



## Joint management & obesity in dogs Developing effective natural nutritional support for joint ailments & weight management in canines

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**T**he two most prevalent problems dogs suffer from in middle age to seniority are joint ailments and overweight/obesity, and very often they are concurrent. These two conditions can tax heavily on the canine's quality of life which can also impact the lives of their owners.

Joints are complex structures made up from bone, cartilage, ligaments, and other soft tissues that allow mobility and add flexibility to the skeleton. Joints can suffer sporadic inflammation (arthritis), or a chronic articular degradation of cartilage, a painful condition known as osteoarthritis (OA).

According to recent papers, 20 percent of dogs older than one year and over 90 percent of dogs older than five years suffer from this disease. Normal cartilage, a complex material composed of a solid collagen and proteoglycan matrix saturated with water, is synthesised by chondrocytes, and functionally supports joint range of motion. Sporadic inflammatory arthritis associated to trauma or infections are usually short-lived.

### Severe impact on a dog's quality of life

Osteoarthritis, however, is a pervasive condition where the articular cartilage deteriorates, followed by bone remodeling, changes in periarticular tissues, and variable-grade inflammation.

This leads to gait alterations, discomfort and pain, and can ultimately have severe impacts on a dog's quality of life.

Causes of OA range from genetics to breed size to obesity, with age and repetitive stress upon the cartilage as the main factors. There is no known cure for this ailment. However, research has shown some polyphenol-rich botanical extracts can prevent the appearance, or reduce the severity of OA, because they can control three of its mechanisms: cartilage degradation, oxidation status, and inflammation.

Most often, damaged cartilage cannot be repaired, or existing repair procedures are complex with an uncertain outcome. In-vitro and in-vivo research with the polyphenol icariin, a glycoside of the flavonoid kaempferide has shown its ability to stimulate mesenchymal bone marrow stem cells differentiating into chondrocytes and osteocytes and laying the foundation for cartilage and bone repair.

Other research shows icariin can also stimulate chondrocyte growth under poor articulate oxygen and nutrient conditions, and growth of 3D cartilage structures as well. Researchers have also identified the cell pathways icariin modulates to achieve this effect, namely Nrf2/ARE, and MAPK.

Other pathways are activated by excess Reactive Oxygen Species (ROS) within the chondrocyte. ROS in the cell operate by activating the NF- $\kappa$ B pathway, which trans-locates key elements into the cell DNA, forcing expression of inflammatory cytokines.

Research has shown that polyphenol-rich botanical extracts including green tea, pomegranate and mango leaf can help keep oxidative stress in check, reduce inflammation and support healthy metabolic activity. For example, pomegranate is rich in polyphenols such as ellagic acid, gallic acid and punicalagins.

There are many papers dealing with the metabolic antioxidant properties of these extracts and demonstrating that these potent polyphenols have the ability to help neutralise ROS, thus inhibiting the NF- $\kappa$ B pathway. This reduces the expression of inflammatory cytokines such as TNF- $\alpha$ , IL1- $\beta$ , IL-6, which can result in positive effects such as a reduction in swelling, inflammation and pain.

The third pathogeny of OA is inflammation itself, which also appears in sporadic arthritis. Mango leaf extract contains, among other molecules, the polyphenol xantone mangiferin. Mangiferin has been shown to possess specific anti-inflammatory activity, and its molecular mechanisms have been elucidated, and research has shown protective effects in-vitro and in-vivo osteoarthritis in experimental animals.

### **There is no magic bullet against obesity**

While botanical extracts can help to support articulate challenges, they can also support healthy weight. Excess weight in pets can also have impacts on joint health. If an inappropriate diet and lack of exercise are major factors in canine obesity, it would be natural that weight management should involve just increasing energy expenditure and controlling food intake.

Unfortunately, research has shown obesity is more than just weight increase. Two extra factors complicate the issue, namely oxidative stress and sub-clinical chronic inflammation.

Obesity involves excess fatty acids circulating through, and stored in, the liver and other tissues. These free fatty acids increase ROS at levels above those the body antioxidant system can neutralize them. This causes secretion of pro-inflammatory cytokines that end up in insulin resistance by the adipocyte. Further, increased pro-inflammatory cytokines level cause widespread sub-clinical inflammation that result in osteoarthritis or diabetes.

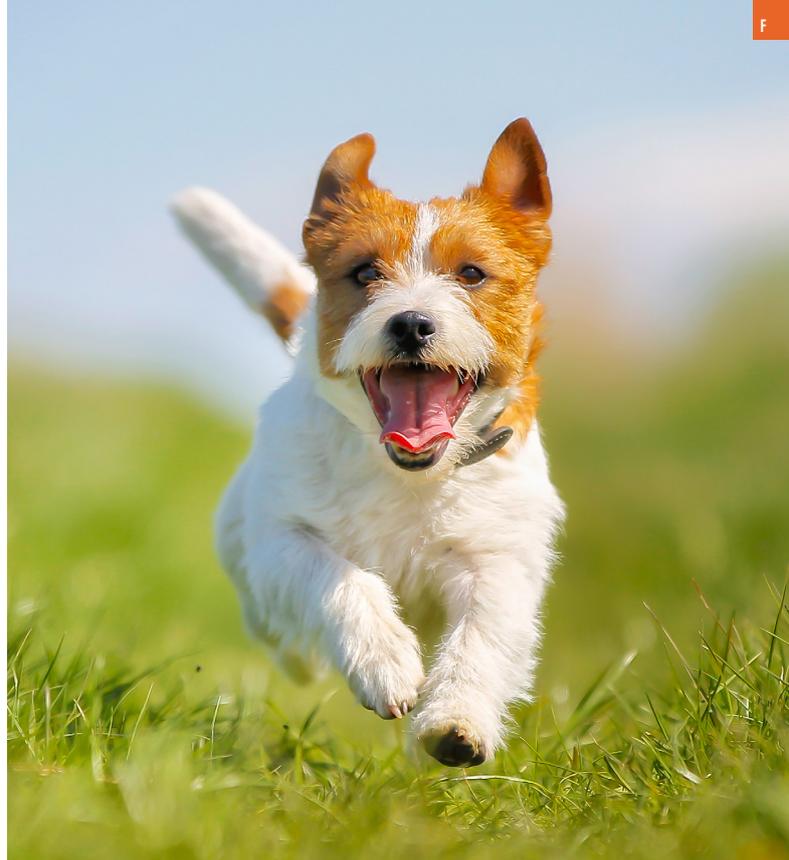
There is no magic bullet against obesity. The use of especially formulated diet, high in protein and low in calories; the change of feeding patterns, by serving small food portions several times through the day instead of large amounts once; promoting exercise; restraining excess rewards, especially those rich in energy; disposing off food scraps off the table instead of giving it to pet, all are good weight control strategies that, unfortunately, do not address the root cause of obesity complications.

Earlier studies have shown that green tea extracts provided to obese dogs decreased insulin resistance, improved triglyceride profile, and modified genes linked to metabolism of lipids and glucose, alleviating the metabolic status of dogs.

More recently, researchers have confirmed green tea extracts improve the metabolic status of obese dogs, by reducing the expression of inflammatory cytokines that results in a lower level of liver inflammation induced by high fat diets.

Also, they identified the metabolic pathways linking metabolic oxidation with inflammation, confirming the cause of obesity-related metabolic dysfunction in obese dogs is an exacerbated state of oxidative stress.

When using green tea extracts for obesity/overweight management, it is critical to ensure that these extracts are caffeine-free. Caffeine and other methylxantines such as theobromine and theophylline are toxic for dogs, and they can cause behavioural and cardio-respiratory syndromes that may require urgent intervention.



### **Promising tools**

Function-targeted botanical extracts containing active polyphenols are promising tools to help support two serious conditions in mid-age and older canines – joint damage and obesity. The TruGro CARE Joint Health and Weight Management solutions from Layn Natural Ingredients are efficient options for pet supplement and treat brands that contain these proven, potent polyphenols.

Joint comfort and healthy weight contribute to a happier and healthy life for pets and help alleviate the concern and stress of pet owners when dogs enter the senior stages.



#### **About the Author:**

Juan Javierre is Nutrition Scientist at Layn Natural Ingredients. He is a Doctor of Veterinary Medicine, as well as a nutritionist and researcher. Juan has over 30 years of experience in animal and pet nutrition in Europe, the Americas, Southeast Asia and China. (juan.javierre@layn-usa.com; www.layncorp.com)