable higher starch gelatinization. This fits very well with former descriptions about functional soy protein acting as a cohesive network to increase stability of the kibbles (Riaz and Rokey, 2012). This is especially important when the fat content of the formulation is low because of the inclusion of vegetable protein instead of meat by-products with a high fat content. The results demonstrated that SPC has a good extrusion functionality in comparison to a diet based on poultry by-product meal.

Table 1: Amino acid composition of selected ingredients [% as fed basis]

Ingredient	DM	CP	Lys	met	thr	TRP	VAL	ARG	LEU	ILEU	HIS
Meat Meal, rendered ¹	94	54.1	2.91	0.77	1.83	0.36	2.40	3.82	3.41	1.60	1.11
Poultry By-Product Meal ¹	94	59.0	2.84	1.02	2.10	0.46	2.76	3.89	4.20	2.25	1.34
Corn gluten MEAL ¹	87	56.3	0.95	1.33	1.90	0.30	2.61	1.80	3.76	2.20	1.20
Soybean meal, without hulls ¹	90	48.2	3.03	0.69	1.91	0.61	2.23	3.52	2.20	3.76	1.33
Soy protein concentrate ²	> 90	60	3.87	0.85	2.47	0.81	3.01	4.59	4.68	2.79	1.64

¹NRC, 2006; ²CJ Selecta, X-Soy 600.

Table 2: Comparison of average analytical values of soybean meal and soy protein concentrate (CJ Selecta X-Soy)

Components	Soybean Meal	Soy protein concentrate ¹
Raffinose [%]	1.07	< 0.6
Stachyose [%]	4.23	< 1.6
Beta-congycinin [mg/kg]	480	< 3.0
Glycinin [mg/kg]	264	< 2.0

Palatability and digestibility of SPC

In a trial with 37 trained dogs, the palatability of diets with high inclusion rates of SPC (18.7 % of the diet) was compared with pet food based on corn gluten meal and poultry by-product meal using the two-bowl-method (Venturini et al., 2018). Dog’s preferred diets containing poultry by-product to diets containing corn gluten meal. However, there was no statistical difference for first choice and ingested quantities between diets containing SPC or diets based on poultry by-product meal (Venturini et al., 2018). Thus, pet food containing SPC can have a palatability like a diet based on animal protein.

The same working group also evaluated the digestibility in vivo. The Coefficients of total tract apparent digestibility for dry matter, fat, crude protein, and crude energy did not differ statistically between the diets based on poultry by-product meal, corn gluten meal, and SPC as main ingredients. Only organic matter showed slightly higher digestibility coefficients for corn gluten meal compared with SPC (Venturini et al., 2018). In an earlier study (Clapper et al., 2001), SPC had even a higher crude protein digestibility compared with poultry by-product meal. Thus,

digestibility of a diet based on SPC is comparable to a diet based on classic pet food ingredients like corn gluten meal and poultry by-product meal.

Conclusion

SPC is an ingredient which is characterized through a low nutrient fluctuation and a stable supply. Even high SPC inclusion rates have no negative impact on the palatability of final food. Digestibility coefficients of diets based on SPC were comparable with diets based on poultry by-product meal as a protein source. Through its good extrusion functionality with beneficial impact on kibble formation, SPC is a useful vegetable protein supplement for the pet food industry.

References

Venturini, K. S., Sarcinelli, M. F., Baller, M. A., Putarov, T. C., Malheiros, E. B., & Carciofi, A. C. (2018). Processing traits and digestibility of extruded dog foods with soy protein concentrate. *Journal of animal physiology and animal nutrition*, 102(4), 1077-1087.

Riaz, M. N., and G. J. Rokey. 2012. *Extrusion problems solved: Food, pet food and feed*. UK: Woodhead Publishing. <https://doi.org/10.1533/9780857095206>.

Hill, D. 2004. *Alternative proteins in companion animal nutrition*. In *Pet Food Association of Canada Fall Conference*.

National Research Council. 2006. *Nutrient requirements of dogs and cats*. Washington, DC: The National Academies Press.

Clapper, G. M., Grieshop, C. M., Merchen, N. R., Russett, J. C., Brent Jr, J. L., and G. C. Fahey Jr. 2001. Ileal and total tract nutrient digestibilities and fecal characteristics of dogs as affected by soybean protein inclusion in dry, extruded diets. *Journal of animal science*, 79(6), 1523-1532.



OTTEVANGER
MILLING ENGINEERS

Specialist in designing and building installations for the pet food industry

At Ottevanger Milling Engineers we acknowledge and understand how trends in the pet industry impact the design of pet food processing solutions.

Our expertise in project management, engineering and production ensure the successful realisation of machines, process lines and complete installations.



A TRIOTT COMPANY

Turning whisky's wastewater into pet food rich in Omega-3

Douglas Martin, founder and managing director of MiAlgae, explains how his University of Edinburgh biotech start-up is turning algae into nutritious pet food using a by-product from the Scotch whisky industry.

Walking around a fish market is an experience that can stimulate the senses: there's the sight of the weird and wonderful fish of all shapes and sizes lined up in their containers; there's the noise from the buyers and sellers haggling over prices at the auction; there's the smell of the sea filling the air as the latest catch is landed.

Sadly, not all of those fish at the market will end up being lowered into a chip shop's deep-fat fryer or making it onto the kitchen's pass at a high-end restaurant. Instead, much of the fish that can't be sold – either through lack of demand or because there's no quota available – will be ground up and turned into fishmeal, which will be used as pet food, animal feed, or even food for farmed fish.

Turning wild fish into feed for other animals is simply unsustainable. Already, around 90% of the world's fish stocks are over-exploited or fully depleted, giving rise to the need for quotas in the first place.



As conservationist Sir David Attenborough has reminded us in countless television series, the very future of our seas lies in our hands.

That desire to prevent the over-harvesting of fish was one of my motivations for founding MiAlgae in 2016. My biotechnology company uses algae to create a feedstock that's rich in Omega-3 oils, just like wild caught fish. And we make that nutrient-packed feed with a little help from Scotland's national drink – whisky.

The romance and reality of whisky

There's a romantic side to making whisky. Millions of tourists each year enjoy taking tours around distilleries tucked away in the Highland glens, peering in at the oak casks as they slumber in their vast warehouses, before enjoying a dram of the amber nectar by the fireside back in the comfort of their hotels.

Yet whisky – like any other industrial process – creates by-products that need to be handled in a safe and environmentally-sustainable way. In the past, wastewater from distilleries could simply be released into the local river or loch or sea, but now more stringent environmental protection laws mean that waste needs to be taken away for treatment and disposal.

These rules – which are designed to increase water quality, especially on beaches, bringing benefits to both people and our environment – can lead to an expensive headache for whisky distilleries. Those same rules also lead to an exciting opportunity though.

As a company at the forefront of creating a “circular economy”, in which the waste products from one industry can be turned into the raw materials for another, our company can provide a solution for these distilleries. In effect, we're taking a “by-product” and turning it into a “co-product”.

How that wastewater is created

It's fascinating to think that Scotch whisky – the bedrock of a massive industry, which exported the equivalent of 1.14 billion bottles last year [2020] – is made from three simple ingredients: malted barley, water, and yeast. By law, it can only be made in Scotland and must age for at least three years in oak barrels before it can make the magical transition from “new-make spirit” to “Scotch whisky”.

To begin the process, barley is soaked in warm water until it germinates, with a wee shoot poking out from the grain, signalling that the starches in the cereal are being converted into the sugars that are needed to make alcohol. Germination is then halted by drying the grains in a kiln; in the past, these fires would have been lit using peat, which gave a smoky flavour to the barley, but now most distilleries burn gas or kerosene, with peated whiskies confined mostly to the island of Islay in the Inner Hebrides chain off the west coast.

This malted barley, or malt, is then ground down and added to warm water to make a “mash”, dissolving the sugars into a liquid called the “wort”, which is drawn off. The grain that's left over is called



Copper stills used for the production of malt whisky

“draff” and is turned into pellets and sold to farmers as protein-rich feed for their cattle.

Yeast is then added to the wort to ferment those sugars into alcohol – in effect, making a strong beer or “wash” that can then be distilled to create a spirit. At its simplest level, distillation involves heating the wash in a big, oddly-shaped copper kettle known as a “still”, with the spirit collected after it has evaporated and condensed before being transferred into wooden casks to slumber for at least three years.

What we do with that waste

What’s left over inside the still after the spirit has been made – the “pot ale” and “spent lees” – is taken out and treated to remove any copper or other toxic substances. Traditionally, pot ale could also be turned into animal feed, or spread onto fields as fertiliser, or pumped into rivers or the sea.

Now, there’s another option; our company takes that nutrient-rich pot ale and uses it to grow algae in special fermentation vessels. The algae strain that we use occurs naturally in our oceans, where it feeds on upwelling nutrients – by researching and replicating this early stage of the food-chain, we are working hand in hand with nature.

Taking this wastewater from the whisky industry gives us a human-grade growth medium in which we can farm our algae. Using a co-product means that we can keep our costs down, producing algae in a very cost-effective way.

When they’re ready, the algae are extracted and turned into feed rich in Omega-3 oils for pets, fish, and farm animals. By removing all those nutrients, our process also turns the pot ale back into clean water.

Meeting pet owners’ sustainability demands

Not only does our process help the Scotch whisky industry to deal with a troublesome waste product, but it also helps pet food manufacturers and pet owners to play their part in tackling over-fishing. That desire on the part of consumers to address the environmental impact of their pet food looks set to accelerate.

Before the pandemic struck, the *State of the Pet Industry Report*



Special fermentation vessel for growing algae

from the Pet Sustainability Coalition and the World Pet Association revealed that 91% of pet professionals expected consumer demand for environmentally-friendly and socially-conscious companies would increase over the next five years. That trend appears to have continued during the pandemic, with an American survey by ingredient supplier TreeTop last year [2020] finding that 22% of owners wanted to see more sustainably-sourced pet food.

Younger people in particular appear to be keen on sustainability. The previous year’s Mintel survey for TreeTop found that 28% of respondents aged 18 to 34 were interested in seeing more sustainably-sourced pet food, compared with 15% among people aged 55 and older.

The increase in pet ownership could stoke that trend even further, with figures from the Pet Food Manufacturers’ Association (PFMA) showing that 3.2 million households in the UK bought a pet during the pandemic, taking the total to 34 million pets spread across 17 million households. Almost two-thirds of those new owners were aged between 16 and 34 – if they match their peers’ interest in sustainability and protecting the environment then the pet food industry’s role in over-fishing could come into even sharper focus.

‘Good health’ – for our seas and for our pets

MiAlgae’s ability to help solve that problem for pet food producers took a further step forward in March [2021] when we appointed global food and pet care specialist David Macnair to our board. David brings with him experience from a broad range of businesses – including Cadbury, Mars, and Campbell’s Soup Company – that will help us to make connections with the pet food industry and beyond.

His experience – and the skills of our other directors and managers – will also help us to expand into other sectors. As well as recycling whisky’s wastewater, the same approach could be used throughout the food and drink industry, giving our company exciting opportunities for expansion.

Last year, we secured £1 million of funding from new investor Hillhouse Group and from existing investors Equity Gap, Old College Capital, and the Scottish Investment Bank. The investment is helping us to scale-up our business and commercialise our process, creating further opportunities for expansion.

I founded MiAlgae while I was still studying for my master’s degree at the University of Edinburgh, which allowed me to access support from the university and from the wider entrepreneurial ecosystem in Scotland and beyond, including through Scottish Enterprise, the Edinburgh Centre for Carbon Innovation, the Scottish EDGE competition, Shell’s LiveWire contest, and Innovate UK. That support has spurred me on to not only begin to tackle the scourge of over-fishing but also to help the Scotch whisky industry to deal with a nuisance co-product; that’s worth raising a dram and saying “cheers” or, as we’d put it in Scotland, “slàinte mhath” – good health.

The Pandemic Increases Demand for Healthy Pet Foods

The pandemic has driven pet owners to look for ingredients with health promoting effects, as more people take time to consider what they are feeding to their beloved pet. Here Karel Thurman, Commercial Director at BENEEO Animal Nutrition, discusses how pet food producers can meet these changing demands using functional rice ingredients.

Healthy nutrition for pets is big business

In 2019, the pet food market worldwide stood at €73 billion, and it is predicted to reach €103 billion by 2027¹. This expected global pet food market growth is due, in part, to an increasing demand from animal owners for more natural and premium products which is a direct reflection of what is happening in human nutrition. It is no surprise, following a global pandemic that there has been an increased interest from pet parents regarding healthy nutrition.

In fact, the relationship between animal and human nutrition trends is a strong one. According to the American Veterinary Medical Association (AVMA): “Trends in companion animal nutrition often mirror trends in human nutrition, reflecting the desire of pet owners to feed them diets they consider healthy and beneficial for the well-being of their pets”. Governments are also increasingly encouraging the usage of natural, healthy, and safe ingredients in pet food products and demanding more label transparency when selling such products.

Label transparency increases

A pre-pandemic BENEEO survey on attitudes towards pet foods in the US, UK, Brazil, Germany and China found that almost three-quarters of dog owners (73%) and 66% of cat owners looked at the ingredients list when purchasing a new pet food product. Compare this to the 51% of consumers who said that they usually read the ingredients list when shopping for a new food product, and it clearly shows the significant importance owners placed – even before COVID-19 - on positive nutrition for their pets. The survey findings also highlighted that three quarters of pet owners were looking for feed products that contained less, or no, ingredients they disliked, such as artificial colours and flavourings, and actively avoided products with fillers, additives, or chemical ingredients. It is no wonder, therefore, that demand for all natural, recognisable ingredients is high and this is driving a shift in pet food production.



Digestive health concerns

Digestive wellness is an area of increasing concern for pet owners and figures show that 81% of European cat and dog food buyers believe that actively looking after their pets' digestive health is essential for their overall health² and natural, easy to digest ingredients are therefore a key purchasing decision driver for pet owners³. Similar to humans, many cats and dogs can suffer with a range of gastrointestinal issues. There can be many causes for these issues, including parasites, viruses, bacterial infections, pancreatitis or simply eating something they should not. For pets with symptoms only present when on certain diets, gastrointestinal problems can also be due to a food allergy or an intolerance.



Food allergies occur when the animal immune system abnormally reacts to a certain food protein and mounts an immune response against this allergen, leading to skin and/or gastrointestinal disorders⁴. There is no easy test to identify food allergy triggers, so dietary elimination trials are recommended by vets. With unique protein and carbohydrate sources, limited-ingredient diets reduce the number of potential triggering allergens in the end product.

In general, recognisable ingredient lists, are of key interest for pet owners if they are watching out for potentially hazardous ingredients for their pets. Add to this the increased concern for digestive well-being and food allergies, and it's no surprise that more manufacturers are increasingly looking into clean label, hypoallergenic and highly digestible solutions using rice ingredients.

Meeting label transparency demands using rice ingredients

Pet owners want the ingredients in their pet's food to be natural and healthy, but also understandable and recognisable to them. This creates challenges for manufacturers who use fillers or artificial colours and

flavourings in their products, as these are increasingly being actively avoided by many pet owners.

One of the biggest challenges for manufacturers is cleaning up the label on wet pet foods to cater for this growing trend as, traditionally, these contain guar, cassia or xanthan hydrocolloids, carrageenan or locust beans. These additives have been used for many years as a cost-effective way to create the appropriate viscosity in the different types of wet pet food. However, with a rise in demand for natural and recognisable ingredients on-pack, more and more manufacturers are looking to replace these gums with clean label ingredients such as rice starches.

When it comes to veterinary and premium wet pet food products, rice starch offers an ideal replacement for modified starches. This is due to the fact that it is a highly digestible ingredient that is recognised as natural by consumers. It also performs exceptionally well from a technical perspective. In trials carried out by BENEEO, results have shown that by adding just 3% of BENEEO's native waxy rice starch to a recipe, a similar viscosity is achieved in wet pet food gravies as those containing traditional gums, whilst also catering for clean label demand.

Rice starch allows manufacturers to create a wide range of different textures, from soft gravies to firm jelly-like textures and due to the branched structure of the amylose in rice, which binds water much better than other starches, it also has excellent stability during shelf life and temperature fluctuations (offering freeze-thaw stability). BENEEO has even developed a functional native rice starch that is a clean label texturiser and that can withstand harsher pH, temperature or shear conditions.

Although rice starch is ideal for use in wet pet foods, it can also be used as a technological aid to optimise the extrusion behaviour in extruded pet snacks and treats, as well as in baked products. With its high set temperature, the inclusion of rice starch improves the porosity and surface of extruded and baked snacks, allowing for a good level of crispiness and crunchiness in the final product. Additionally, rice starch has a neutral taste and colour, with good palatability, so that it won't influence negatively the organoleptic profile of the pet food product.

Overcoming allergies and digestive issues using rice protein

BENEEO's research³ has shown that over 60% of cat and dog owners are 'very or somewhat concerned' about food allergies, with 2 in every 5 respondents also saying that using no allergens makes food seem a lot healthier. This highlights that concern about food allergies applies to most pet owners, meaning that pet food that supports limited-ingredient and hypoallergenic diets hold mass appeal. As a hypoallergenic, clean label ingredient that is free from the most frequent food allergens, rice protein is well suited for use in such diets. Where high digestibility is required, rice protein is also ideal, as it has shown an apparent digestibility of 87% in dogs⁵, making it not only attractive for pets with allergies, but also for sensitive pets such as puppies and older animals.

BENEEO's rice protein is produced in alkaline conditions, which leads to significantly better digestibility than other rice proteins that have been isolated using an acidic treatment⁶. This makes it an ideal ingredient for not only promoting digestive stability, but for use in limited-ingredient

diets, as it is a high quality and concentrated protein with a protein content of >80%. It is also produced in Europe from non-GMO raw materials sources. BENEEO's rice protein has a well-balanced essential amino acids (EAA) profile, delivering what is required to promote long-term pet health. Furthermore, it is a good source of the EAA methionine/cysteine and phenylalanine/tyrosine that are involved in some major metabolic processes, as well as supporting a pet's normal growth.



In conclusion, consumers across the globe are increasingly looking for health boosting products following the pandemic and the same approach is being adopted for their pets. With 'natural credentials' so key to many pet owners' purchasing decisions, rice ingredients are well placed to help manufacturers remove artificial preservatives and flavourings from their pet food ingredients' labels and help them create products that are able to accommodate intolerances and allergies. In fact, BENEEO's rice ingredients are well-placed to help manufacturers deliver the best in veterinary diets and premium pet food products, naturally.

References

1. *Fortune Business Insights™: Pet Food Market Size, Share & Industry Analysis, By Animal Type (Dogs, Cats, and Others), Form (Dry Pet Food, Wet Pet Food, and Snacks & Treats), Distribution Channel (Supermarkets/ Hypermarkets, Specialty Pet Food Stores, Online Channels, and Others), and Regional Forecast, 2020 – 2027.*
2. *Mintel 2019*
3. *BENEEO Consumer Research on Attitudes towards Pet Food in US, Brazil, UK, Germany and China (N= *500, 2018)*
4. *Verlinden et al 'Food allergy in dogs and cats: a review.' Critical Reviews in Food Science and Nutrition.;46(3):259-73. doi: 10.1080/10408390591001117. PMID: 16527756 (2006)*
5. *Twomey et al 'The replacement value of sorghum and maize with or without supplemental enzymes for rice in extruded dog foods.' Animal Feed Science and Technology 108 61–69 (2003)*
6. *Yang, L. et al 'Rice protein extracted by different methods affects cholesterol metabolism in rats due to its lower digestibility.' International Journal of Molecular Sciences, 12(11), 7594-7608 (2011)*

Insects:

healthy and tasty with less impact on the planet

By Catharina Nieuwenhuizen Technical manager, Barentz Animal Nutrition

To answer the increasing demand for proteins worldwide, we need to look for innovative alternatives that are more sustainable than current sources. Beyond humans, livestock and pets are drivers in this rising demand. Another growing trend is that pet owners want to buy food for their beloved pets containing high quality ingredients while at the same time reducing its environmental impact. To answer these needs, insects can be added to the diet of pets. Insects are a novel source of nutrients that is produced sustainably, and which is tasty for pets. They can be used as a natural alternative to animal proteins and vegetable oils.

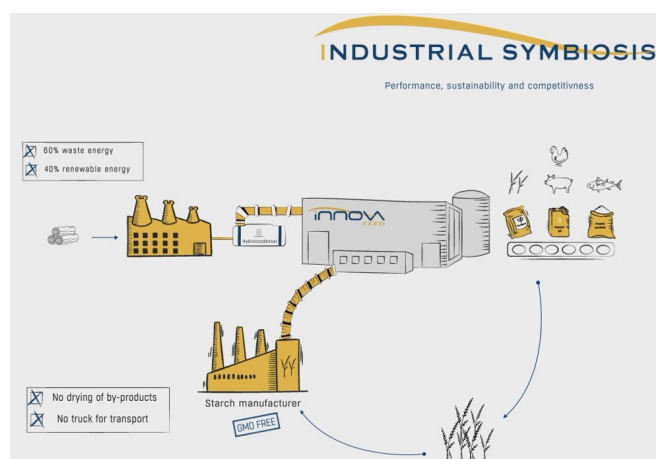
Sustainability

Insects are more sustainable for several reasons. Firstly, insects can turn low value feed materials and related by-products into high value insect protein and oil. They are fed with by-products, not suitable for other livestock, which otherwise would have gone to lower value productions such as bio-refineries. Secondly, insect breeding is a zero-waste and circular process. There are three final products produced from insects: insect protein, insect oil and organic fertilizer. Insect protein and oil are used as natural and sustainable alternative ingredients in livestock feed and pet food. The frass, which is the manure and the leftovers from the insect breeding, is used as an organic fertilizer to grow new crops, of which again the lowest value by-products are used for feeding new batches of insects. It is a fully circular model! But sustainability of insect-based ingredients can even go beyond circularity and upgrading of low value by-products.

Industrial symbiosis

At Barentz Animal Nutrition, we are partnering with InnovaFeed, a highly innovative company, that has developed a unique production

The industrial symbiosis model of InnovaFeed



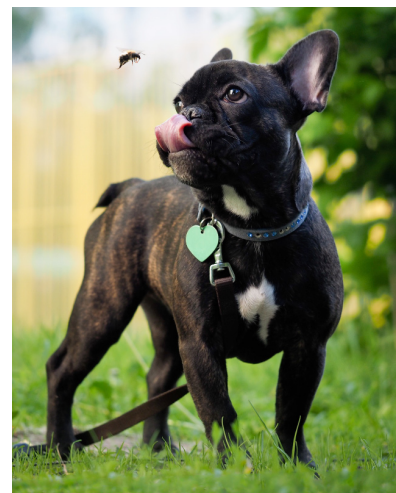
process based on an industrial symbiosis model. Their insect production site is directly connected with the next-door starch manufacturer, allowing agricultural by-products feeding the insects to be delivered to InnovaFeed's facility through a direct pipeline, effectively eliminating transportation and thus significantly reducing their carbon footprint. To

"With this unique industrial symbiosis model, InnovaFeed produces insect protein and oil with a reduction of 80% CO₂."

go one step further, InnovaFeed also connected its production site with the next-door power plant providing them with residual heat that would otherwise have gone into the atmosphere. This allows the saving of a lot on energy and carbon emissions. With this unique model, InnovaFeed produces their insect protein and oil with a stunning reduction of 80% in their carbon footprint!

Versatile ingredient

These insect ingredients come from the black soldier larvae, *Hermetia illucens*, which has many nutritional benefits. The insect protein is highly digestible and has very balanced amino acid profile very much comparable to fish meal. Due to this amino acid profile the product is also high palatable. This high-quality insect protein fits perfectly in hypo-allergenic diets, because insect protein is an innovative ingredient, and most animals haven't been exposed to this protein source before. This makes insect protein very versatile, since it is tasty, nutritious, and functional. The oil also has nutritional benefits thanks to its high level of medium chain fatty acids that makes it easily digestible. Insect oil is also rich in lauric acid (C12-fatty acid), which is known for its antibacterial properties and thus improves gut health of animals. Insect protein and oil are both free of any unwanted substances and can be used in combination as high-quality, nutritious and sustainable ingredients to replace animal and vegetable meal and oils in certain livestock feed and pet food.





Barentz.
Always a better solution

Barentz Animal Nutrition is a global distributor of technical ingredients and additives for the feed and pet food industry. We have several solutions for clean label, hypoallergenic, sustainable, vegetarian and organic concepts. We are your one-stop-shop.

www.barentz.com/animal-nutrition

... PET SUBJECTS ... PET SUBJECTS... PET SUBJECTS ... PET SUBJECTS ...

FISCHBEIN

A DURAVANT COMPANY

Fischbein, a Duravant Company, designs and manufactures bag packaging equipment and complete systems. For over 100 years, Fischbein has been the leader in sewing and sealing systems by delivering highly engineered, robust and dependable solutions. Serving customers worldwide in agriculture, animal feed, seed, pet food, chemical, mineral, milling, food, building material, medical and pharmaceutical industries, Fischbein has a full range of sealing, filling, weighing, handling, and palletizing equipment.

Since February of this year 2021, the Votech brand of packaging machinery is now part of the Fischbein portfolio. This acquisition will enable Fischbein to offer a wider range of packaging solutions.

The combination of Votech's expertise in bag management and palletizing and Fischbein's portfolio of bag sealing and sewing equipment creates a complementary fit between the two companies.

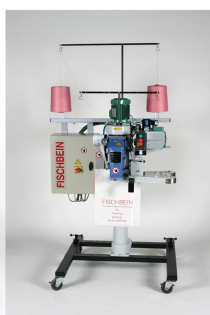
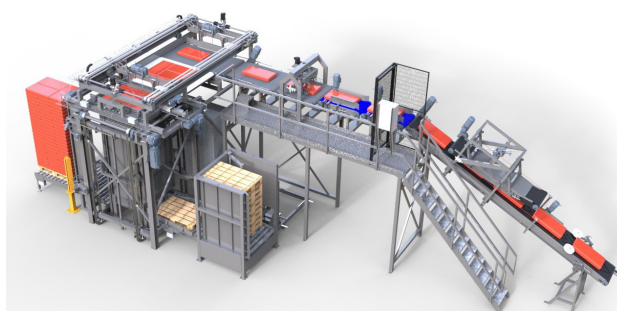
Fischbein now has a competitive force in filling and bag management. Fischbein proposes complete automated solutions, from the filling of a bag to the internal pallet transport to the warehouse. Fischbein has proven success delivering packaging solutions for free-flowing and powders applications.

For more information, visit www.fischbein.com. and www.votechbv.com.

Contact us to discuss your needs:

UK (Fischbein UK): phone +44 20 8344 6600 / e-mail : salesuk@fischbein.com

Europe (Fischbein SA): phone : +32 2 555 11 70 / e-mail : sales@fischbein.com



BIOMEGA CALLS FOR PET FOOD INDUSTRY TO SUBSTITUTE GLYCERINE IN PET TREATS WITH A HEALTHIER, NATURAL ALTERNATIVE

Biomega Group has called for pet food manufacturers and suppliers to use natural alternatives in pet food and treats in a bid to phase out the nutritionally devoid ingredient, glycerine.

Serving as a humectant, glycerine is used to bind water in canned food and treats by lowering water activity and gives pet food and treats the necessary elasticity for a chewy texture. According to the U.S Food and Drug Administration ('FDA') and the European Food Safety Authority ('EFSA') vegetable glycerine is classed as functional and safe when added in pet food as a preservative ingredient.

Glycerine is, however, a nutritionally devoid ingredient and is generally considered by pet owners as unhealthy due to its artificially high sugar content. With increasing humanisation of the way pets are treated, owners are now much likely to swap product choices for more natural, healthier and fresher pet treats.

Bjørn Liaset, Director of R&D at Biomega, said: "Glycerine is seen as especially palatable to cats and dogs due to its sugar content and is a widely used ingredient in today's pet food market due to its excellent water binding properties. As a leading biosciences company, we're asking for pet food manufacturers and wholesalers to think about the bigger picture. With rising pet obesity, pet health is front of mind for many pet owners – and it's why we're seeing a larger trend towards fresh and healthy pet treats.

"Our latest research at Biomega has unveiled how our 100% pure Norwegian hydrolysed salmon peptides can substitute glycerine in semi-moist pet treats. By delivering highly nutritional protein value, great palatability and health benefits, including increased muscle recovery and lower blood pressure, our salmon peptides have the potential to positively transform the semi-moist pet treat market we know today."

A recent study carried out on behalf of Biomega by Passion4Feed AS, an independent Norwegian pet food research facility, has demonstrated that removing glycerine is possible from cat and dog snacks when using Biomega's Salmigo® Protect L60.

"The aim of the study was to reduce the starch, remove glycerine and increase the level of high-quality carbohydrates and proteins to deliver a plasticising effect," added Milka Tesla, CEO at Passion4Feed. "With the combination of 100% natural pea starch and Salmigo Protect L60, we discovered that glycerine could be replaced in its entirety. This means petfood applications using this combination of

ingredients can claim to be 100% natural and highly nutritional."

The Salmigo Protect L60 study can be viewed in full in the company's latest whitepaper, which explains the scientific advantages salmon bioactive peptides could have on animal wellbeing. To download the whitepaper, please complete the online web form located on the Biomega website.

CHOCOLATE AND WHISKY ON THE MENU FOR SUSTAINABLE PET FOOD

Edinburgh-based biotech firm MiAlgae has appointed global food and pet care specialist **David Macnair** to its board as it moves towards commercialisation, embarking on ambitious international expansion, having doubled in size over the last 12 months.

A scientist by training, Macnair brings 40 years of food industry innovation, with a diverse background and experience holding science and business leadership positions roles at Cadbury Ltd, Mars Inc and Campbell's Soup Company.

Macnair explains: "I have a great passion for the oceans and health of the marine environment. As a diver and underwater photographer, I have seen first-hand the impact we are having on our seas and it is deeply worrying. I believe MiAlgae has the potential to make a significant and positive impact on reducing and hopefully eliminating the need for wild caught fish as the source for Omega-3.

"I also believe we can expand MiAlgae's core technology into other areas to provide environmentally sound and sustainable solutions for waste streams while creating value-added products. Ultimately I want to see good science translated into truly sustainable and environmentally responsible businesses."

Pet owners are demanding more than simply 'pet food' and the industry is evolving rapidly to truly become 'pet care'. Pets are members of the family and owners look to treat them accordingly. This impacts every aspect of their lives from nutrition, mental and physical wellbeing to the role they play in our own quality of life.

Macnair continues: "How we feed our pets mirrors how we choose to eat ourselves. So, everything we value, from the integrity of the ingredients, how the food is prepared and how we feel when we feed it is very important. We want to feed our pets well, but responsibly, so increasingly we judge pet foods through the same lens as our own food. This will continue to be the case and the industry is moving strongly in this direction."

Douglas Martin, founder and managing director of MiAlgae, said:

"David's eclectic career means he brings huge diversity of experience. He is known for the role he plays in hiring, developing and nurturing talent. We believe he will help us create a team that will have a profound impact on solving major environmental challenges, while creating a truly value-added and sustainable business model."

MARS PETCARE ANNOUNCES PERFORMANCE OF 81% TOWARD ITS SUSTAINABLE FISH SOURCING GOAL

Mars Petcare announced progress towards a longstanding goal to sustainably source 100% of the fish used in some pet food recipes. The company now sources 81% of fish used from more sustainable sources aligned to Mars' guidelines. The company also confirmed it sources no endangered fish species.

The goal is part of Mars, Incorporated's Sustainable in a Generation plan and demonstrates the company's commitment to integrating sustainability into the heart of its business and bringing more innovative, sustainable choices to pet owners around the world.

In partnership with World Wildlife Fund (WWF), Mars Petcare set an ambitious target in 2010 to seek 100% sustainable sources of fish. Progress toward the goal is highlighted in a new joint report from WWF and Mars Petcare detailing work over the past decade to innovate and scale approaches to more sustainable fish sourcing. WWF and Mars Petcare have renewed their global partnership until 2025 to advance Mars sourcing goals and to positively influence progress toward sustainability in the fishing sector more broadly.

As Mars Petcare continues to work towards a fully sustainable fish supply, the business will regularly evaluate where it sources its fish, the types of fish used, and practices across its supply chain, aiming to minimize competition with the human food supply chain while helping to ensure that products can be both nutritious for pets and better for the world's oceans.

The company is also working with certifying organizations, standard setters and fish experts at the Marine Stewardship Council, Monterey Bay Seafood Watch and Aquaculture Stewardship Council on sustainable fish buying practices and collaborating with businesses and governments to drive change across the industry to help protect vulnerable ecosystems and drive responsible practices.

Mars Petcare will continue to work toward its commitment to source 100% of fish from sustainable sources, continue to ensure that it does not source endangered fish species according to the IUCN Red List, and take action to help strengthen protections for people in its fish value chain.

E.C.O.TRACE[®]



Organically Bound Trace Minerals.

Small Input - Great Effect.

Trace minerals have the smallest proportion in feed - but they make all the difference!

E.C.O.Trace[®], glycine-bound minerals, are designed to unlock the full nutritional potential of your feed. Benefit from the sustainable effects of the highly bioavailable minerals and experience the improved animal growth, immunity, and production. The special technology and know-how behind **E.C.O.Trace[®]** allow you an easy and safe application in all species.

Contact us: Oliver Caiger-Smith · Technical Sales Manager · +44 7722 019727 · caiger-smith@biochem.net

What are you doing differently to stay ahead?



In the fast-changing world of FMCG, if you're not innovating, you're standing still... and that's when your competitors can overtake you. Trouw Nutrition leads the world in developing the kind of product innovations that differentiate our partners' brands, keeping them way ahead of the rest of the marketplace.

Isn't it time you gave your NPD the 'Trouw innovation' difference?

Contact Katarzyna Świrkowicz
or Roderick Prince on: +44 (0)1335 341121

www.trouwnutrition.co.uk/globalleader

 **trouw nutrition**
a Nutreco company

G L O B A L L E A D E R I N P E T P R E M I X