

## INDEX OF HEREDITARY DISEASES OF PUREBRED DOGS WITH SPECIAL REFERENCE TO SURGICAL AFFECTIONS

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### SUMMARY

This work covers 146 purebred dogs and lists 365 different hereditary diseases of dogs with their definitions. This work is done in the form of a computer program divided into two parts. Part one focused on stating hereditary diseases for each dog breed whereas part two focused on listing the hereditary diseases. In part one, the page for each breed displays the breed name with other common name(s) if present, the weight, the list and the total number of the hereditary diseases for each breed. Diseases with surgical importance are highlighted. In part two, all hereditary diseases are listed alphabetically and are divided into 20 groups, based mainly on the body system and miscellaneous affections, each group is color coded. The definition of each disease is provided. The full software of this work is provided in the form of a compact disc (CD).

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### INTRODUCTION

The dog has been with man kind for thousands of years. As a matter of fact this animal was a part of the first cultural changes in history (Wikipedia, 2007 and Jimmy, 2005). Thanks to it, man was able to hunt in a more organized and efficient way. Later on the dog helped with the development of herding which led to stockbreeding. Although it is not certain when dogs and humans started interacting, historians believe it was during the creation of the first settlements. In prehistoric Egypt, long before the rise of the first Dynasty, humans and dogs lived and hunted together in the Nile Valley. In June 2000, cave drawings were discovered near the Ain Sokhna Road, about 40 Km south-east of Cairo, by George Cunningham. There were several levels of civilization in the cave, but the earliest drawings, according to Egyptian

scholars from the Supreme Council of Antiquities, date to approximately 7000 B.C.; they clearly show men and women, armed with bows, hunting alongside domesticated dogs (Jimmy, 2005).

Inbreeding is the main cause of flourishing of hereditary and congenital diseases. Dogs are being bred without considering the sire/dam relationship. Fear that dogs can catch sexually transmissible diseases (STD) encouraged dog-owners to inbreed their dogs overlooking the high risks of having puppies with hereditary diseases and congenital anomalies (Alex, et al, 2005; Meyers-Wallen, 1999 and Meyers-Wallen and Patterson 1989).

Dogs are raised to perform different tasks being a police dog, watch-dog or a companion dog. The increased number of raised dogs comes with an increased number of hereditary diseases affecting these dogs (Holmes and Binns, 1993, Curtis, et al, 1991, and Wilcock, 1990).

The aim of this research was directed towards achieving three goals; the first is to collect and group the existing hereditary diseases found in purebred dogs. The second is raising the awareness and attention of dog-owners and veterinarians to the danger of the hereditary diseases and subsequently reduce the incidence of inherited disorders in dogs. The third is providing an easy tool for all those interested in raising dogs to get more acquainted with the breed(s) they have and what are the possible

diseases that can affect those breeds. Further work on this research will be conducted in order to include symptoms and possible method of treatment for each disease where applicable.

## **MATERIAL AND METHODS**

Data were collected from textbooks and from published papers on the internet. A total of 146 purebred dogs and 365 hereditary diseases were included in this research. This work was divided into two parts. Part one focused on stating hereditary diseases for each dog breed –navigation by breed-whereas part two focused on grouping the hereditary diseases -navigation by disease-.

In part one, dog breeds were sorted and gathered alphabetically. Navigation is possible through 2 different choices. The first is to navigate by clicking on one of the alphabet-letters. All breed names starting with this letter are listed with their corresponding images (Fig 1). Choosing a breed by clicking on its name or image will display a page listing all the hereditary diseases of the selected breed (Fig 2). Passing with the computer-mouse over any listed disease will provide the user with a brief hint about that disease. Help button was included to explain the way this program works and how to interact with its

buttons. The second way of navigation is through "next/previous arrows" for those interested in reviewing all breeds sequentially. This will allow the users to move page by page. Hereditary diseases were color-coded according to the body system affected in order to facilitate the recognition of the affections of each body system. The weight category of each breed was mentioned. Little details on surgical treatment were provided wherever possible.

In part two, an index for all listed diseases was included. This disease index was organized in two ways. The first, diseases were sorted alphabetically. Choosing a letter of alphabet will result in displaying all hereditary diseases starting with the selected letter. The second, diseases were categorized according to the body system affected. Diseases were divided into 20 categories. The Definition of each disease was also provided.

The computer program was designed using *Macromedia Director*<sup>®</sup> program version 10 and to run under *MS-Windows*<sup>®</sup> with a minimum screen resolution of 1024x768. The same program can be adapted easily to run from the internet in the form of *Shockwave* application to expand the benefit of its usage.

## RESULTS

All purebred dogs were grouped alphabetically into 22 groups. The breed name and the number of breeds in each group is shown in table (1). The total number of hereditary diseases affecting different body system for 146 purebred dogs was 365. Diseases were divided into 20 different group based mainly on the affected body system and miscellaneous groups. These groups were sorted according to the number of diseases within each group as shown in table (2). The total number of hereditary diseases affecting any certain breed was displayed at the breed-page as shown in Fig (3). Information about the breed size was also provided on the breed page. Breeds were classified according to body size into: small (<10 Kg), medium (10-25 Kg), Large (26-40 Kg) and Giant (>40Kg) as shown in Fig (4). Hereditary diseases were color coded to facilitate the correlation with the body system affected. For example, the diseases affecting the digestive system is colored green, those of the vascular system are red, the immune system diseases are white and the miscellaneous diseases group are black (Fig 3). The disease index listed all the diseases in two ways, alphabetically and also by category (Fig 5).

Select a breed by clicking on the breed image or name.

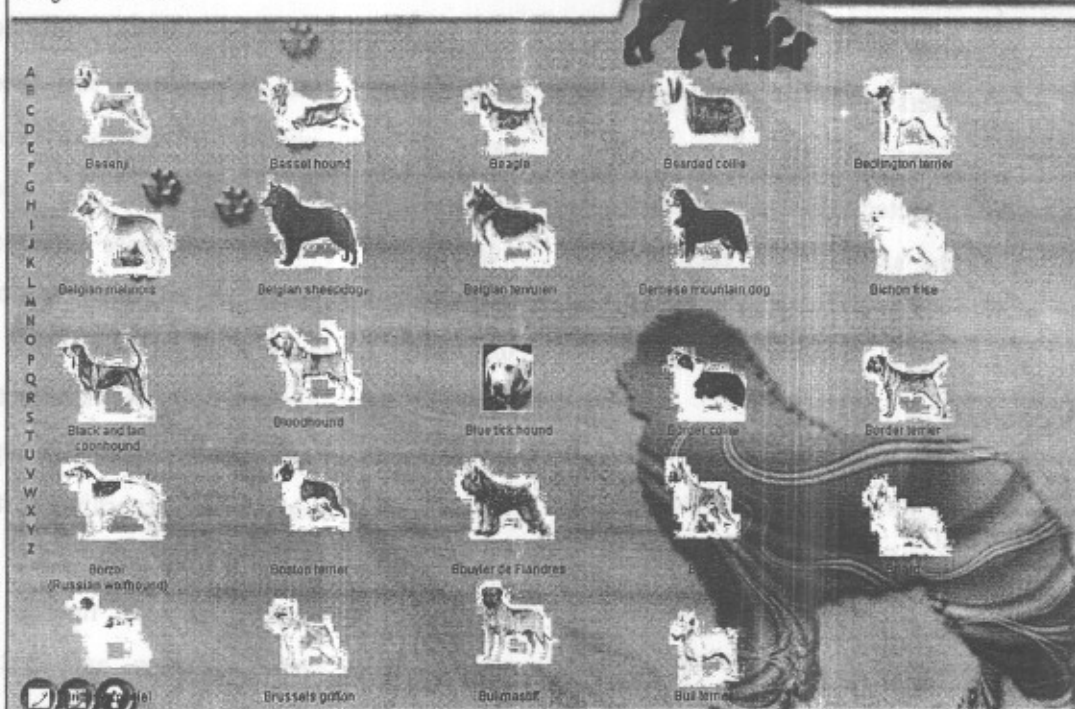


Fig (1): Dog breeds are listed in alphabetical order. This page displays all dog breeds beginning with the letter B.

## German shepherd

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P  
Q  
R  
S  
T  
U  
V  
W  
X  
Y  
Z

**Cataract**

**Cleft lip**  
**Cleft palate**  
**Coloboma**  
**Corneal dystrophy**

**Entropion**

**Epilepsy**  
**Exophthalmic acromegaly**  
**Eversion of nictitating membrane**  
**Factor VIII deficiency (Hemophilia A)**  
**Factor IX deficiency (Hemophilia B)**

**Gastric torsion**  
**Hemangiosarcoma**  
**Hypertyrosinism**

**Lens luxation**

**Lysosomal storage diseases**  
**Malabsorption syndrome**

**Optic nerve hypoplasia**

**Osteosarcoma**  
**Otitis externa**  
**Pancreatic insufficiency**  
**Pannus**  
**Patent ductus arteriosus**

**Persistent right aortic arch**  
**Pharyngeal diverticulum**  
**Progressive retinal atrophy**  
**Ratinal dysplasia**  
**Subaortic stenosis**  
**Thyroiditis**  
**Ulcerative colitis**  
**Von Willebrand's disease**

20-40 kg

- Hematopoietic System
- Integumentary System
- Reproductive System
- Musculoskeletal System
- Endocrine System
- Eye & Ear
- Genital System
- Immune System
- Lymphatic System

- Mouth & Teeth Disorders
- Muscular System
- Nervous System & Brain
- Respiratory System
- Skin & Hair Disorders
- Urinary System
- Cardiovascular System

**Total Number of Hereditary Diseases:**

# 63

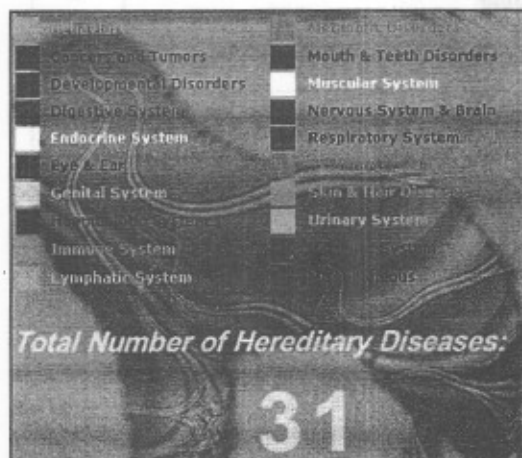
Fig (2): Breed page. Notice the color coding of different body systems affected.

**Table (1): List of the all purebred dogs arranged in alphabetical order together with the number of breeds within each group.**

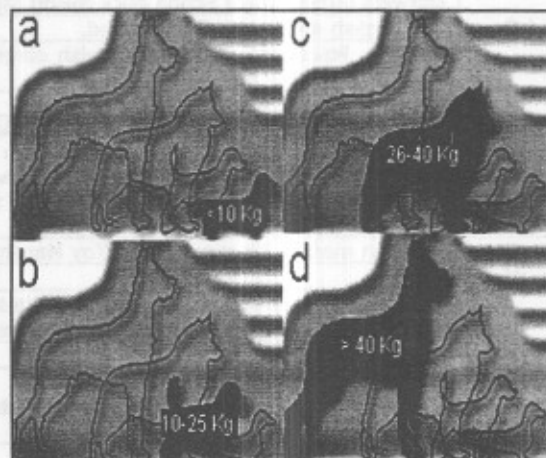
Group	Breeds names	No.
<b>A</b>	Affenpinscher, Afghan hound, Airedale terrier, Akita, Alaskan malamute, American cocker spaniel, American foxhound, American Staffordshire terrier, American water spaniel, Antarctic husky, Australian cattle dog (Australian blue heeler), Australian kelpie, Australian shepherd, Australian terrier.	13
<b>B</b>	Basenji, Basset hound, Beagle, Bearded collie, Bedlington terrier, Belgian malinois, Belgian sheepdog, Belgian tervuren, Bernese mountain dog, Bichon fries, Black and tan coonhound, Bloodhound, Blue tick hound, Border collie, Border terrier, Borzoi (Russian wolfhound), Boston terrier, Bouvier de Flandres, Boxer, Briard, Brittany spaniel, Brussels griffon, Bullmastiff, Bull terrier.	24
<b>C</b>	Cairn terrier, Cardigan Welsh corgi, Cavalier King Charles spaniel, Chesapeake Bay retriever, Chihuahua, Chinese shar pei, Chow chow, Clumber spaniel, Collie, Curly-coated retriever.	10
<b>D</b>	Dalmatian, Dandie Dinmont terrier, Doberman pinscher.	3
<b>E</b>	English bulldog, English cocker spaniel, English foxhound, English setter, English springer spaniel, English toy spaniel (King Charles and Ruby Blenheim spaniels).	6
<b>F</b>	Field spaniel, Finnish spitz, Flat-coated retriever, French bulldog.	4
<b>G</b>	German shepherd, German short-haired pointer, German wire-haired pointer, Giant schnauzer, Golden retriever, Gordon setter, Great Dane, Great Pyrenees, Greyhound.	9
<b>H</b>	Harrier, Havanese.	2
<b>I</b>	Ibizan hound, Irish setter, Irish terrier, Irish water spaniel, Irish wolfhound, Italian greyhound.	6
<b>J</b>	Jack Russell terrier, Japanese spaniel (Japanese chin).	2
<b>K</b>	Keeshond, Kerry blue terrier, Komondor, Kuvasz.	4
<b>L</b>	Labrador retriever, Lakeland terrier, Lhasa Apso.	3
<b>M</b>	Maltese, Mastiff, Miniature bull terrier, Miniature dachshund, Miniature pinscher, Miniature poodle, Miniature schnauzer.	7
<b>N</b>	Neapolitan mastiff, Newfoundland, Norwegian dunkerhound, Norwegian elkhound, Norwich terrier, Nova Scotia duck tolling retriever	6
<b>O</b>	Old English sheepdog, Otter hound.	2
<b>P</b>	Papillon, Pekingese, Pembroke Welsh corgi, Pharaoh hound, Pointer, Pomeranian, Portuguese water dog, Pug, Pull.	9
<b>R</b>	Rhodesian ridgeback, Rottweiler.	2
<b>S</b>	Saint Bernard, Saluki, Samoyed, Schipperke, Scottish deerhound, Scottish terrier, Sealyham terrier, Shetland sheepdog, Shih Tzu, Siberian husky, Silky terrier, Skye terrier, Smooth fox terrier, Soft-coated Wheaten terrier, Spinoni Italiani, Standard dachshund, Standard Manchester terrier, Standard poodle, Standard schnauzer, Sussex spaniel, Swiss mountain dog.	21
<b>T</b>	Tibetan mastiff, Tibetan terrier, Toy Manchester terrier, Toy poodle.	4
<b>V</b>	Vizsla	1
<b>W</b>	Weimaraner, Welsh springer spaniel, Welsh terrier, West Highland white terrier, Whippet, Wire-haired fox terrier, Wire-haired pointing griffon.	7
<b>Y</b>	Yorkshire terrier	1
<b>Total number of purebred dogs</b>		<b>(146)</b>

**Table (2): List of the diseases' groups and the number of diseases within each group in a descending order**

Disease group	No. of affections
01- Skin & Hair Diseases	63
02- Eye & Ear Problems	48
03- Skeletal System	47
04- Nervous System	30
05- Digestive Problems	20
06- Haemobiotic Disorders	20
07- Vascular Diseases	19
08- Miscellaneous	16
09- Cancers and Tumors	14
10- Immune System	14
11- Urinary Tract Problems	13
12- Genital system	11
13- Muscular Diseases	10
14- Metabolic Disorders	9
15- Mouth and Teeth	9
16- Respiratory Problems	8
17- Endocrine System	7
18- Developmental	3
19- Behavioral Issues	2
20- Lymphatic System	2
<b>Total Number of Hereditary Diseases</b>	<b>(365)</b>



**Fig 3: total number of hereditary diseases displayed at the breed-page.**



**Fig 4: Breeds classified according to body size into a: small (<10 Kg), b: medium (10-25 Kg), c: Large (26-40 Kg) and d: Giant (>40Kg).**

<p><b>Aberrant cilia:</b> eyelashes growing abnormally, such as rubbing against the eyeball (see #86)</p> <p><b>Abnormal copper metabolism:</b> (usually Bedlington terriers or Doberman pinschers) an inability to utilize and store copper properly, resulting in liver disease and other problems.</p> <p><b>Abnormal dentition:</b> abnormal placement, number and development of teeth.</p> <p><b>Acanthosis nigricans:</b> (usually dachshunds) a skin disease where the skin becomes thickened and dark, primarily affecting the ardliae (armpits).</p> <p><b>Achondroplasia:</b> abnormal development of cartilage leading to dwarfism (seen aberrantly in most breeds, but that's what makes a Bassett hound and</p>		<p>Necrotizing panitibis Oitis externa</p>	<p>Goiter Hypercholesterolemia Vitamin B12-responsive malabsorption Zinc deficiency Zinc-responsive dermatosis</p>
		<p>Genital System Diseases 11</p>	<p>Mouth and Teeth Disorders 9</p>
		<p>Cryptorchidism Cystic ovaries Dystocia Endometritis Hemaphroditism Prolapsed uterus Pyometra Sertoli cell tumor Uterine eclampsia Uterine inertia, primary Vaginal hyperplasia</p>	<p>Abnormal dentition Cleft lip Cleft palate Gingival hyperplasia Malocclusion Missing teeth Oligodentrogia Oligodontia Teeth abnormalities</p>
		<p>Vascular Diseases 19</p>	<p>Muscular Diseases 10</p>
		<p>Arteriovenous fistula Atrial septal defects Bundle branch block Bundle of His degeneration Cardiac valvular disease Cardiomyopathy Cerebral hemorrhage</p>	<p>Edema Generalized myopathy Muscular dystrophy Myasthenia gravis Necrotizing myositis</p>

Fig 5: Disease index showing alphabetically ordered list of the hereditary diseases -on the left, and group order on the right.

## DISCUSSION

Egypt is the origin of Saluki and possibly the Greyhound breeds as stated by (Wikipedia, 2007). Egyptian probably first domesticated the cat, but dogs were most likely domesticated in other parts of the world. Notably, the first domestication of dogs from wolves occurred in Persia, North America and possibly Northeast Africa. The earliest reference to dogs in Egypt comes to us from the predynastic period. Bones of domesticated dogs have been discovered dating to the fifth millennium BC in Egypt, and we find the first representation of domesticated dogs on the Moscow cup from the Badarian age (4000-4500 BC) (Jimmy, 2005).

The dog is kind of a domestic animal which has the most acceptance and popularity in our civilization, which is reflected in the constant demand and growth of all breeds in most households. Thanks to the involvement of man today there are more than four hundred recognized breeds, not to mention the innumerable crossbreeds that are somewhat accepted (Anon 1998). The dog is an excellent companion, a faithful friend who we share lots of our activities with. Its ability of adapting and connecting with our environment is remarkable, making it an indispensable member of the family. Our pets move freely around the house

(except special cases) and enjoy privileges that other company animals don't; they are taken on walks, to the park, outings and accompany their owners in many outdoor activities. The man-dog relation is very intense. In general it abides by certain behavior and living rules, imposed – and often broken – by humans. Dogs have a lot to offer and they make up for all the attention they get in thousand different ways. All you need to do is pay it a little attention. They are excellent playmates, a good solution against feeling sad, indispensable helpers and friends till the end. Besides, they watch and guard the house with all they've got; risking themselves if need be (Smith, 1994).

In the last few decades, dogs became a very important animal for Egyptian to raise. This new custom goes parallel with modern changes in the style and social life. The expansion of the new cities and living in new houses demanded the keeping of one or more dogs as watch dogs. Also the up-shifting in the life standards of many citizens led to more dogs being owned by individuals as a pet and a companion animal. Many other reasons, some of which are sentimental also aided in the increase number of dogs raised. All these reasons made it very important and useful to have the knowledge presented in this work.



In this work, all purebred dogs were grouped into 22 groups alphabetically. This excludes the letters Q, U, X, and Z as there are no dog-breeds starting with these letters.

This CD will be very helpful for the veterinarians who are dealing with such breeds specially they don't study the different breeds and its related diseases during the course of their undergraduate study. It was noticed that the knowledge of different dog's breeds and the related hereditary diseases are not collected in one reference either in a textbook, published papers or computer program. Hereditary diseases listed in this work were collected from different sources and were divided into 20 groups being: Behavioral issues (Curtis, et al, 1991), Cancers and tumors (Bryan, et al, 2006; Nakade, et al, 2006b and Holmes, 2000), Developmental disorders (Holmes, et al, 1993), Digestive system (Cotard, 1993), Endocrine system, Eye & Ear (Lin, et al, 2002; Clements, et al, 1996; Whitley, et al, 1995; Bedford, 1991; Barnett, 1988; Dodds, et al, 1981 and Wegner,1970), Genital system (Meyers-Wallen, 1999 and Meyers-Wallen and Patterson 1989), Haemobiotic system (De Meyer, et al, 2006; Nakata, 2006; Brooks, 1999; Carr, 1994; Mischke, et al, 1994; Catalfamo, et al, 1988; Fogh and Fogh 1988 and Dodds, et al, 1981), Immune system (Pedersen, 1999), Lymphatic system (Holmes, 2000), Metabolic disorders (Washizu, et al, 2000; Tachikawa and Sawamura 2000; Evans, 1989 and Patterson

1980), Mouth and teeth (Taney and Smith 2006 and Wegner,1970), Muscular system (Wilcock, 1990), Nervous system (Wilcock, 1990), Respiratory (Mike, et al, 2005 and Robinson, 1991), Skeletal system (Hutt, 1968), Skin & Hair (Peter, et al, 2005), Urinary tract (Bryan, et al, 2006; Nakade, et al, 2006 and Picut and Lewis 1987), Vascular system (Christiansen, et al, 2007, Goodrich, et al, 2007; Smith and Martin 2007; Mike, et al, 2005 and Catalfamo, et al, 1988) and a miscellaneous group (Robinson, 1991).

Using this computer program it is easy to get more statistics about breeds and hereditary diseases, for instance: the breed with the highest number of hereditary diseases was the German Shepherd with a total number of 63 hereditary diseases affecting 14 body system (Skin and hair (n=13), eye and ear (n=10), mouth (n=2), behavioral disorders (n=1), urinary (n=3), immune (n=5), skeletal (n=8), nervous (n=3), digestive (n=5), haemobiotic (n=3), metabolic (n=1), cancers (n=2), endocrine (n=3), lymphatic (n=1), and vascular (n=3)). The highest number of affections occurred in the skin and hair (n=13) while the lowest was behavioral metabolic and lymphatic (n=1 for each). The lowest number of hereditary diseases was reserved for the Harrier dog. No hereditary disease was registered so far. Similar

detailed results for all breeds were possible using the CD of this research.

Further work on this research is intended to add more information about the different hereditary diseases and the possible way of treating them wherever possible.

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