Chapter 1

Hello, and welcome to Become a Veterinary Assistant II: Canine Reproduction! My name is Jeff Grognet, and in this course we'll be working our way through the many aspects of the reproductive process in dogs.

I've been a veterinarian for over twenty years. When I first started my career, I worked with all species, but now I devote my time exclusively to cats and dogs. I practice with my wife, fellow veterinarian Louise Janes, and we both love veterinary medicine. Every day challenges us with interesting and unique cases and we enjoy helping companion animals and their people. I have written extensively on veterinary topics for almost 20 years. I've been a regular contributor to the magazines Dogs in Canada, the AKC Gazette, as well as the AKC Family Dog, and I've written many freelance articles for agricultural and pet-oriented publications as well.

Another love of mine is teaching. I taught a veterinary assistant program at a local college that later developed into my first online course, Becoming a Veterinary Assistant. Many students wanted to learn more about breeding dogs, so I decided to devote an entire course to the topic.

There's a lot to know about a dog's reproduction process. I've tried to anticipate your needs and questions, but if I haven't covered something you want to know about, please bring it up in the Discussion Area. I'd love to talk with you there, and I'm sure other students will have the same questions on their minds.

What can you expect to learn in this course? If you want to breed dogs, you will better understand the reproductive process, which will allow you to talk intelligently with your veterinarian. Your dogs will also benefit directly from your knowledge. You will make informed choices about care and management that may result in healthier puppies.

If you work at a veterinary hospital, you will better understand why the veterinarian recommends certain procedures. You will also be able to answer all those questions on reproduction your clients ask, like these:

Can I vaccinate my dog even though I bred her last week?
What is pyometra?
When is the best time to breed?
How can I tell if my dog is pregnant?
When do I need to call for help during whelping?
What should I do when my puppies are crying?

The breeding process does not begin on the day of mating, so neither does this course. It starts by choosing the right breeding stock. As a veterinarian, I leave the looks and temperament to breeders and focus on health.

Today's lesson will demonstrate how you can assess health through blood tests, radiographs, and thorough physical examinations. We'll look at how genetic disease is inherited and how to avoid it, and then finish with tips on how to manage the breeding pair; specifically vaccinations, deworming, and nutrition.

In subsequent lessons, we will see how males and females can be evaluated to ensure they don't have any abnormalities or diseases that would reduce their fertility. We will also study issues related to mating, from timing to natural and artificial methods of breeding. We'll then examine the reasons why pregnancy may not occur.

Next we'll look at pregnancy and its many aspects: how to determine pregnancy, its stages, times of vulnerability, care and feeding of the mother, and how to deal with unwanted pregnancies. Then we'll explore whelping and when to seek veterinary help, learn about the diseases and conditions to watch for, and finally we get to the puppies!

As you can see, I hope to provide you with a veritable guidebook to canine reproduction in these lessons. I've also supplied links to more information in the Supplementary Material section. Remember, you can always bring your questions to the Discussion Area. That's what I'm here for—to help you learn.

Let's get started by seeing how to choose superior parents for a successful breeding program.

Chapter 2

Assessment of the Potential Breeding Dog

The logical starting point for any breeding program is the selection of breeding stock. How do you determine what dog is the best? You have to decide what traits are desirable to you. Some breeders focus their assessment on show traits and critique their dogs for

correct ear carriage, proper back length, a perfect color pattern, or an ability to move well in the ring.

Others select their dogs according to temperament. They may choose dogs with drive and athleticism if they want them for retrieving trials. Or they may look for an individual with a gentle nature to become a family companion. Parents often pass these traits to their puppies.

I think it is vitally important to evaluate the health of breeding stock. You don't want to breed a dog that has a high probability of developing a crippling bone disease, becoming blind, dying of cardiomyopathy at a young age, or developing cancer. Though you can't detect many of these conditions until it is too late, it is possible to screen potential breeding animals for a number of these diseases.

Veterinary experts have extensively researched genetically linked orthopedic disorders. The most common of these inherited conditions, and the bane of many large breed dogs, is hip dysplasia. According to the Orthopedic Foundation for Animals (OFA), over three-quarters of bulldogs suffer from this ailment. The popular golden retriever breed has a 21% incidence, while almost one in five German shepherd dogs are afflicted.

Hip dysplasia is a developmental defect of the hip joint–the connection between the upper leg bone (femur) and the pelvis. When the ball at the top of the femur (femoral head) fits poorly into its socket (the acetabulum in the pelvis), this allows the head to rattle around in the joint. Over time, this wears down the cartilage, causes inflammation, and brings on arthritis. I've seen puppies as young as five months of age with hip pain, but most don't develop symptoms until they are middle-aged.

Veterinarians use several methods to detect hip dysplasia, but the most accepted method is a hip X ray using either the OFA positioning or the University of Pennsylvania Hip Improvement Program (PennHIP) technique.

The most widely used method is the OFA assessment. To get an appropriate OFA hip X ray of a dog, he is laid on his back with his hind legs pulled down to the table parallel to each other. The X rays are submitted to veterinary radiologists who subjectively assess how the femur fits into the hip socket (otherwise known as the conformation of the hip joint) using several criteria. Dogs are graded as normal (excellent, good, and fair), borderline, or dysplastic (mild, moderate, and severe).

X ray of normal hips

The above X ray shows a normal set of hips. Study how the femur fits snug into the hip socket. This means that when the dog walks and is active, the bones will move smoothly. Veterinarians also call this good seating of the femoral head in the acetabulum.

X ray of dysplastic hips

The above X ray shows a set of very dysplastic hips. Notice that the hips are not even in their sockets and could be called dislocated. Even though this dog is just over six months old, it will have a lot of difficulty walking.


X ray of arthritic dysplastic hips

The above X ray shows a set of dysplastic hips that have become arthritic. The poor seating of the hip joint is evident because the femur is barely in the acetabulum. The extra bone that has built up around the hip joint reflects the arthritis in this older dog.

In the PennHIP system, the dog is laid on his back, his femurs are pointed upwards and his knees are bent. Using a frame placed in the groin between the dog's legs, the knees are pulled toward each other. This tension pulls the femoral head out of the socket, what vets call distracting the hip joints. The goal of using this method is to evaluate how far the femoral head can be moved out of the socket, also know as measuring hip laxity.

The veterinarian takes measurements and calculates a distraction index. This index is a measurement of hip joint laxity and not a passing or failing score. Hips with distraction indexes close to zero are considered to be tight, while those close to one are considered to be very loose. Some people consider this index to be an indication of the percent out of joint that the femoral head is out of the acetabulum. For example, an index of 0.58 means the femoral head comes out of the joint by 58%.

The PennHIP is an objective technique. It determines the presence and severity of dysplasia based on a calculated index—the higher the index, the worse the dysplasia. Although this method has the advantage of not being based on a subjective opinion, most breeders do not use PennHIP because very few veterinarians are certified to perform the procedure.

Hip dysplasia is a polygenic inherited trait, which means many genes are involved in its development. A dog's environment also plays a key role in the disease's development. The offspring of affected dogs have a 25% to 40% chance of having hip dysplasia. Screening dogs, especially those breeds with a high incidence of hip dysplasia, has become commonplace. Ideally, only dogs free of the condition should be bred.

In breeds with a high incidence of orthopedic conditions such as elbow dysplasia, osteochondritis dessicans (OCD), Legg-Perthes disease, and dislocated knee caps (luxating patellas), further testing is also recommended prior to breeding.

Checking for ophthalmic diseases such as cataracts and Progressive Retinal Atrophy (PRA) can also be included in a prebreeding assessment. A cataract is an opacity in the lens of the eye that can be detected with a thorough eye examination by a veterinarian. Like many diseases in dogs, recessive genes are responsible for most cataracts. How these are inherited is the topic of the next chapter in this lesson.

PRA, another recessive trait, is also diagnosed with an eye examination, but it cannot be detected until dogs are middle-aged. We have not been able to reduce the incidence of PRA because puppies have already been produced before the parents develop the disease. To circumvent this problem, researchers have developed a blood test to detect the DNA sequences that cause PRA. Because each breed has its own unique genetic mutation, these tests are breed-specific. The results of these gene tests categorize each individual as a normal dog (free of the PRA gene), a carrier dog (has only one PRA gene), or as a dog that will develop PRA (has both genes that code for PRA).

Chapter 3

Genetic Disease

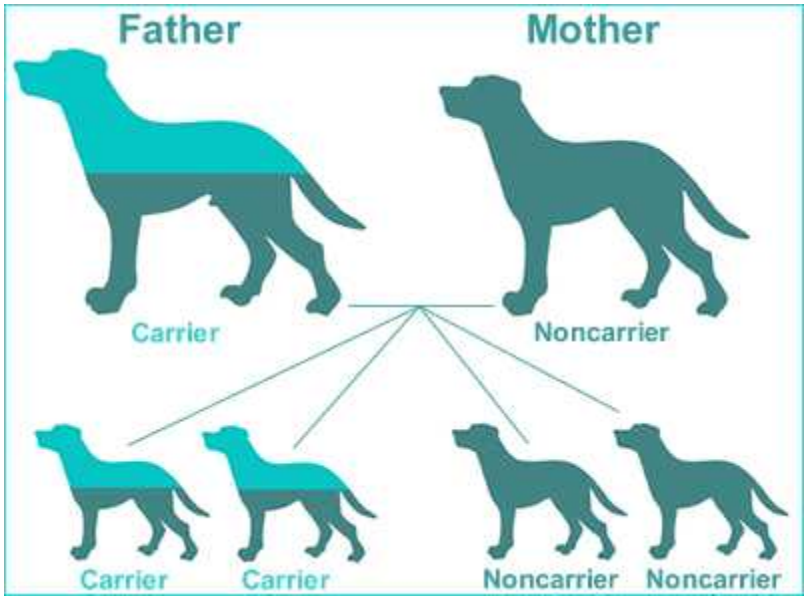
Let me give you a little background on some introductory principles of genetics to help you grasp the following concepts. Genes form the basic unit of heredity in all living organisms, from bacteria to humans. They determine the physical characteristics that an organism inherits, such as the shape of the nose and the color and markings of the coat. They also determine if a dog develops a particular disease.

Genes are made of deoxyribonucleic acid (DNA). Millions of genes line up to form long, threadlike structures called chromosomes. Every cell in a dog's body has 78 chromosomes (humans have 46), which are arranged in 39 pairs of matching chromosomes.

Offspring inherit half of their chromosomes from each parent, which also means they inherit half their genes from each parent.

The Dominant/Recessive Effect

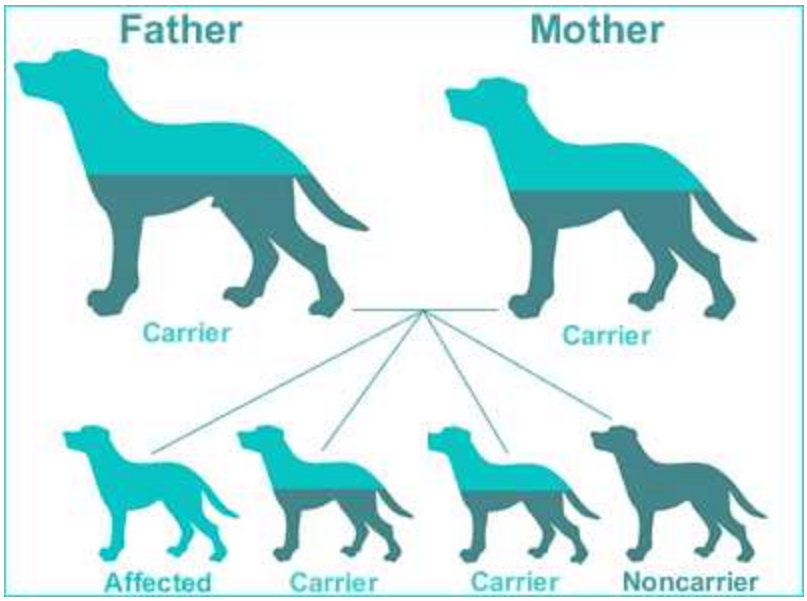
A recessive defect can only be produced if two copies of the recessive gene are present. A dog possessing only one copy of the recessive gene does not have the disease because the normal (dominant) gene prevents the condition from emerging. He is a carrier because he can pass his one recessive gene to his offspring.



One parent is a carrier

In the illustration above, the father has one copy of the dominant gene (green) and one copy of the recessive gene (turquois). His female mate has two copies of the dominant gene (two green). The diagram demonstrates what offspring they will produce. Keep in mind that each parent can contribute just one gene to its offspring. The four puppies shown represent the probabilities of the combinations that can result from these parents.

The two puppies on the far left received the recessive (turquois) gene from their father and the dominant (green) gene from their mother. Both of these puppies are carriers. The two puppies on the right inherited two dominant (green) genes, one from each parent, so they do not carry a recessive gene. In summary, puppies born to these parents have a 50% chance of being carriers. Because none of these puppies can inherit two copies of the recessive gene, none of them will develop the disease.



Both parents are carriers

When both parents are carriers (each one carries a dominant and a recessive gene), we see a different combination of genes in the pups. If each parent passes a recessive gene to a puppy, it will develop the disease. If each parent passes its dominant gene to a puppy, it is clear. Both of these combinations occur 25% of the time. The last combination, which is seen 50% of the time, is a carrier that has one dominant and one recessive gene.

Most inherited diseases in dogs are recessive traits. This means that a disease will only be seen sporadically and, by its very nature, is only detectable if it turns up. The gene that causes the defect can sometimes be identified through a test (such as the one for PRA), and individuals can be labeled as affected, carriers, or clear.

Chapter 4

Management of the Breeding Dog

Once you have selected a breeding individual, your next job is to prepare him or her for breeding. This begins with a thorough examination long before breeding time.

Under ideal circumstances, all current health issues should be resolved before breeding. For example, if a bitch has a bladder infection, let it clear up before mating. Blood tests to evaluate the individual organs may be warranted. For example, an evaluation of thyroid function is appropriate in some breeds (such as Doberman pinschers and bassets) because infertility can occur in both males and females as a consequence of low thyroid hormone levels. The reproductive system of both sexes needs a detailed investigation, and I'll cover this in detail in upcoming lessons.

Another consideration is vaccinations—what vaccines should be given and when? Most breeders vaccinate their bitches against distemper virus and parvovirus so that they can

pass immunity to their puppies via their colostrum. Vaccines against other diseases such as hepatitis and parainfluenza should also be considered if they are a threat to young puppies.

As a general rule, vaccinations should be given prior to breeding. However, what do you do if a bitch is due for her vaccinations at the same time she is to be bred, or when she is pregnant? Most veterinarians will not vaccinate pregnant bitches—they want to ensure they do not threaten a developing fetus. However, if there is an outbreak of parvovirus in the breeding facility, you may need to vaccinate the pregnant bitches to maximize immunity in the puppies. You should discuss unique circumstances like this with your veterinarian.

Because worms can migrate through the placenta to developing puppies or through the bitch's milk to nursing puppies, reducing the risk of worms in bitches is of paramount importance. Some dewormers are safe to use in breeding animals, while others are not. The table below provides details on some products. Note that for some products, the safety in breeding and pregnant animals is not established….