



Gryphon Bouviers
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The Bouvier des Flandres Health and Genetics Issues

Assuring that a puppy has the opportunity to develop into a healthy companion is the shared responsibility of breeders and owners. It is important that proper and useful information reach owners who need it to raise their dogs and make appropriate daily health decisions.

This Flyer is one effort to disseminate pertinent information to potential Bouvier owners to assist them in properly considering and understanding the broad issues of Bouvier Health and Genetics.

Introduction

With the advent of the Internet and other communication tools, it has become more and more important for proper and useful information to get to those people who need it to raise their dogs and make appropriate daily decisions. This booklet is one of Gryphon Bouviers ways of getting some of that important information to the real users - potential Bouvier owners - so that they can give proper consideration on how to understand the broad issues of Bouvier Health and Genetics.

A Healthy Dog

Healthy dog care is every owner's responsibility. Whether it is nutrition, vaccinations, regular grooming, exercise, training, genetics, or love, your dog is YOUR responsibility.

Breeders can steer you in the right direction, but they can't do it all for you.

This booklet gives some basics on what Gryphon Bouviers considers healthy dog care. It is not intended to replace your Veterinarian, but it gives you a feeling on what we consider the minimum care to be.

Nutrition

Food and water are the two most elementary items in any living animal's life. Without both, it will die.

From food, your Bouvier will receive the necessary energy and nutrients to grow, maintain a healthy and active life, to fight infections, and to prepare to reproduce (for Bouviers that are appropriate for breeding). From water, your Bouvier will get the molecule that allows the body to pass its wastes through the kidneys (besides being over 70% of the body's composition).

It is very important to understand there is a fine balance in both the quantity and quality of the foodstuffs and nutrients consumed. Both undernutrition and overnutrition can adversely effect your Bouviers growth and maintained life, and it WILL impact the adult dog's ultimate health and well-being.

Nutritional needs for puppies, adults, seniors, and pregnant or lactating bitches are different. Consult your Veterinarian and your Breeder for their recommendations.

Vaccinations

We are lucky that we live in a generation where some devastating diseases can easily be prevented by proper vaccinations. Diseases such as Parvo, Distemper, Rabies, and Hepatitis - which have an extreme mortality rate (almost always fatal in the case of Rabies) - can be prevented by periodic vaccinations and boosters to your dog. Some of the diseases (specifically Leptospirosis and Rabies) can cross species, and can infect and are dangerous to humans.

With all vaccinations, consult with your Vet to determine what they feel is

correct for your dog in your area. Recently, some leading Veterinary Medicine Teaching Universities have come out with specific guidelines for vaccination schedules, intended to guide a line between necessary immune protection and the potential for adverse affects from overvaccination. Colorado State University (www.cvmb.colostate.edu/vth/savp2.html) has put forth a very good effort at balancing this line - and both you and your Vet should take some time to inform yourselves on its content. There is a very thorough listing of reference work to guide the uninitiated.

Rabies vaccinations are required by Regulations in all 50 States in the US. To move your animal from state to state, or across country borders may require a Certificate which documents that your dog has been properly immunized. Many areas require Rabies Tags which confirm that a dog has been vaccinated and registered. Please confer with your Vet on your State's requirements for Rabies vaccinations, and at what ages to admister them. Some states have three year terms on revaccination of adults, some states have one year terms on revaccination of adults - check with your Vet to be sure.

Other commonly vaccinated diseases are Parvo virus, Distemper, Canine Hepatitis, Carona virus, and Kennel Cough (Bortadella). There currently is no vaccine for Canine Brucellosis or Canine Herpes. Vaccines are not effective/available for heartworms, or other intentinal parasites - these must be prevented and/or treated by medications.

Overvaccination is becoming a very significant concern within the veterinary community. Consult with your Veterinarian to discuss the issues, but DO NOT just stop vaccinating your dogs.

Health, Genetics, and Heridity

Common advice is “go to a breeder with a proven record and good reputation”. What is a “*good reputation*”???

Is it success producing pretty dogs which win in the show ring? Is it mating “Dick” and “Jane” to produce family pets? Is it commercial success where you are the “main show in town”?

It is our opinion that a good reputation involves *honesty* and *integrity*, both in health and structure/temperament. These come from a solid foundation in bloodlines, and the firm understanding of GENETICS.

Overall, the Bouvier is considered a fairly healthy breed. But there are problems out there to which Breeders AND Owners need to pay attention. Many inheritable diseases can be minimized by planned breeding of animals which have been tested and evaluated for those known conditions. The underlying genetics needs to be understood and considered.

As a potential Bouvier Owner, YOU must educate yourself on the various conditions which can effect the Bouvier, and YOU must insist that Breeders evaluate their breeding stock. Several of the Regional BdF Clubs have established ethical guidelines to identify reputable breeders. The ABdFC has established criteria for it's Futurity Program at the Nationals which include

required Health Testing, and has recommendations in the ABdFC Code of Ethics for Health Testing of breeding animals.

• What to Do.... What to Do..... ?

The popularity of the Bouvier is increasing. The incidences of some health conditions are getting more “press”, both on the Internet and within various media. What is a Bouvier Owner or Breeder to do?

Well, the simple (*but correct*) answer is to understand those conditions, and develop a sound genetic plan to minimize those conditions. The incorrect (*but sometimes increasingly heard*) answer is to say that “We don't have that problem”.....

Burying your head in the sand will not make the conditions go away. Health Testing of Bouviers (OFA, CERF, PennHip, et.al.) is an absolute necessity, taking the bloodline information on these results (siblings, parents/ancestors, all progeny) into account, and figuring out how to adjust potential breeding plans.

To say the “sky is falling” is not true. To say that “there are no problems” is also not being honest. The genetic health of the Bouvier is somewhere in between. In general, the Bouvier is considered to be a “healthy” breed.

Several years ago (in 1994), the American Bouvier des Flandres Club (ABdFC) endeavored to survey the membership find the prevalence of specific genetic conditions in the Breed. This data was compiled by Judy Abramsohn, and published in the December 1994 issue of the ABdFC's Dirty Beards Magazine. It was not designed to be a scientific study to obtain percentage incidences within the breed, rather than to give some direction of what the “hot buttons” might be.

More recently (in 1996), the ABdFC again endeavored to survey the Bouvier Community, this time attempting to perform a scientific study to determine actual incidence rates within the Bouvier community. The results of the ABdFC Genetic Health Survey were published for the National Meeting in 1996, and have been posted on the ABdFC's Internet WebSite (www.Bouvier.org).

The following sections are not meant to replace any consultations which you should have with your Vet. They are presented to give a quick summary of potential genetic health conditions and information on what those conditions are and how they can be handled.

• Hips and Elbows

In recent years, more attention has probably been given to dysplasia of the hips than to any other disease. Recently, more focus on elbow dysplasia in Bouviers is being noticed, as more breeding stock is being tested. Simply put, dysplasia of the hips or elbows is the abnormal formation of the joint structure. Both hips and Elbows are being certified by the Orthopedic Foundation for Animals (www.offa.org), and a new methodology for rating hips has been introduced by PennHip (www.vet.upenn.edu/pennhip).

It is unfortunate that some Breeders and Owners have the view that if a dog can move well enough to move/win in the Show Ring or at Herding Trials, then the hips and elbows are obviously acceptable. Hips and elbows don't always

show pain or poor movement until later in life, and some dogs develop compensatory structures around the joint that allow acceptable movement long-term.

Dysplasia is considered to be a genetic condition, and the OFA has taken great pains to demonstrate the betterment of the statistics over the years by taking Hip Ratings into account whenever breeding animals. Recent data from other scientific sources also highlights increased risks on large/giant breeds from environmental factors relating to growth rates and weight. Some groups push the positive effects of Vitamin C, but there is no conclusive scientific evidence to support that claim.

Hips and elbows should be tested to the proper protocols (OFA, PennHip, OVC in Canada) in any dog that is going to be used in a breeding program. Furthermore, information may be valuable from also testing all littermates of breeding stock, even though they are not intended for breeding.

Joint diseases have been treated with a variety of products, and recently a promising anti-inflammatory (NSAID) was approved for use in canines. Rimadyl is a oral drug produced by Pfizer, and has shown excellent clinical efficacy against the pain and joint inflammation commonly seen with dysplasia and other arthritic joint symptoms (consult with your Vet on use, as *all* NSAID's have potential for adverse health effects). Other approaches to joint pain/inflammation (enteric coated aspirin, glucosamines, MSM, Vitamin C, other diet changes) have had variable success, but may be worthwhile.

• Thyroid

Thyroid diseases are categorized into two general types - overactive thyroid glands (*hyper*thyroidism) and underactive thyroid glands (*hypo*thyroidism). Clinical hypothyroidism is found much more prevalently, and is a real concern in Bouviers.

Thyroid disease is categorized into two broad types for clinical hypothyroidism, one being Autoimmune Thyroiditis (Hashimoto's Disease), the other being Idiopathic Hypothyroidism (literally, "idiopathic" means "cannot be attributable to other causes"). Both exhibit similar affects on T4 (thyroxine) and T3 (triiodothyronine) concentrations, and to most extents on TSH (thyroid stimulating hormone) values. In clinical hypothyroidism, levels of T4 and T3 are depressed, while TSH values are generally elevated in an attempt to stimulate the production of more T4 and compensate for low existing serum levels. Autoimmune Thyroiditis is characterized by the existence of Thyroglobulin Auto-Antibodies (TgAA for short).

Although onset may be variable in age, hypothyroidism is most commonly seen between 4 and 10 years old in canines. Deficiencies in thyroid hormones affect the function of ALL organ systems, and as a result may be seen as very diffuse clinical signs - many of the signs are directly related to the slowing of the animal's metabolism from low thyroid hormones.

Overall, you may see some changes in mental acuity, lethargy, intolerance of exercise, and/or weight gain without any corresponding increase in food

intake/appetite. With the decreases in metabolism, the dog may have some difficulty maintaining normal body temperature, consequently seeking "warm" places to put themselves. Changes in the skin and coat are very common, and one of the most telltale signs of clinical hypothyroidism, as dry skin and dull coat are common dermatologic effects of the changes in cellular metabolism. Thickening of the skin, hair thinning (or on the extreme case, alopecia) can be symptoms of more involved hypothyroidism.

Hypothyroidism is considered to be a genetic condition, and the OFA (www.offa.org) has recently instituted a Thyroid Registry to certify acceptable dogs. Specific testing protocols are offered by both the OFA and Michigan State University for thyroid function testing.

There have also been hypotheses forwarded by Dr. Jean Dodd and others which suggest that secondary hypothyroidism is a byproduct of over-vaccination and other immune system "insults". The data on these hypotheses are scientifically inconclusive, though.

Stress is also known to precipitate endocrine changes, including thyroid function changes.

Hypothyroidism is treated by the administration of oral doses of thyroxine (trade name is Soloxine), which is calculated at the dog's body weight and level of deficiency. Although some people have felt that the 'old' glandular derived thyroid pills worked better (presumably from the mixed dosage of both T4/T3), care should be taken with your Vet, as there is significant variability in drug levels and absorption of the product in the glandular derived medications. Thyroxine is the current Veterinary treatment of choice. Retesting at periodic intervals is recommended by most Vets, as thyroid function may change over time.

• Sub-Aortic Stenosis

Sub aortic stenosis is a heart condition where fibrous lesions appear on the ascending aorta/left ventricular septum anatomy of the heart. The more severe the lesion, the more restricted is the bloodflow from the heart out through the aorta, with the potential for cardiac failure in severe cases. This may be picked up either by a vet during a cardiac exam where a heart murmur is detected and confirmed (*not all heart murmurs are SAS, though*), or if a dog is suspected of cardiac problems from behavior (exercise intolerance, fainting, congestive heart failure) and then confirmed by a cardiac exam.

SAS can be so mild as to be asymptomatic (no apparent outward symptoms), or so involved that the dog may suddenly die (sometimes attributed to "heart attacks"). SAS is known to exist in Bouviers, but actual incidence levels is not well known as attention has only been focused on the condition in the last few years.

SAS has been shown to be a genetic condition on studies of Newfoundlands and Golden Retrievers, and the inheritance mode has been shown to be dominant with variable expression (possibly polygenic) in those high-risk breeds. Scientific studies are ongoing, with several Veterinary Colleges working with

Goldens and Newfoundlands in an attempt to obtain a DNA test for this condition.

Treatment of SAS has been frustrating. Mild cases are generally left untreated, as affected dogs are usually asymptomatic. Moderate to severe cases have been treated with medicines aimed at decreasing clinical symptoms (such as congestive heart failure), but those medicines do not affect the underlying condition. Clinical studies have been ongoing to determine whether surgical intervention (balloon angioplasty) are beneficial, but results are not conclusive at this time.

SAS is a potentially severe, debilitating condition for the dog, and a saddening situation for the family. It is the responsibility of all breeders to check their bloodlines, and ethically breed to remove the condition from the breed. Understanding the genetics of the condition is important -- *two OFA Certified parents can produce affected progeny on account of the parents' genetic carrier status.*

• Eye Conditions

Several eye conditions exist in Bouviers, all with relatively low incidences if CERF data is to be considered reliable.

Glaucoma is the increased intra-ocular pressure within the eyeball. The increased pressure destroys tissues within the eye, particularly the retina and optic nerve. Complete or partial vision loss is the eventual outcome, which may occur gradually or with a sudden onset. The eyeball will often be enlarged and bulging, and the cornea will be hazy and lack transparency. Glaucoma may be primary (congenital) or secondary (caused by other eye damage). Glaucoma is a serious situation which needs Veterinary medical or surgical attention to relieve the pressure within the eyeball. Most cases of Glaucoma end in blindness, although temporary alleviation of symptoms is possible. It is not clear whether primary Glaucoma is a genetic trait or not, although it is suspected to be familial/hereditary.

PRA (Progressive Retinal Atrophy) is a genetic condition where the vision cells of the retina gradually degenerate, leading from partial loss of sight to eventual blindness. Onset of the disease is variable, and is progressive over the animal's lifetime. Initial signs are impairment of night vision. There is no treatment for this disease. Some breeds now test by ERG early in life to determine early stages of PRA.

Cataracts are any opacity in the lens of the eye. Cataracts present a varying degree of vision loss, depending on the amount of lens impacted and the position on the lens. Primary cataracts are considered genetic, while secondary cataracts (caused by eye trauma) are generally environmental. It is important to consult a Ophthalmologic Veterinary Specialist to determine the type of cataract which may be present, so as to know whether your dog is a genetic carrier.

Entropion and **Ectropion** are conditions of the eyelid. Entropion is the inversion of the eyelid in towards the eyeball, while ectropion is the eversion of the eyelid away from the eyeball. Ectropion is not likely to be painful, whereas

entropion is very often painful because the eyelashes contact the eyeball. Both can be surgically repaired, and both conditions may be genetic or may be secondary from injury/allergies. Despite the relative common occurrence in many breeds of dogs (and existence within in the Bouvier) the genetic inheritance mode is unclear.

CERF (the Canine Eye Registration Foundation) has set forth certification criteria for acceptable eyes (similar to how OFA has set forth criteria for other conditions). Exams must be performed by a Board Certified Ophthalmic Veterinarian. Initial certification is for a one year period, and re-examination (and recertification) is required on a periodic basis.

• Bloat

Bloat (technically known as "acute gastric dilation-torsion"), is an extremely dangerous condition which can kill a dog before the owner may know what is happening. Bloat is the swelling of the stomach, with rotation to cut off blood flow and to prevent evacuation of the contents. Bloat is a life threatening medical emergency.

Dogs suffering from bloat appear extremely restless, will probably be salivating and drooling, and may unsuccessfully attempt to vomit (to clear the stomach). The abdomen is severely distended, and tapping gently on it will produce a "drum-like" thump. A dog can quickly go into shock, and the condition may be fatal if not treated as a medical emergency. Time is of the absolute essence, and obtaining emergency Veterinary care immediately is the most important factor on the survival of the animal.

Bloat has been suspected to be a genetic condition, but studies have not been scientifically conclusive. Bloat has a clear tendency to show up in large, deep chested dogs, and is a known problem in Bouviers.

Treatment of Bloat is by immediate surgical intervention. Current surgical technique decompresses the stomach, repositions it in the abdominal cavity, and may surgically-staple the stomach to prevent further torsion of the stomach and intestines.

Prevention of Bloat is a common practice among owners of large chested breeds. Scientific studies are ongoing, and knowledge of how to prevent bloat is advancing. Some suggestions and measures to reduce the risk of bloat from other large chested breeds:

- Feed two or three times daily. Be sure someone is around to observe after-feeding behavior for possible bloat symptoms.
- Restrict water intake after the feeding. Water should be available at all times to the dog in general, except immediately after the meal.
- Restrict vigorous exercise and excitement after the meal. Period of quiet should be about one hour to two hours after. Walking appears to not present a risk, and may help normal digestion.
- Feeding with elevated dishes does not appear to help, and may actually increase risks of bloat (thought to be from faster eating habits).

• Epilepsy

Epilepsy is a functional disease of the brain characterized by recurring periodic seizures or convulsions. These neurologic disorders present themselves with unusual brain electro-physiology, and can be caused by a number of factors, both environmental and genetic.

Environmental sources can be such as head trauma, viral/bacterial/fungal infections, brain tumors, chemical intoxication (i.e. pesticides, lead, strychnine, and other toxic chemicals), or various bodily endocrine or physiologic states (e.g. hypocalcemia, certain vitamin or severe thyroid deficiencies, severe low blood sugar, hyperthermia).

Where no apparent cause for the seizures or convulsions are evident, the condition is called “idiopathic epilepsy”, which should be a significant concern for Breeders.

Idiopathic Epilepsy has been shown to have a strong genetic component in some canine breeds, and some forms of the condition have been shown to be inherited. The mode of inheritance is not yet well understood, but there are strong indications that it is recessive with incomplete penetrance with some sex-limited involvement.

Treatment of Epilepsy follows two tracks. One is to determine whether there is an environmental factor which may be contributing to the symptoms, and then attempting to alleviate those factors. The second is to administer anti-epileptic drugs in an attempt to alleviate or lessen the seizures/convulsions. Success in the first endeavor may be frustrating, and you need to carefully consult in detail with your Vet. Commonly administered drugs include phenobarbital, phenytoin, and primidone, giving the drugs either singularly or in combination.

However, in severe cases, the dog may suffer from convulsions/seizures so involved and continuous (and where medication is minimally effective) that coma or death may result. In unresolvable cases such as these, euthanasia may be the kind and appropriate choice for the animal.

• Adrenal Gland Dysfunction

Adrenal Gland dysfunction falls into two types - overactive adrenal glands (*hyper*adrenocorticism - Cushing’s Disease) and underactive adrenal glands (*hypo*adrenocorticism - Addison’s Disease). Both involve the production of the adrenal hormone - cortisol - one being over production (Cushing’s), the other being the underproduction (Addison’s).

Cushing’s Disease is a condition resulting from an excess of adrenal hormones (too much cortisol is produced). The onset may be either related to a pituitary tumor (adenoma) in the brain producing ACTH, or by idiopathic hyperactivity of the adrenal gland itself. This condition results in a spectrum of functional problems, among those being hair loss and skin lesions (thinning, pigmentation, cutaneous calcium deposition), muscle wasting and/or atrophy, and gradual abdominal enlargement. The disease is insidious, and left untreated may grow progressively worse until systemic shock and death occur.

Addison’s Disease is a condition resulting from a deficiency of adrenal hormones (not enough cortisol is produced). The onset of this disease can result from damage to the adrenal glands by infection, cancerous or non-cancerous tumors, drugs, pituitary gland disease or from unknown causes. This condition can result in impaired heart and kidney function, damage to the muscle, reduction in circulating blood volume, and faulty sugar and fat metabolism.

Both diseases are diagnosed with definitive adrenal-function testing which shows the differences that are possible among the causes of the syndromes. You need to consult in detail with your Vet to have the correct diagnostic laboratory assays performed.

General long-term treatment of Addison’s disease involves the administration of fludrocortisone acetate (a corticosteroid). In severe cases, an adrenal crisis is an acute medical emergency and requires prompt Veterinary care to stabilize the dog, and prevent shock and imminent death.

Dogs with laboratory confirmed Cushing’s disease are treated either surgically or medically depending on the cause. Surgery is indicated in the event of a tumor, to remove the affected gland. Medical drug treatment is indicated in simple idiopathic hyperactivity of the adrenal gland. In both cases, the animal should be monitored in the event that treatment for Cushing’s disease induces a low cortisol level which would need to be treated as in Addison’s disease.

• Cancer

Cancer can be a horrible disease. It can devastate the daily life of both the animal and your household.

Cancer is one of the terms given to classes of tumors that are characterized by uncontrolled cellular growth. “Tumor” is the general term for atypical cellular growth, where a mass of cells grow into/displace other cells and organs in the body. Tumors are categorized into two types - benign (basically harmless) and malignant (cancerous).

What is Cancer? -- Cancer is a group of more than 100 different, discreet diseases, each type of cancer being physically and biochemically different than other types in how the cells activate and behave. All organs of the body are made up of cells, and normally cells divide to produce more cells only when the body needs them. Cancer occurs when cells become abnormal and keep dividing and forming more cells without control or order. If cells divide when new ones are not needed, they form a mass of excess tissue, called a tumor. The cells in malignant tumors can invade and damage nearby tissues and organs. Cancer cells can also break away from a malignant tumor and travel through the bloodstream or the lymphatic system to form new tumors in other parts of the body. The spread of cancer is called metastasis.

How is Cancer Diagnosed? -- Cancer is diagnosed by physical examination, radiographs (simple X-ray images, CT Scans, or MRI Scans), and tissue samples. The only sure way of confirming cancer is by taking a sample of the suspected tissue (called a “biopsy”), and having it checked by a Pathologist. Samples of tissues may be obtained either by surgical removal of the complete mass or by

limited biopsy of selected portions of tissue by needles or small surgical incisions.

How is Cancer Treated? -- Cancer can be treated with surgery, radiation therapy, chemotherapy, hormone therapy, or biologic therapy. The Veterinarian may use one method or a combination of methods. The choice of treatment depends on the type and location of the cancer, whether the disease has spread, the dog's age and general health, and other factors.

Radiation and chemotherapy has shown only limited successes against limited types of cancers in canines, but clinical trials are a constant ongoing process at Veterinary Colleges. Consult with your Veterinarian on the decisions that need to be made regarding the treatment of cancer in your dog. In more complex cases, it is likely that you will be referred to one of the Veterinary Teaching Colleges for a more specialized consultation with a Veterinary Oncologist.

Is Cancer Genetic? -- Most of the science on whether cancer is genetic or environmental is in the human cancer "model" at the current time. Studies noted in the book The Genetics of the Dog by Malcolm B. Willis clearly indicate an inheritable predisposition exists in dogs, but it stops short of putting a genetic "tag" to which breeders must pay attention.

In the human study of cancer, there are some cancers where there appear to have a very strong viral component in the development of the disease. Also in the human study of cancer, there are an increasing number of cancers which appear to have a very strong genetic-risk component in family lines. On the research upside: a number of human malignancy types are starting to "give up" the molecular basis of their cancer, and are being better understood down to the metabolic pathways and DNA coding.

The Human Genome Project and the Canine Genome Project are giving some very promising information about the genetic issues of cancer, and only time will tell how quickly and how reasonably genetic approaches to cancer therapy may become. Limited molecular biologic studies are being done on canine cancer at this time - most molecular cancer research is either mouse models or human cell line models. It is unclear whether this will change in the near future, but it is promising that information obtained from the molecular study of cancer in humans may be relevant within the canine species.

Prevalence of Cancer in Dogs? -- Different classes of cancers have differing incidences and separate survival rates and life expectancies. If you find that your Bouvier has cancer, you should confer with your Vet to find the best information and course of treatment for that particular cancer.

-- Mammary tumors are the most prevalent cancerous condition in dogs, accounting for up to ~50% of tumors found in females (reference Merck Veterinary Manual and The Genetics of the Dog). Data clearly indicates that early spay (ovariectomy) reduces the risks to significantly lower levels if the bitch is spayed before sexual maturity (spay prior to first estrus reduces the risk to 0.5% of the risk of intact bitches, while spay after one estrus reduces the risk to 8% of the risk with intact bitches, those spayed after sexual maturity showed no change in risk relative to intact bitches).

-- Bone tumors also present a very large number of cases yearly, with the majority being in large and giant breeds. Several types of bone malignancies, especially osteosarcomas, are quite prevalent and must be treated as soon as possible. Some new advances in chemotherapy and radiation therapy appear to have some promise. Metastasis is common in bone tumors if treated by amputation alone.

-- Canine Lymphoma is one of the most prevalent cancerous conditions in dogs as a whole, affecting all breeds, males and females. It is a malignancy that affects the lymph system, and is progressive, generally being considered as treatable but not curable. Treatment is generally with chemotherapy.

References

TheseReferences are a starting point if you wish to obtain further information. Books and Internet listings are continually being updated, as scientific study and knowledge are always advancing.....

- OFA -- <http://www.offa.org> (*note the double "ff"*)
- PennHip -- <http://www.vet.upenn.edu/pennhip>
- CERF -- <http://www.vet.purdue.edu/~yshen/cerf.html>

- Colorado U. Vaccination Info -- www.cvmb.colostate.edu/vth/savp2.html
- Purdue U. Bloat Info -- <http://www.vet.purdue.edu/epi/bloat.htm>
- U. Penn. Veterinary Cancer Info -- http://oncolink.upenn.edu/specialty/vet_onc/

- ABdFC -- <http://www.bouvier.org>
- SoCal BdF Club -- <http://scbdfc.com/>
- NorCal BdF Club -- <http://www.bcnc.cc/home.html>
- Cascade BdF Club -- <http://dhart.com/cbdfc/>

- Genetics of the Dog, by Malcolm B. Willis, published by Howell Book House. The basic text of Canine Genetics. A book related to understand the overview of genetics, and to obtain a general view of conditions and diseases in dogs.
- Breeding Better Dogs, by Carmelo L. Battaglia, PhD, published by BEI Publishing. A well thought out book, giving much of the information contained in his seminars. Highly recommended for its practical approach to breeding dogs based on realistic genetic principles.
- GENETICS - a Molecular Approach, by T.A. Brown, PhD, published by Chapman & Hall. An excellent, detailed textbook which gives the molecular approach to teaching genetics. It is quite technical, and assumes a moderate amount of understanding of biochemistry. For those who have sufficient background, it is an excellent reference.
- The Path to the Double Helix, by R. Olby, published by McMillan. A good summary of the developments in genetics during the 20th Century, charting the history of genetics and molecular biology.
- "How cells divide", by D. Mazia (an article in Scientific American, vol 205(3), pp 100-120, 1961) and "The cell cycle", by D. Mazia (an article in Scientific American, vol 230(1), pp 54-64, 1974). Two very good review articles which describe the cellular events and mechanisms surrounding the cell reproductive cycle of mitosis and meiosis. Basic reading which you should have.