

Growing Pains: Successfully Raising the Large Breed Puppy

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INTRODUCTION

The art of dog breeding has never been easy. Long-term success has eluded many breeders. In the past, accomplishment was easier because we only bred for a few traits (eg, size, working ability, or general appearance). We were merely trying to conform to a standard. Today's breeder has a much larger challenge because multiple conformation traits, temperament, agility, utility, and health problems all must be considered when planning a mating. As the number of parameters increase, the difficulties with the project escalate. It is no wonder that many become discouraged and frustrated over time. Successfully breeding dogs is not an easy mission.

Breeders and exhibitors of the large and giant breeds are faced with even more difficulty because of a number of

developmental conditions involving the bones and joints. Diseases like hip dysplasia, hypertrophic osteodystrophy, panosteitis, and osteochondrosis are frequently-discussed topics at health seminars, national specialties, or anywhere fanciers of the large and giant breeds gather. These skeletal conditions seem to be diagnosed at an even more common rate than in the past. Occurring during the rapid growth stages of pups and adolescent dogs, some of these diseases can devastate a kennel.

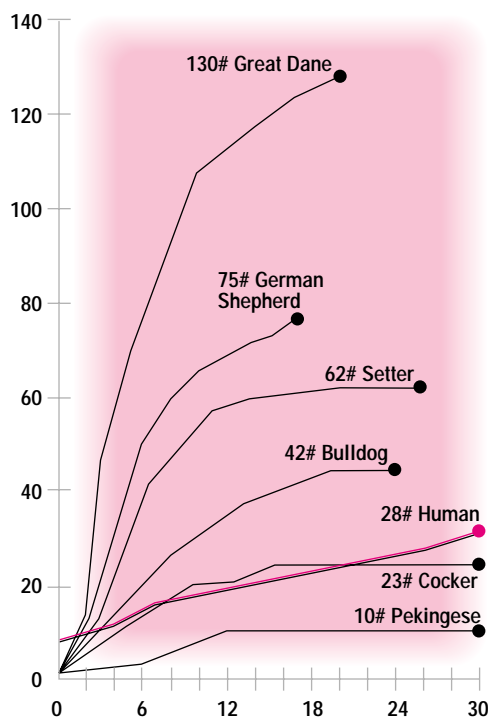


Figure 1 – Representative growth curves of a variety of breeds. Adapted from Current Veterinary Therapy V, 1974. (Reprinted from Lepine AJ, Nutritional management of the large breed puppy. In: Reinhart GA, Carey DP, eds. Recent Advances in Canine and Feline Nutrition, Vol II: 1998 Iams Nutrition Symposium Proceedings. Wilmington, OH: Orange Frazer Press, 1998, p54. Used with permission).

developmental conditions involving the bones and joints. These particular puppies seem appealing because of the “extreme” characteristics that are desired in a particular breed. But, often those very puppies are the ones that may become plagued with panosteitis or osteochondrosis. So, is bigger really better? What are some of the influences on whether our puppy is the one to develop a certain developmental bone disease. Where does diet fit in? What can we do as breeders to avoid getting it or perpetuating it in our lines? These are a few of the questions we will attempt to answer.

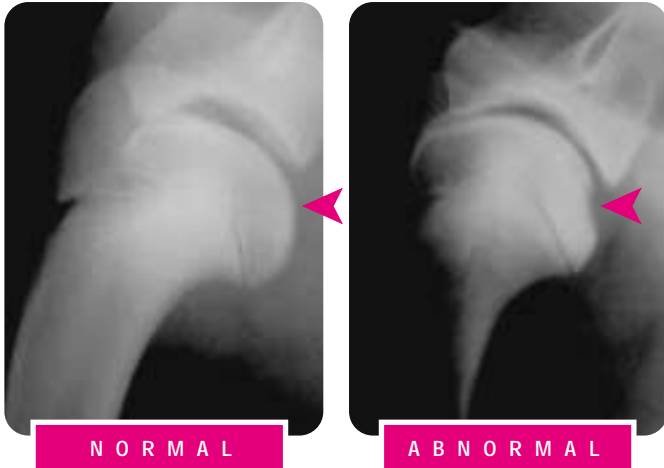
Let's examine the various types of commonly seen developmental bone diseases and how they present themselves in our growing or adolescent dogs.

Obviously, different breeds of dogs grow at different rates (Figure 1). Some large breed dogs are the same size and weight at birth as 3 month old Chihuahuas! And by 8 months of age, those dogs increase in size and weight to 80 or 100 pounds while many of the toy breeds are less than a few pounds at the same 8 months! It is only logical that large or giant breeds of dogs undergo tremendous metabolic and structural changes to allow for the “hyper-space” type growth. Sometimes breeders are drawn to those puppies in the litters that have bigger bone structure.

DEVELOPMENTAL BONE DISEASES

Osteochondrosis

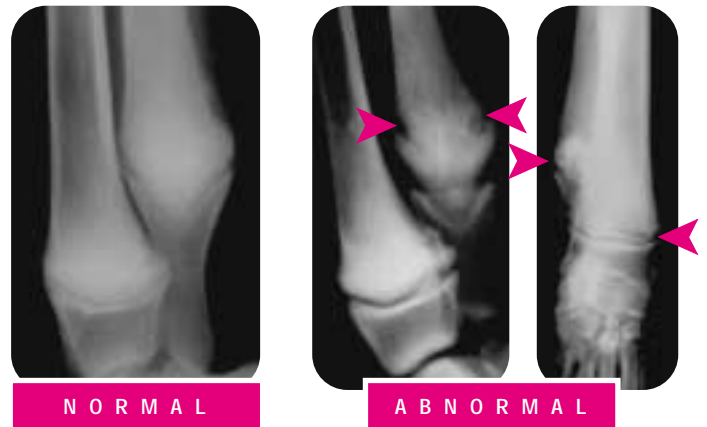
Osteochondrosis is a common cause of lameness in growing large and giant breeds with a high incidence in the Great Dane, Labrador Retriever, Newfoundland, and Rottweiler. Osteochondrosis is the degeneration or breakdown of bone and cartilage of certain joints. It commonly is followed by regeneration or calcification of the tissues of the joint while it attempts to heal. It typically



occurs in growing dogs between 5 and 9 months of age and is often associated with rapid growth. Dogs with osteochondrosis usually present to their veterinarian with pain, lameness, and swelling of the shoulder, elbow, hock, or stifle joints. It is considered a systemic disease and affects more than one or 2 joints at a time although it may show in only one. When the breakdown of the cartilage occurs in some of these joints, occasionally small sections of tissue can break loose inside the joint forming a calcified “joint mouse.” This is more commonly known to breeders then as osteochondrosis dessicans or as “OCD.”

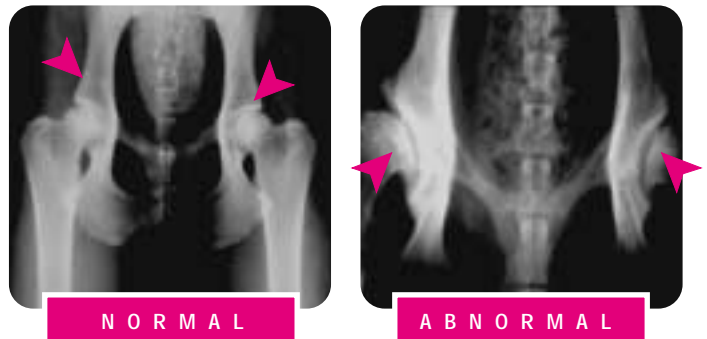
Hypertrophic Osteodystrophy

Hypertrophic osteodystrophy is another common cause of lameness of puppies in breeds such as Great Danes, Saint Bernards, Boxers, Dalmatians, Irish Setters, German Shepherds, Labrador Retrievers, Collies, and other rapidly growing large breeds at 3 to 8 months of age. It is a condition characterized by abnormal bone growth of the lower front leg (of the radius or ulna – the area just above the carpus). This results in large “wrists” and, sometimes, bowed legs. These puppies may also have an elevated body temperature and/or become anorexic or not interested in eating their food.



Hip Dysplasia

Of all the skeletal diseases of dogs, hip dysplasia is the most well known. It is a developmental disease of the hip joint where luxation of the femur from the socket (acetabulum) of the pelvis causes remodeling of this joint. The acetabulum becomes shallow with flattening of the head of the femur. The mismatch of the ball and socket leads to arthritis. Early cases of hip dysplasia may have signs of mild discomfort after exercise or a general mild lameness. As the condition progresses, lameness, pain, abnormal gait, reluctance to rise and a thinning of musculing of the thighs may occur. Hip dysplasia is a polygenic disease (involves many genes) that can be influenced by diet. Rapid growth or rapid weight gain can aggravate the lameness of hip dysplasia.



Panosteitis

Panosteitis is another commonly discussed bone disease in the breeder arena. This condition is also known as eosinophilic panosteitis, “Pano” or “Eo Pan”, which is the most common terminology used by breeders. It is a disease of the long bones of the forelimb such as the humerus, radius or of the hind leg including the femur or tibia of large and giant breeds of dogs. German Shepherds seem to have a higher incidence of this condition. However, any breed can be plagued by this condition especially puppies with extremely large bone. Although this condition can cause extreme lameness and be alarming to the average breed or owner, it is self-limiting, and there is no permanent damage or aftermath of the condition. It is most often seen during growth spurts with affected pups usually losing their appetite in addition to showing lameness.

Most commonly puppies will have acute onset of lameness with no history of trauma. Male puppies are 4 times more affected than females.¹ Puppies with panosteitis will often “carry” or favor the limb that is affected for just a few days or many weeks. Often, the puppy will appear to have a “shifting leg lameness,” that is, they appear to be lame on one leg one day and another leg the next. Such puppies usually have panosteitis of multiple bones and limp on the one that hurts the most.

What influences the developmental bone diseases? Where does diet fit in? What can be done to avoid these problems in puppies?

It is known that all skeletal development is affected by four major areas:



GENETICS

As we all know, “the genes make the dog.” Therefore genetics can play a significant role in the development of certain bone diseases. Puppies from very large boned parents may have large bones and be more apt to develop panosteitis. Puppies from dysplastic parents are much more likely of becoming dysplastic. Puppies from parents who were rapidly growing are more likely to grow rapidly, too.

When considering genetics and nutrition together, there are 2 well-known nutritional truths. The first is that growth rate and adult size are programmed in the genes for every puppy. The second is that increasing the energy intake (supplying more calories) to a puppy can push the growth rate to its upper limit and thus increase the likelihood of certain skeletal diseases. This leads to the next topic of discussion– *nutrition*.

NUTRITION

Nutrition can influence the development of certain developmental bone diseases in 3 areas: protein content of a diet, energy content or calories fed, and calcium intake (whether as part of the diet or as a supplement).

Dietary Protein

In the past, some diets were said to be “too hot” (ie, contained high levels of dietary protein) and promoted rapid growth rate predisposing large and giant breed dogs to skeletal problems. However, controlled research done in 1991 by Nap et al.,² showed that protein was uninvolved. Great Dane puppies were fed identical diets except for the protein content from weaning for 18 weeks. These diets had a broad range of dietary protein compositions of 31.6%, 23.1% and 14.6%. This research demonstrated that skeletal development problems were NOT related to variations of the dietary protein content. Thus, protein in and of itself does not effect bone development or influence the incidence of developmental bone diseases.^{2,3} (The low-protein diet did have some problems keeping weight on the pups.)

Energy Density

However, research done by Hedhammer did find a nutritional factor that does influence the incidence of certain developmental bone diseases. This researcher investigated the issue of dietary energy intake (how many calories a puppy ate each day) by feeding either (1) as much as the puppy wanted to eat [ad libitum] or (2) a restricted amount of food [66% of the ad libitum amount]. This research was also done on Great Dane puppies which were fed until the puppies were 60 weeks of age (approximately 15 months old). He found that the puppies fed as much as they wanted (ad libitum) had a significantly higher incidence of skeletal abnormalities than those puppies who were fed a restricted amount of food (meal fed).⁴

Another researcher (Dammrich) in 1991 confirmed this fact by doing research on Great Dane puppies fed ad libitum or a restricted diet of 70-80% of the ad libitum fed puppies.⁵ His research was done from weaning until 6 months of age. He proved that puppies fed as much as they wanted had weaker bone and inadequate support of the joint cartilage. Thus, those puppies fed as much as they wanted had a significantly higher frequency of developmental bone diseases.⁵

Iams research has also shown that the number of dogs showing the radiographic changes of osteochondrosis and HOD increases as the number of calories consumed increases. In other words, pups that get too many calories grow fast and are more likely to have developmental bone problems.

Calcium

The amount of calcium in a diet has also been demonstrated to have significant effects on the development of the skeleton of the large or giant breed puppy. Research done by Hazewinkel et al. showed that diets too high in calcium have been shown to have detrimental effects on puppies’ endocrine systems, blood levels of calcium and skeletal development and will increase the risk of developmental bone diseases. Specifically, high levels of calcium affected bone development by causing retained cartilage cones, increased bone mineral, and delayed bone remodeling. These puppies had more abnormalities seen on their radiographs (x-rays) with more osteochondritic lesions (osteochondrosis).^{6,7}

Another research project done by The Iams Company evaluated 3 diets containing 26% protein and 14% fat, but differing in the calcium and phosphorus levels:

Test Diet	Ca:P Levels
1	2.70% calcium to 2.20% phosphorus
2	0.80% calcium to 0.67% phosphorus
3	0.48% calcium to 0.40% phosphorus

Great Danes puppies were fed the various diets from pre-weaning until 18 months of age. During this research growth rate, body composition, bone mineral density or composition, and skeletal integrity were evaluated. This research demonstrated that diets with 0.8% calcium and 0.67% phosphorus level provided ideal mineral levels for

healthy bone growth and development for large breed dogs. Puppies fed the diet with these levels had better conformational or skeletal structure. These puppies also had a lower prevalence of developmental bone disease or clinical signs of lameness.⁸⁻¹¹

Environment

Environment also can influence the incidence of certain types of developmental bone diseases occurring in our large breed dogs. Environmental influences are anything that can effect an animal from non-genetic sources. Space for exercise and exercise (or lack of) and conditioning are considered environmental influences. Dogs that are not exercised properly do not develop adequate musculing or tendon strength, and thus these things can alter bone density and development. Slippery floors or awkward footing can lead to abnormal gait and altered bone development, particularly in very young puppies.

Trauma

Any type of trauma, especially to the rapidly growing large or giant breed dog can effect both bone and joint development. Broken bones, slipped growth plates, or injured joint cartilage can all be factors that determine whether dogs can be predisposed to developing bone or joint problems in the future. Thus it is important to allow for proper exercise and conditioning of large breed dogs, but not to stress their delicate, young skeletons which may cause injury that could be permanent. Puppies should not be pushed to perform. A puppy with an otherwise unnoticeable osteochondrosis often has a history of running and pulling up lame. The combination of a developmental bone disease and trauma created the lameness. Surfaces and conditions should be carefully evaluated to avoid dangerous structures for dogs. Trauma-related injury can be avoided by using common sense and light exercise.

Practical Implications

Large and giant breed dogs can be plagued by the occurrence of certain bone diseases during their early and adolescent growth stages. Genetics, environment, and nutrition can influence the development of these conditions.

Based on recent research, nutrition can play a key role in decreasing the occurrence and severity of these diseases. Some of the concepts we know now exist are:

Managed growth rate is important in reducing the incidence of skeletal disease

- Rapid rate of growth contributes to the incidence of skeletal abnormalities. Feed a diet with around 15% fat to provide enough calories for growth but not so much as to fuel rapid growth.

The ideal diet for growing large breed puppies from weaning to adulthood contains
26% protein
15% fat
0.80% calcium
0.67% phosphorus

- Dietary protein has little impact on skeletal disease. Feed a diet with about 26% protein to support muscle development.
- Mature size is genetically programmed.

Support healthy bone development

- Appropriate dietary calcium and phosphorus concentrations are essential. The diet should have a calcium level of 0.8 to 0.9% and be balanced with phosphorus.
- Calcium supplementation or high calcium diets can increase the incidences of certain developmental bone diseases. Any supplementation whether as calcium, bone meal or dairy products will increase the calcium intake and increase the puppy's likelihood of developmental bone disease.

Breeders CAN influence the frequency of certain bone diseases occurring in their kennel by implementing proper feeding management of their puppies, considering the genetic potential of the heritage of their dogs, exercising and conditioning properly, as well as preventing trauma or damage to growing bones and cartilage of their puppies.

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