Developmental Orthopedic Diseases

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The objective of this session is to provide the practitioner with an overview of developmental orthopedic diseases in the dog and outline their pathogenesis, progression, and surgical and rehabilitation management. Emphasis will be on decision-making and approach to management, not detailed management protocols.

Developmental orthopedic diseases (DODs) are a group of diseases that cause skeletal abnormalities in young, growing dogs. The etiology of most of the DODs is considered to be multifactorial, attributable to both genetic and environmental factors. Recognition of breeds at risk for DODs can aid in diagnosis, early management, and prevention through selective breeding. The most common DODs are listed along with identified breeds at risk in the table below.

Disease	**Primary breeds at risk**	**Age of onset**
CHD	Airedale terrier, Alaskan malamute, bearded collie, Bernese mountain dog, bloodhound, border collie, Bouvier des Flandres, briard, Brittany spaniel, bulldog, bullmastiff, Chesapeake Bay retriever, chow chow, English springer spaniel, German shepherd dog, German wirehaired pointer, giant schnauzer, golden retriever, Gordon setter, Great Dane, Great Pyrenees, keeshond, Kuvasz, Labrador retriever, mastiff, Neapolitan mastiff, Newfoundland, Norwegian elkhound, Old English sheepdog, pointer, Portuguese water dog, rottweiler, Saint Bernard, Samoyed, Treeing Walker coonhound	5-6 months
CMO	Cairn terrier, Scottish terrier, West Highland white terrier	3-8 months
FCP	Basset hound, Bernese mountain dog, Bouvier des Flandres, bullmastiff, chow chow, German shepherd dog, holden retriever, Gordon setter, Irish wolfhound, Labrador retriever, mastiff, Newfoundland, rottweiler, Saint Bernard	4-5 months
HOD	Boxer, Chesapeake Bay retriever, German shepherd dog, golden retriever, Great Dane, Irish setter, Labrador retriever, Weimaraner	2-4 months
OCD Elbow	Chow chow, German shepherd dog, golden retriever, Great Dane, Labrador retriever, Newfoundland, rottweiler	4-6 months
OCD Shoulder	Bernese mountain dog, border collie, Bouvier des Flandres, boxer bullmastiff, Chesapeake Bay retriever, dalmation, English setter, German shorthaired pointer, German shepherd dog, German wirehaired pointe, golden retriever, Great Dane, Great Pyrenees, Irish wolfhound, Kuvasz, Labrador retriever, mastiff, Munsterlander, Newfoundland, Old English sheepdog, rottweiler, Saint Bernard, standard poodle	4-6 months
OCD Stifle	Boxer, bulldog, German shepherd dog, golden retriever, Great Dane, Irish wolfhound, Labrador retriever, mastiff, rottweiler	4-6 months
OCD Tarsus	Labrador retriever, rottweiler, bullmastiff	4-6 months
Panosteitis	Afghan hound, Akita, American cocker spaniel, American Staffordshire terrier, basset hound, bearded collie, Bernese mountain dog, boxer, bull terrier, bulldog, Chesapeake Bay retriever, Chinese shar pei, chow chow, dalmation, Doberman pinscher, English setter, English springer spaniel, giant schnauzer, German shepherd dog, German shorthaired pointer, golden retriever, Great Dane, Great Pyrenees, Irish wolfhound, Labrador retriever, mastiff, Neapolitan mastiff, Newfoundland, Rhodesian ridgeback, rottweiler, Saint Bernard, Shih tzu, Weimaraner West Highland white terrier	6-18 months

PL	Akita, American cocker spaniel, Australian terrier, basset hound, bichon frise, Boston terrier, bulldog, Cairn terrier, Cavalier King Charles spaniel, Chihuahua, Chinese shar pei, chow chow, flat-coated retriever, Great Pyrenees, Japanese chin, keeshond, Lhasa apso, Maltese, miniature pinscher, miniature poodle, papillon, Pekingese, Pomeranian, pug, shih tzu, Silky terrier, standard poodle, toy fox terrier, toy poodle, West Highland white terrier, wirehaired fox terrier, Yorkshire terrier	4-6 months
UAP	Basset hound, Bernese mountain dog, Chonese shar pei, chow chow, Wnglish setter, German shepherd dog, golden retriever, Labrador retreiver, mastiff, Newfoundalnd, Pomeranian, rottweiler, Saint Bernard	4-5 months

Table adapted from LaFond et al, JAAHA 2002

Because DODs are controlled by a combination of genetic and environmental factors, their effects can be manipulated on a population or individual patient basis with the use of selective breeding or environmental (primarily nutritional) management. That is, breeds determined to be at increased risk for a DOD may have a genetic predisposition and thus may be more susceptible to environmental manipulation. For instance, puppies from breeds at increased risk for a DOD with a demonstrated nutritional etiology may benefit from dietary modification to minimize disease-associated morbidity. Specific nutritional risk factors for these diseases include excess energy intake, excess calcium intake, and electrolyte imbalance. Other environmental manipulations such as activity level may also affect manifestation of disease later in life.

Joint-associated DODs

DODs that involve joints affect the conformation of the joint and all share the sequela of degenerative joint disease (DJD). The clinical management of DODs that involve joints can be thought of in two stages - early on when there is potential to change the conformation of the joint with the hope of limiting DJD, and later in life after DJD has already been established.

	WITHOUT DJD	**WITH DJD**
Conservative management	Weight reduction/nutritional management Controlled exercise/rehabilitation Pain Management (NSAIDs, immune-modulating agents) Monitor need for surgical intervention or modification of medical management	Weight reduction Controlled exercise Pain Management (NSAIDs, immune-modulating agents) Monitor need for surgical intervention
Surgical management	Procedure to change conformation of joint (eg, TPO, JPS, DPUO, Ulnar osteotomy)	Procedure to remove arthritic joint (eg, total joint replacement, FHNE)

Prevention

An alternative approach to environmental management for disease control is manipulation of the genetic makeup of future generations of dogs by using controlled breeding. The recognition that some of the DODs have a substantial genetic component has resulted in the establishment of genetic screening programs such as the PennHIP and the Orthopedic Foundation for Animals.