

## *Health Talk*

### *Too much of a good thing is bad – How overfeeding and calcium supplementation in puppies can cause skeletal problems (or: The relationship between nutrition and skeletal problems during growth in large breed dogs).*

By Quixi Sonntag (BVSc) (Hons)

#### Introduction.

Large and giant breed dogs often suffer from lameness and bone deformities during growth. These symptoms are caused by disease of the joint cartilage or by abnormal development of the growth plate cartilage. The most commonly involved joints are the shoulder, elbow and hip. The conditions that affect these joints are **osteocondrosis** or **osteocondritis dissecans** (OCD) of the shoulder, **elbow dysplasia** (ED) and **hip dysplasia** (HD).

The growth in the length of bones originated from the growth plates, which are plates of bone cartilage (soft bone) at the top (proximal) and bottom (distal) ends of bones. In very young pups, most of the skeleton is in fact cartilage, and as the body matures, the cartilage is constantly being transferred into hard, mature bone. Once all the cartilage has changed into mature bone, the growth plates close. This process is called **endochondrial ossification**. In the joints themselves, the joint cartilage undergoes a similar process. Sometimes the cartilage maturation process in the **growth plates** or the **joint cartilages** can be disrupted. Growth plate abnormalities will cause some aspects of ED while joint cartilage damage is responsible for HD or OCD.

#### More about Elbow Dysplasia.

Elbow dysplasia is not HD of the elbow, but in fact a group of conditions, which occur in growing, large breed dogs, that affect the development of the elbow.

The following five conditions are included under the term ED:

- Osteochondrosis (OCD)
- Fragmented coronoid process (FCP)
- Ununited anconeal process (UAP)
- Elbow incongruency (INC)
- Articular erosion

OCD is the result of abnormal cartilage development which causes a weakened area in the joint cartilage. Often this weak area becomes partially detached and forms a flap in the joint space or becomes fully detached and then floats around in the joint (so-called joint mouse). This condition - although it forms part of the ED - is very commonly encountered in the shoulder.

FCP is a small chip of bone often associated with a traumatic injury, but is thought to be linked to disturbed growth in the growth plate.

UAP is caused by the failure of the growth plate in the anconeal process (the proximal end of the ulna) to close, resulting in a loose piece of bone in the elbow joint.

INC is caused when growth plates around the elbow are injured and different bones grow at different rates, causing deformities.

Articular erosions are lesions in the joint cartilage causing roughness of the joint surfaces.

The final outcome of ED is an irreversible inflammation of the elbow joint (**elbow arthrosis**). Resulting in pain and lameness.

## Genes versus Environment.

HD, OCD and ED are hereditary diseases. Therefore the dog that has the genes that carry the disease will be at risk to develop the clinical signs. The transmission of the genes from parents to offspring involves various gene locations and is therefore complicated and cannot be predicted. In addition, the environment influences the way in which that genetic potential is manifested in an individual animal. **These diseases cannot occur in animals that do not have the genetic presence of the disease, so the environment cannot induce the disease.** However, the severity of the disease in those individuals who do not have the genes, will be determined by certain environmental factors, notable nutrition and trauma.

## Overnutrition and its effect on the growing skeleton.

Research has shown that animals with the genetic potential for HD will develop far more severe clinical symptoms if they are overfed. Two groups of dogs with the same genetic back ground were fed the same food, the only difference being that one group received 7% of the maximum of the other group. The group whose food intake was restricted, showed a reduced incidence and severity of HD.

Overnutrition and over weight during growth causes an overloading of the immature hip cartilage, thereby influencing the congruency of the joint. The frequency and severity of OCD and ED is also increased with overnutrition.

Although the prevention of overfeeding will obviously never completely eradicate these conditions, it does improve the well-being of dogs who are genetically prone to the disease anyway. Breeders and owners can therefore influence the outcome of HD, OCD and ED in puppies by correct feeding. The bigger the puppy is not necessarily develop into the bigger adult dog. It is interesting to note that the protein percentage in the diet does not affect the skeletal development. It is the total energy intake that makes the difference.

## Calcium and how it affects skeletal development.

Calcium is needed for the development of healthy bone tissue. However, when calcium intake is too high, there is an increased risk for the development of the skeletal conditions in large breed, growing dogs. Puppies, due to the immaturity of their intestines, are unable to refuse the calcium that they do not need. (Mature dogs can regulate calcium absorption in the intestines down to -10% of the calcium in the diet, whereas in puppies the percentage cannot be lowered under 40%). Very young puppies can suffer toxic effects from high calcium levels.

Calcium is the biggest risk factor in the diet related to skeletal problems in large and giant breeds. Too low calcium levels result in undermineralisation of the bones (Causing weak bones that fracture easily) and (far more commonly) too high levels cause OCD, ED and HD.

It is important to consider the ratio between the energy content of the food and the calcium level. During growth, large and giant breed pups require less calcium in relation to energy than small and medium breeds. This is due to the fact that calcium intake is related to actual body weight while energy is related to metabolic body weight\*\*. Thus a low quality feed containing high calcium levels would increase the risk of skeletal problems. The same would apply to feeding adult dog food to puppies, because the calcium to energy ratio is higher in the adult product (more calcium per unit of energy), thereby increasing the risk of OCD, ED and HD.

## Conclusion.

The well being of large breed dogs clearly depends on optimal nutrition in the growth phase, especially the very early stages. Breeders and owners should consider the benefits of feeding better, more expensive diets at an early stage to promote optimal lifelong health of their dogs.

Unfortunately, however, nutrition will not affect the genetic incidence of these diseases. It is the duty of responsible dogdom to screen as many animals as possible for these conditions so that sufficient statistics can be produced for proper genetic research.

\*\* Metabolic body weight: Energy used by the body is given off as heat, mainly via the body surface. Therefore, the energy expended is directly related to body surface area. The smaller the animal, the greater the body surface area per unit of body weight. Metabolic body weight is calculated from actual body weight by a specific formula.

*SA Bullmastiff News, Spring 1998*