5/6/08

CHIC Program for Shetland Sheepdogs

Health problems, in general, are not common in Shelties; however, testing of breeding stock is a recommended practice to keep the incidence of certain problems as low as possible. It must be remembered that dogs are animals, not machines, and on average, every dog has 4 to 5 defective genes.[1] Congenital and/or hereditary problems will occur no matter how conscientious a breeder is. Nonetheless, breeders should strive to breed Shelties that are a combination of beautiful breed type and good health.

The Canine Health Information Center (CHIC) www.caninehealthinfo.org/chicinfo.html is a canine health database program jointly sponsored by the AKC/Canine Health Foundation (AKC/CHF) and the Orthopedic Foundation for Animals (OFA). Its purpose is to assist breeders in breeding healthy dogs and being a central resource of health information for breeders, owners, and researchers. Over 100 breed clubs participate in the program. The national club for each participating breed recommends health tests to be performed in dogs used for breeding. The number and types of tests are tailored to the needs of each breed. Dogs that have had the required tests will receive a CHIC number, and the CHIC database can be searched for dogs having CHIC numbers. Additional health tests may be recommended, but are considered optional for that breed. Normalcy is not required for participation in the CHIC program; abnormal results of any test are only released to the public with owner permission. As new tests become available, the list of required and optional tests may be altered. Participation in the CHIC program is voluntary.

Breed requirements for Shetland Sheepdogs are as listed below and on the CHIC Shetland Sheepdog web page. www.caninehealthinfo.org/brdreqs.html?breed=SS

Required tests:

- Hip dysplasia (OFA or PennHIP)
- Eye clearance (Canine Eye Registration Foundation, CERF)
- von Willebrand's Disease (VetGen, test results registered with the OFA)
- Multiple drug sensitivity (MDR1) DNA test (Washington State University, results registered with the OFA)

Optional tests:

- Autoimmune thyroiditis (OFA evaluation from an approved laboratory, test results registered with the OFA)
- Collie eye anomaly DNA test (Optigen, test results registered with the OFA)
- Elbow dysplasia (OFA)
- Congenital cardiac database (OFA evaluation by board certified cardiologist or internal medicine specialist)
- American Temperament Testing Society, TT title, (test results registered with the OFA)

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[1] **George A. Padgett, DVM, Michigan State University, Prioritizing Genetic Defects,** www.lgd.org/library/PadgettDefects.htm

Brief Explanation of the Tests

Required tests:

Hip Dysplasia Evaluation – As of March, 2008, Shetland Sheepdogs rank 129th of 150 breeds of dogs evaluated for hip dysplasia by the Orthopedic Foundation for Animals (OFA) www.offa.org. Of 16,223 Shelties evaluated, 4.8% were dysplastic. OFA certification or PennHIP evaluation of the hips (x-ray examination) is on the required list for the CHIC program because hip dysplasia can be a crippling disorder, and one affected influential dog used in breeding programs could increase the incidence in Shelties. OFA hip evaluation results are automatically included in the OFA database with no extra charge. More information can be obtained by clicking on the following link http://www.offa.org/hipgeninfo.html .

Eye Certification with the Canine Eye Registration Foundation (CERF) http://www.vmdb.org/cerf.html – Eye abnormalities can occur at any age. Ophthalmic examination can detect a variety of congenital abnormalities, including Progressive Retinal Atrophy (PRA) and Collie eye anomaly (CEA), which also occurs in Shelties. The merling gene may make it difficult to detect mild cases of CEA by ophthalmic examination because merling is normally associated with less pigmentation of the eyegrounds (back of the eye). Also, the CEA lesions (chorioretinal hypoplasia) in some mildly affected dogs may be partially masked as the eye matures, so may be missed at 8-10 weeks of age or later. Thus examination at an early age, about 5-8 weeks of age, is recommended. Because the onset of other eye diseases (such as cataracts and retinal degeneration) can occur at any age, dogs should be reexamined periodically. A more detailed discussion can be found at: http://www.vmdb.org/aug02.html#d xspot . Ideally, each dog should be examined within the preceding 12 mos. of being bred. According to the link above, the likelihood of a genetic problem showing up after age 9 years is low. The test is an eye examination performed by a board certified veterinary ophthalmologist. Results are automatically included in the OFA database with no extra charge.

von Willebrand's Disease (vWD) DNA Test – vWD is a potentially serious bleeding disorder and one that can be kept from being a major problem in the breed by having this one-time DNA test done. According to the VetGen website (http://www.vetgen.com/canine-vwd3.html), the incidence of vWD in Shelties as of January, 2005 is: Clear – 92%, Carrier - 7%, Affected – 1%. Dogs "Clear By Parentage" (first generation - see OFA website for detailed policy) would be accepted into the CHIC program. The test can be performed using DNA from cheek brush collection that can be mailed-in by the owner.

Multiple Drug Sensitivity (MDR1 gene) DNA Test – This DNA test identifies dogs that are sensitive to several medications. Shelties, Collies, Australian Shepherds, and Border Collies are a few of the breeds with this genetic mutation. Several commonly used drugs, ex. antiparasitic drugs (some used in heartworm preventatives), tranquilizers (acepromazine), and anti-diarrheal drugs (Imodium®) are a few of the drugs that may affect dogs with this genetic mutation. This test would provide useful, practical knowledge for every Sheltie owner, since knowing the status of each dog as clear, carrier, or affected would help a veterinarian determine which drugs to use or avoid in a particular dog. As of March, 2008, 448 Shelties have been tested (Washington State University) with 11% being heterozygous (carriers) for the MDR1 mutation, and 1 % homozygous for the MDR1 mutation. Heterozygous dogs (carriers) exhibit sensitivity to drugs that is similar to or less than that of homozygous (affected) dogs. A complete list of

drugs that may affect dogs with the MDR1 gene can be found at the following link: http://www.vetmed.wsu.edu/depts-VCPL/drugs.aspx. More information on the topic can be found at: http://www.vetmed.wsu.edu/depts-VCPL/ and http://www.ashgi.org/articles/mdr1.htm . Dogs "Clear By Parentage" (first generation - see OFA website for detailed policy) would be accepted into the CHIC program. The test can be performed using DNA from cheek brush collection that can be mailed-in by the owner.

Optional tests:

Autoimmune Thyroiditis – Autoimmune thyroiditis may lead to hypothyroidism. It is generally accepted that autoimmune thyroiditis is inherited; however, studies to determine mode of inheritance either have not been performed or are inconclusive[2]. According to the OFA website, where breed results for the Michigan State University Laboratory are listed, Shetland Sheepdogs are 24th of 140 breeds (in which 100 or more evaluations have been performed) with autoimmune thyroiditis. Of 14,110 Sheltie evaluations, 12.7% were positive for autoimmune thyroiditis. From the OFA website, "Since the majority of affected dogs will have autoantibodies by 4 years of age, annual testing for the first 4 years is recommended. After that, testing every other year should suffice. Unfortunately, a negative result at any one time will not guarantee that the dog will not develop thyroiditis." The ASSA Research Advisory Committee recommends that, at a minimum, dogs be tested at 2, 4, and 7 years of age. A blood sample is needed for this test. The Committee debated whether or not this test should be on the required list as it should be repeated multiple times over the life of a dog, and it is more expensive than other procedures that should be repeated such as eye certification. More information on autoimmune thyroiditis can be found at the following links: http://www.offa.org/thygeninfo.html and. http://www.upei.ca/~cidd/intro.htm .

Collie Eye Anomaly (CEA or Choroidal Hypoplasia) DNA Test - CEA is a recessively inherited ocular anomaly that affects development of a portion of the eye. Homozygous recessive dogs may have lesions ranging from mild to severe. Heterozygous dogs will be phenotypically normal. Choroidal hypoplasia, coloboma, and retinal detachment are features of the disease. It occurs in Shetland Sheepdogs as well as other herding breeds. The CEA DNA test can distinguish between normal, carrier, and affected dogs. Unlike CERF examination, it is indifferent to the age of the dog or the presence of the merle gene. The ASSA Research Advisory Committee encourages breeders to consider this test for their breeding stock to keep the incidence of this problem as low as possible. A blood sample is needed for this test. This test is for CEA only, so CERF examinations must still be performed to rule out other types of hereditary eye disease such as progressive retinal atrophy. For an excellent discussion on the topic, see the following link www.optigen.com/opt9_test_cea_ch.html .

Frequencies Based on CERF Eye Exams in the U.S. from 1991 to 1999[3]

	Choroidal Hypoplasia	Coloboma	Retinal Detachment
Collies	66.7%	8.75%	1.88%
Border Collies	2.12%	0.57%	0.06%
Shelties	0.39%	0.79%	0.05%

CERF numbers may underestimate the prevalence of the CEA mutation, because of the difficulty of detecting the defect in older dogs and the difficulty in diagnosing in a merled dog. Although the incidence

[2] Canine inherited disorders database - http://www.upei.ca/~cidd/intro.htm

[3] From the OptiGen website: http://www.optigen.com/opt9_test_cea_ch.html

of CEA in American Shelties is relatively low, it occurs in European Shetland Sheepdogs in a significantly greater frequency. For this reason, it is recommended that, at the very least, imported Shelties be tested for the CEA gene. Dogs "Clear By Parentage" (first generation - see OFA website for detailed policy) would be accepted into the CHIC program.

Elbow dysplasia – Of breeds having 100 or more elbow evaluations, Shetland Sheepdogs rank 62nd of 92 breeds with elbow dysplasia. As of March, 2008 there have been 404 Shelties evaluated with 97.3% being normal. More information about elbow dysplasia can be found at the following link: http://www.offa.org/elbowinfo.html . Radiographs (x-rays) are required for this test.

Congenital Cardiac Database – Many congenital cardiac defects have a genetic component, and nearly all common ones produce audible murmurs that can be detected by a veterinarian using a stethoscope. Although not common in Shelties, such defects have been found in the breed. OFA certification for the cardiac database is primarily based on examination by a veterinarian using a stethoscope. Because some veterinarians are more experienced at detecting subtle murmurs than other veterinarians, the ASSA Research Advisory Committee stipulated that the examination must be performed by a board certified veterinary cardiologist or internal medicine specialist. Dogs must be 12 mos. of age to receive a certification number. As of March, 2008 61 Sheltie evaluations have been entered into the OFA database. More information can be obtained at the following link: http://www.offa.org/cardiacinfo.html

American Temperament Testing Society, TT title - The "TT" title isn't exactly a health test; however, some breeds do include temperament testing in their CHIC test list, and since heredity does play a role in temperament, the ASSA Research Advisory Committee included it on the optional list. Minimum age for a dog to take the test is 18 mos. As of December, 2007, 472 Shelties have been tested. The pass rate was 67.4%. More information on the test can be obtained at the following link: http://www.atts.org/about.html

HTTP://WWW.CANINEHEALTHINFO.ORG/

CHIC INFORMATION

The Canine Health Information Center, also known as CHIC, is a centralized canine health database jointly sponsored by the AKC/Canine Health Foundation (AKC/CHF) and the Orthopedic Foundation for Animals (OFA).

Mission Statement

To provide a source of health information for owners, breeders, and scientists, that will assist in breeding healthy dogs.

CHIC Goals

- To work with parent clubs in the identification of health issues for which a central information system should be established.
- To establish and maintain a central health information system in a manner that will support research into canine disease and provide health information to owners and breeders.
- To establish scientifically valid diagnostic criteria for the acceptance of information into the database.
- To base the availability of information on individually identified dogs at the consent of the owner.

CHIC Benefits

Once in place and accepted within the dog breeding community, the CHIC program offers benefits to breeders, buyers, parent clubs, and researchers.

- **For breeders**, CHIC provides a reliable source of information regarding dogs they may use in their breeding programs. In the future, breeders can begin to analyze the pedigrees of a proposed breeding for health strengths and weaknesses as well the traditional analysis of conformation, type, and performance strengths and weaknesses.
- **For buyers**, the CHIC program provides accurate information about the results of a breeder's health testing. For diseases that are limited to phenotypic evaluations, there are no guarantees. However, the probability that an animal will develop an inherited disease is reduced when its ancestry has been tested normal. Further, as more DNA tests become available and the results are entered into CHIC, the CHIC database will be able to establish whether progeny will be clear, carriers, or affected.
- **For parent clubs** considering establishment of health databases on their own, CHIC provides the answer with no upfront investment required by the club. The CHIC infrastructure is supplied and maintained by the OFA. The data is maintained in a secure environment by trained staff. The services are not subject to the time, technology, and resource constraints that parent clubs might face on their own. This frees parent clubs to focus on their core

strengths of identifying health concerns, educating their membership, and encouraging participation in the CHIC program.

- **For researchers**, CHIC provides confidential and accurate aggregate information on multiple generations of dogs. CHIC information will also be useful for epidemiological studies enhancing our knowledge of health issues affecting all breeds of dogs.
- **For everyone** interested in canine health issues, CHIC is a tool to monitor disease prevalence and measure progress.

CHIC Policies and Guidelines

The CHIC database is a tool that collects health information on individual animals from multiple sources. This centralized pool of data is maintained to assist breeders in making more informed breeding choices, and for scientists in conducting research. In order for data to be included in CHIC, test results must be based on scientifically valid diagnostic criteria.

Breed Specific

Core to the CHIC philosophy is the realization that each breed has different health concerns. Not all diseases have known modes of inheritance, nor do all diseases have screening tests. Some screening tests are based on phenotypic evaluation, others on genetic testing. With all these variables, a key element of CHIC is to customize or tailor the CHIC requirements to the needs of each breed. These unique requirements are established through input from the parent club prior to the breed's entry into the CHIC program. Breed specific requirements typically consist of the inherited diseases that are of the greatest concern and for which some screening test is available. Each parent club also drives specific screening protocols. As an example, one parent club may allow cardiac exams to be performed by a general practitioner. Another parent club may require the exam to be performed by a board certified cardiologist. A club may also use the CHIC program to maintain information on other health issues for anecdotal purposes. Later, as screening tests become available, the disease may be added to the breed specific requirements.

Identification

Regardless of breed, each dog must be permanently identified in order to have test results included in CHIC. Permanent identification may be in the form of microchip or tattoo.

Informed Consent

CHIC operates an informed consent database. All information regarding test results remains confidential unless the owner specifically authorizes release of the information into the public domain. Owners are encouraged to release all test results realizing it is in the ultimate health interests of the breed and the information greatly increases the depth and breadth of any resulting pedigree analysis. For those not quite ready to accept open sharing of information, there is still value in submitting their results. All test information entered into the database is available in aggregate for research and statistical reporting purposes, but does not disclose identification of individual dogs. This results in improved information on the prevalence of the disease, as well as information regarding progress in reducing the incidence of the disease.

CHIC Numbers and Reports

A CHIC number is issued when test results are entered into the database satisfying each breed specific requirement, and when the owner of the dog has opted to release the results into the public domain. The CHIC number itself does not imply normal test results, only that all the required breed specific tests were performed and the results made publicly available.

A CHIC report is issued at the same time as the CHIC number. The CHIC report is a consolidated listing of the tests performed, the age of the dog when the tests were performed, and the corresponding test results. As new results are recorded, updated CHIC reports reflecting the additional information will be generated. For example, if a breed requires annual CERF examinations, an updated CHIC report will be generated every time updated CERF results are entered. Another potential example is as new DNA tests are developed and added to the breed specific requirements, updated CHIC reports will be generated as the test results are entered.

Once included in the CHIC program, the breed specific requirements are dynamic. As health priorities within a breed change, or as new screening tests become available, the breed specific requirements can be modified to reflect the current environment. If the breed specific requirements are modified, existing CHIC numbers are not revoked. Again, the CHIC number is issued to a dog that completed all required tests at a given point in time.

CHIC will provide the parent club quarterly reports consisting of both aggregate numbers and specific dogs who have been issued CHIC numbers.

CHIC Fee Structure

Test results from the OFA and CERF databases are shared automatically with the CHIC program. There is no fee to enter test results from either the OFA or CERF, and there is no requirement to fill out any additional forms.

To enter results into CHIC from another source such as PennHIP, GDC, OVC, or parent club maintained databases, there is a one time per dog fee of $25.00. To enter results from any of these organizations, a copy of the test results, the fee, and a signed note requesting the results be entered into the CHIC database should be sent to the OFA. Any additional results after the one time fee is paid are recorded at no charge. Additionally, there is no charge when entering results on an affected animal from a non-CERF/OFA source.

Participation

Any parent club interested in participating in the CHIC program should contact either the OFA or the AKC/CHF to discuss the program, entry requirements, answer any questions, or to request application forms.

Each breed should have a health committee and survey results which determine the major health concerns within the breed. The club should select one person from the health committee to be the CHIC liaison, and to work with the club's membership in determining what health tests should be considered for participation in the CHIC program. Questions to be considered are: what tests are currently available and being used, and at what age are the tests

appropriate and reliable. Staff members from the OFA and the AKC/CHF will assist parent clubs during this phase of requirement and protocol definition.

CHIC Frequently Asked Questions

What is CHIC?

In short, CHIC is a database of consolidated health screening results from multiple sources. Co-sponsored by the OFA and the AKC Canine Health Foundation, CHIC works with parent clubs to identify health screening protocols appropriate for individual breeds. Dogs tested in accordance with the parent club established requirements, that have their results registered and made available in the public domain are issued CHIC numbers.

My breed is not listed, is my dog eligible for a CHIC number?

No. To receive a CHIC number, the breed itself must be one of the participating breeds. Participation in CHIC must be initiated by the breed's Parent Club.

My dog has met all the breed specific CHIC requirements. Do I need to do anything else to receive my CHIC number?

If all the results have been registered appropriately, you shouldn't need to do anything extra. The CHIC number should generate automatically.

My dog has met all the breed specific CHIC requirements. How long does it take to receive a CHIC number?

The program which identifies newly qualified CHIC dogs is typically run two to three times a month, so there is some lag time between the recording of the last requirement and the issuing of the number. If you believe your dog should've received a CHIC number, and it has been more than 4 weeks since the registration of the last test result, you may email chic@offa.org to inquire about the dog's status.

Is there a charge for CHIC?

Currently, the only fee is to register PennHIP or OVC results since this must be done manually. To include these in CHIC, the fee is $25. Send the fee, along with a copy of the test results, and a note asking that the data be included in CHIC to:

Canine Health Information Center
2300 E Nifong Blvd.
Columbia, MO 65201

My dog has completed all the requirements for CHIC, why haven't I received a CHIC number?

The two most common reasons are 1) the owner simply hasn't allowed enough time for the information to be recorded and in sync and 2) the dog has not met the requirement for permanent id via tattoo or microchip.

My parent club is interested in joining CHIC. How do we go about doing this?

For clubs interested in participating in the CHIC program, it is best to begin with a verbal dialogue regarding potential test requirements, protocols, etc. Contact may be initiated via phone or email. Contact Eddie Dziuk at chic@offa.org, or 573-442-0418 x222.

Do test results have to be normal?

No, CHIC is not about normalcy. CHIC is meant to encourage health testing and sharing of all results, normal and abnormal, so that more informed breeding decisions can be made in an overall effort to reduce the incidence of genetic disease and improve canine health.

CHIC Search Results

name	regnum	breed	sex	birthdate	chicnum	appnum
AFTA BAMBI OF THE OZARKS	DN14620701	SHETLAND SHEEPDOG	F	Apr 30 2006	58595	1371164
ALETIAN WISTWIN COMIC RELIEF	DL82154502	SHETLAND SHEEPDOG	M	Jan 8 2000	48075	1103042
ASHBURTON FOXGLOVE MARQUESAS	DN06852901	SHETLAND SHEEPDOG	M	Mar 11 2004	51176	1216374
AYNSWORTH CROSS OF PROMISE	DN16296602	SHETLAND SHEEPDOG	F	Nov 6 2006	57563	1369898
AYNSWORTH SILVER MOONLIGHT	DL83672202	SHETLAND SHEEPDOG	M	May 24 2000	58536	841531
BARWOODS JANA JFK	DN11936003	SHETLAND SHEEPDOG	M	Aug 24 2005	58551	1310478
FAERIE RIVER OF DREAMS	DN05991101	SHETLAND SHEEPDOG	M	Jan 18 2004	56401	1200492
GRANDGABLES SHALL WE DANCE	DN20145601	SHETLAND SHEEPDOG	M	Sep 2 2007	62185	1375901
HOMESPUN DREAM WEAVER	DL91035701	SHETLAND SHEEPDOG	M	Jun 14 2002	57450	1116948
LYNNLEA'S CAMPFIRE GIRL	DN03423702	SHETLAND SHEEPDOG	F	Mar 14 2003	59243	1078688
LYNNLEA'S SPARKLE PLENTY	DN17718701	SHETLAND SHEEPDOG	F	Mar 2 2007	58594	1286941
LYNNLEA'S THE RING BEARER	DN01982001	SHETLAND SHEEPDOG	M	Nov 29 2002	58593	1067281
OYEZ DARMIL DROP EVERYTHING	DN18159802	SHETLAND SHEEPDOG	M	Jan 5 2007	58065	1366244
REDFIELD FANCY THAT	DN15122602	SHETLAND SHEEPDOG	F	Jun 20 2006	57327	1324006
REDFIELD STARPHIRE INTERLUDE	DN16939903	SHETLAND SHEEPDOG	M	Nov 24 2006	58237	1323202
ROSESTONES IRISH BLESSING	DN10706501	SHETLAND SHEEPDOG	F	Mar 17 2005	52425	1267488
ROSMOOR REQUIEM	DN11126302	SHETLAND SHEEPDOG	F	May 31 2005	47934	1225503
SAGEBRUSH JOLEE GOLDEN DREAMER	DN15778204	SHETLAND SHEEPDOG	F	Jul 28 2006	59245	1334170
SAGEBRUSH LITTLE BIG MAN	DN08975001	SHETLAND SHEEPDOG	M	Nov 8 2004	57451	1178149
SHADLAND MONEY TALKS	DN13478401	SHETLAND SHEEPDOG	M	Feb 5 2005	57562	1266904
SHADYMIST SPREZZATURA	DN15385402	SHETLAND SHEEPDOG	F	Jul 28 2006	54169	1303650
SUNEBANK CAERLEON QUEST	DL89736906	SHETLAND SHEEPDOG	M	Nov 14 2001	52122	1097357
SUNTERA ASHBURTON BREAKING AWAY	DN15452703	SHETLAND SHEEPDOG	M	Jul 22 2006	55917	1347189
WESTAR'S EVANGELISTA	DN01808401	SHETLAND SHEEPDOG	F	Oct 22 2002	53971	1175726
WILDOAK DEAL OR NO DEAL	DN13367701	SHETLAND SHEEPDOG	M	Jan 11 2006	54879	1310893
WILDOAK MIDNIGHT FANTASY	DN07037202	SHETLAND SHEEPDOG	F	Mar 11 2004	62248	1310895
WILDOAK WALDENWOOD HOLLY BERRY	DN13067403	SHETLAND SHEEPDOG	F	Dec 25 2005	58064	1310896
WINDRUSH AYNSWORTH NIGHT SKY	DN15382702	SHETLAND SHEEPDOG	M	Jul 20 2006	59244	1284919

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SEARCH THE CHIC BREED DATABASE

To search the DNA Database, click on "Search DNA Bank" above.

CHIC number or registration number:	Begin Search Clear Search Items
Part of Name:	○ First part of name (faster) ○ Any part of name (slower)
Breed:	SHETLAND SHEEPDOG
Variety:	---
Sex:	---
Date of birth:	--- --- through --- --- OR ---
Clear only:	---
	Begin Search Clear Search Items

Canine Health Information Center | 2300 E. Nifong, Columbia, MO 65201-3806 | 573-442-0418
FAX 573-875-5073 | contact

Design by Robin Nuttall, based on a template by www.mitchinson.net

AYNSWORTH SILVER MOONLIGHT CHIC

Registration: DL83672202 (AKC)
Breed: SHETLAND SHEEPDOG
Sex: M
Color: BLUE MERLE
Birthdate: May 24 2000
DNA Profile:

Sire: DL39868201
Dam: DL50055503
***Titles:** CH
CHIC #: 58536
Addtl. Reg. #

OFA Number	Registry	Test/Film Date	Report Date	Age	Final Conclusion
SS-TH72/14M-PI	THYROID	Aug 10 2001	Oct 2 2001	14	NORMAL
SS-10627E24M-PI	HIPS	May 31 2002	Jun 20 2002	24	EXCELLENT
SS-EL163M24-PI	ELBOW	May 31 2002	Jun 20 2002	24	NORMAL
SS-LP62/24M-PI	LEGG-CALVE-PERTHES	May 31 2002	Jun 23 2005	24	NORMAL
SS-4558	*CERF*	*Jan 31 2006*	*Jan 31 2006 **	*68*	*TESTED: 01,06*
SS-CEA5/96M-PI	COLLIE EYE ANOMALY	Jun 17 2008	Jun 30 2008	96	GENOTYPICALLY NORMAL FOR COLLIE EYE ANOMALY
SS-MD1-40/84M-PI-N/N	MULTIPLE DRUG RESISTANCE (MDR1)	Jun 1 2007	Jul 7 2009	84	NORMAL/NORMAL
SS-VW383/108M-PI	VON WILLEBRANDS	Jun 3 2009	Jul 7 2009	108	GENOTYPICALLY CLEAR FOR VON WILLEBRAND'S

** CERF Certification is valid for one year from the date of the exam.*

Sire/Dam	Registration	Birthdate	Sex	Relation	CERF	HIPS	VON WILLEBRANDS
MACDEGA ASTERISK	DL39868201	Sep 30 1991	M	Sire	SS-5070	SS-3447E27M-T	
AYNSWORTH MOONSHADOW	DL50055503	Sep 30 1993	F	Dam	SS-2447	SS-5659G35F-T	SS-VW42/54F-T

Offspring	Registration	Birthdate	Sex	COLLIE EYE ANOMALY	DNA DATA BANK	ELBOW	CERF	HIPS	LEGG-CALVE-PERTHES	MULTIPLE DRUG RESISTANCE (MDR1)	THYROID	VON WILLEBRANDS
SEA HAVEN CHASING MOONBEAMS	DL89968901	Nov 24 2001	M					SS-12218E26M-PI	SS-LP2176/26M-PI			
SEA HAVEN BI STARLIGHT	DL89968902	Nov 24 2001	F					SS-12219E26F-PI	SS-LP2177/26F-PI			
SEA HAVEN DARK VICTORY	DL89968903	Nov 24 2001	F					SS-12226E26F-PI	SS-LP2178/26F-PI			
SEA HAVEN NALTAK STARFIGHTER	DL89968904	Nov 24 2001	M					SS-13270E42M-PI	SS-LP3133/42M-PI			
LAURIEN FOOLISH PLEASURE	DL90121802	Jan 11 2002	M					SS-12194F25M-NOPI	SS-LP2137/25M-NOPI			
HILLSTONE FINAL CUT	DL90121801	Jan 11 2002	M	SS-CEA6/79M-VPI		SS-EL249M34-VPI	SS-6895	SS-12871G34M-VPI	SS-LP2759/34M-VPI			

HOMEWOOD WINNING COLORS	DN009215 01	Apr 28 200 2	M	SS-EL224M 24-PI		SS-12347G24 M-PI	SS-LP2293/24 M-PI				
SIMRELL'S MISTY MOONLIGHT	DL9098670 2	May 12 20 02	F		SS-5810	SS-12650G27 F-PI	SS-LP2564/27 F-PI				
SIMRELL'S BLUE MOON RISING	DL9098670 1	May 12 20 02	M		SS-5354	SS-12671F27 M-PI	SS-LP2576/27 M-PI				
SIMRELL'S SLAYER BI MOONLIGHT	DL9098670 3	May 12 20 02	F			SS-13243G24 F-NOPI	SS-LP3100/24 F-NOPI				
KELL ALLEGHENY MOON	DL9085560 3	May 14 20 02	M		SS-5872	SS-13316E24 M-PI					
KELL SINCERELY	DL9085560 2	May 14 20 02	F		SS-5875	SS-13328G24 F-PI					
KELL DANCIN IN THE MOONLIGHT	DL9085560 4	May 14 20 02	F		SS-5948	SS-13330G26 F-PI					
SHILOHS OVER THE RAINBOW	DN016391 01	Sep 16 20 02	F		SS-5890	SS-12858G26 F-PI	SS-LP2767/26 F-PI				
ODYSSEY ALL THAT AND MORE	DN038361 01	Mar 30 20 03	F		SS-5956	SS-13855G34 F-PI					
ODYSSEY OH ME OH MY	DN038361 03	Mar 30 20 03	F		SS-5954	SS-13856G34 F-PI					
KELL'S WIZARD OF ALADDIN	DN038361 02	Mar 30 20 03	M			SS-14043G33 M-PI					
SEA HAVEN STAR SAPPHIRE	DN036121 02	Apr 9 200 3	F			SS-14491E42 F-PI					
SEA HAVEN BI MOONRISE	DN036121 01	Apr 9 200 3	M		SS-7140	SS-16123G69 M-VPI				SS-TH456/72 M-VPI	SS-VW359/72M-VPI
CHELSON THE HUSTLER	DN039065 03	Jun 25 20 03	M		SS-5846	SS-13500G26 M-PI					
CRESTAR NEW YORK MINUTE	DN043333 01	Jun 26 20 03	M			SS-13400G24 M-PI					
SHAMONT MOON RIVER	DN060366 01	Nov 15 20 03	M			SS-13853G26 M-PI					
SHAMONT'S PADEN BLU	DN060366 02	Nov 15 20 03	M		SS-6100	SS-14226G32 M-PI					
CAMEO SONG SUNG BLUE	DN057538 01	Nov 25 20 03	F			SS-15366G48 F-VPI					
OKIE'S MOONLIGHT SERENADE	DN054101 01	Dec 16 20 03	F			SS-14100E29 F-PI					
MUS-ART SARENADE IN BLUE	DN065636 02	Mar 12 20 04	F			SS-14309G28 F-NOPI					
MUS-ART MIDNIGHT BLUE	DN065636 01	Mar 12 20 04	F			SS-14390G29 F-PI					
KANDISWEET CRESTAR PHOENIX	DN074735 02	May 2 20 04	M	SS-EL332M 28-PI		SS-14447G28 M-PI		SS-MD1-41/48M-PI-N/M		SS-TH310/27 M-PI	
CRESTAR BEVERLY HILLS	DN074735 01	May 2 20 04	F			SS-15244G40 F-PI					
SEA HAVEN CHASING RAINBOWS	DN082565 01	Aug 24 20 04	F			SS-14480E25 F-NOPI					
FIGURES MOON PIE	DN093540 01	Jan 10 20 05	F			SS-14622G24					

								F-PI				
DURY VOE ENCORE ENCORE	DN10072901	Jan 22 2005	M			SS-5973	SS-14672G24M-PI					
DURY VOE BETTY BOOP	DN10072902	Jan 22 2005	F				SS-15628E28F-PI					
SPRINGMIST AIM FOR THE HEART	DN10840602	May 26 2005	F		SS-EL414F35-VPI		SS-15673G35F-VPI					
SPRING MIST THE DARK OF THE MOON	DN10840601	May 26 2005	M				SS-16213E45M-PI					
CRESTAR VERONICA MARS	DN11909101	Jul 7 2005	F				SS-16349E46F-PI					
BLUMOON SILVER BI DESIGN	DN11977001	Aug 7 2005	F				SS-15432G25F-PI					
BLUMOON SILVER CASHMERE	DN11977002	Aug 7 2005	F				SS-15440G25F-PI					
FANTASIA'S FLIRTINI	DN15538001	Jul 8 2006	F				SS-16051G28F-PI					
FANTASIA KYMRIC KEEP A SECRET	DN15538002	Jul 8 2006	F				SS-16052E28F-PI					
WINDRUSH AYNSWORTH NIGHT SKY CHIC	DN15382702	Jul 20 2006	M		SS-EL429M24-VPI	SS-6506	SS-15835G24M-VPI		SS-MD1-48/21M-VPI-N/N	SS-TH385/16M-VPI	SS-VW384/34M-VPI	
AYNSWORTH NO MOON TONIGHT	DN16296604	Nov 6 2006	M				SS-16133E26M-NOPI					
AYNSWORTH CROSS OF PROMISE CHIC	DN16296602	Nov 6 2006	F		SS-DNA-44/S	SS-7134	SS-16343E30F-VPI		SS-MD1-18/29F-VPI-N/N	SS-TH498/36F-VPI	SS-VW370/30F-VPI	
BLUVALLEY DOMINO DELIVERS	DN18067902	May 6 2007	M							SS-TH463/23M-VPI		
BLUVALLEY SWEET BABY JANE	DN18067904	May 6 2007	F				SS-16570E27F-VPI			SS-TH490/28F-VPI		
AYNSWORTH MORNING MIST O'KAYLOH	DN19182504	Aug 30 2007	F							SS-TH457/19F-PI		
AYNSWORTH KAYLOH PICASSO PORTRAIT	DN19182505	Aug 30 2007	F			SS-7246				SS-TH458/19F-PI		

Full Siblings	Registration	Birthdate	Sex	Relation	CERF	HIPS	LEGG-CALVE-PERTHES
AYNSWORTH PLATINUM AND PEARLS	DL83672201	May 24 2000	F	Full	SS-4557	SS-10628E24F-PI	SS-LP631/24F-PI

Half Siblings(Sire)	Registration	Birthdate	Sex	Relation	DNA DATA BANK	ELBOW	CERF	HIPS	LEGG-CALVE-PERTHES	THYROID	VON WILLEBRANDS
FOXGLOVE SHINING THROUGH	DL49644003	Jul 16 1993	F	Half(Sire)				SS-4752F24F			
VIRGO SILVERADO	DL49210104	Jul 22 1993	F	Half(Sire)				SS-4799E25F-T			
OAKLEAF N SHANGRI-LAS TURBO	DL49323704	Jul 28 1993	M	Half(Sire)				SS-5001G24M			
MYSTIX QUOTE UNQUOTE	DL50450301	Oct 10 1993	M	Half(Sire)				SS-4952E24M-T			
ESQUIRE MOON SHADOW	DL50685005	Nov 27 1993	M	Half(Sire)			SS-3196	SS-6139E41M-T			
ESQUIRE'S KOOL WHIP	DL50685002	Nov 28 1993	F	Half(Sire)				SS-7099G54F-T			
SHAWN-DEE MS'MOLLY MALONE	DL51199802	Dec 29 199	F	Half(Sire				SS-			

		3		)				5081G24F			
TOVEN WINTERTIDE	DL51849702	Feb 3 1994	M	Half(Sire)				SS-5203E24M-T			
BELMARK NOCTURNE STUDY	DL54075001	Jun 23 1994	M	Half(Sire)				SS-5889G30M			
BELMARK SIRIUS RISING	DL54075006	Jun 23 1994	M	Half(Sire)			SS-4663	SS-9338E76M-PI			
GREIFZU'S FINAL TOUCH	DL57784901	Apr 24 1995	F	Half(Sire)				SS-6145E24F			
GREIFZU'S NICE'N EASY	DL57784902	Apr 24 1995	M	Half(Sire)				SS-6146E24M			
GREIFZU'S SOMEWHITE IN TIME	DL57784903	Apr 24 1995	F	Half(Sire)				SS-6147E24F			
MACDEGA MAJOLICA	DL59341608	Jul 20 1995	F	Half(Sire)				SS-6774G30F-T			
HOMEWOOD ABOVE THE RIM	DL60265004	Jul 27 1995	M	Half(Sire)				SS-6447E25M-T			
HOMEWOOD HURRICANE	DL60265001	Jul 27 1995	M	Half(Sire)				SS-6448E25M-T			
SUGAR HILL MOONLIGHT	DL59508202	Jul 29 1995	F	Half(Sire)				SS-6680E24F-T			
MAINEVENT MELYNA	DL59549001	Aug 8 1995	F	Half(Sire)				SS-6591E26F-T			
INFINITY TOUCHED BI AN ANGEL	DL59748701	Aug 28 1995	F	Half(Sire)				SS-6440E24F			
BRONWYN JAGUAR	DL60381801	Oct 20 1995	M	Half(Sire)				SS-6693E25M-T			
SUNCREST SEDUCTION	DL64085404	Feb 27 1996	F	Half(Sire)				SS-7246F29F			
SHAIZACY STARDUST	DL63416902	Apr 27 1996	F	Half(Sire)				SS-7123G24F			
ACT I BI LINE	DL64094801	May 23 1996	M	Half(Sire)				SS-8041E37M			
FANTASIA PLAY ME A MEMORY	DL64473701	May 30 1996	F	Half(Sire)				SS-7552E30F-T			
ATTRIDGE MIQELON MIDNITE OPERA	FN384039	Jul 12 1996	F	Half(Sire)				SS-9756G55F-PI			
CENTURY FARM TRI STOP ME	DL66082803	Oct 1 1996	F	Half(Sire)				SS-7507E25F-T			
CENTURY FARM OTHERSIDE OF MID NITE	DL66082802	Oct 1 1996	M	Half(Sire)			SS-4599	SS-9673G30M-PI	SS-TH125/78M-PI	SS-VW228/56M-PI	
STONEFOX THE ARCHANGEL	DL66392204	Oct 28 1996	M	Half(Sire)			SS-4235	SS-7898E30M-T			
DUTCH'S BLACK GAMMON	DL66891801	Nov 28 1996	M	Half(Sire)	SS-DNA-12/S						
CAMEO RAINBOW'S END	DL67945101	Jan 30 1997	M	Half(Sire)			SS-3381	SS-7657G24M-T		SS-VW45/7M-T	
ASHBURY DURANGO	DL69867002	Apr 7 1997	M	Half(Sire)				SS-9260E42M-T			
OAKDALE RAPPORLEE JAVA NOIRE	DL71472402	Oct 16 1997	F	Half(Sire)				SS-8301E24F-T			
RAPPORLEE JACKS ARE BETTER	DL71472401	Oct 16 1997	M	Half(Sire)				SS-8457G25M-T			
PEACEWYNDE TILDE	DL71622405	Oct 28 1997	F	Half(Sire)		SS-EL95F25-T	SS-4696	SS-8410G25F-T			
AUTUMNGLD LAUREATE ALABAMA	DL82759701	Apr 4 1998	M	Half(Sire)				SS-8897G26M-T			
WILL O'WISP TOUCH OF FROST	DL74978103	Jun 23 1998	M	Half(Sire)				SS-8951G24M-			

								T		
VENTURA'S MASQUERADE	DL74978101	Jun 23 1998	F	Half(Sire)			SS-9095G25F-T			
BALMARLE FROSTING O' THE CAKE	DL80536402	Jan 22 1999	F	Half(Sire)			SS-12089E59F-PI	SS-LP164/59F-PI		
BALMARLE EXCLAMATION	DL80536401	Jan 22 1999	F	Half(Sire)			SS-9490E24F-PI			
SIMCO THE DISCOVERER	DL78460802	Apr 18 1999	M	Half(Sire)			SS-12753G65M-PI	SS-LP2657/65M-PI		
CALCURT SILVER SORCERESS	DL79296505	May 8 1999	F	Half(Sire)			SS-16146G116F-PI			
PRINHILL GRAFITTI	DL78884701	May 29 1999	F	Half(Sire)			SS-10961G40F-PI	SS-LP950/40F-PI		
CARMYLIE TRIUMPH PIZAZZ	DL80416301	Aug 16 1999	M	Half(Sire)			SS-10012G24M-PI			
PRINHILL EASY SPIRIT	DL84578701	Aug 5 2000	F	Half(Sire)			SS-12604G48F-NOPI	SS-LP2526/48F-NOPI		
WISTWIN INTRIGUE	DL85438405	Nov 6 2000	M	Half(Sire)			SS-11671E32M-PI	SS-LP246/32M-PI	SS-TH180/45M-PI	
WISTWIN MERIDIAN	DL85438403	Nov 6 2000	F	Half(Sire)			SS-11644E32F-PI	SS-LP247/32F-PI		
WISTWIN EIDERDOWN	DL85438401	Nov 6 2000	F	Half(Sire)			SS-11676G32F-PI	SS-LP1665/32F-PI		
WISTWIN ILLUMINATION	DL85438402	Nov 6 2000	F	Half(Sire)			SS-11679E32F-PI	SS-LP1669/32F-PI		
MACDEGA ATLANTIS	DL88693102	Jul 30 2001	M	Half(Sire)		SS-5069	SS-11726E24M-PI	SS-LP1718/24M-PI		
FANTASIA AFFAIR OF THE HEART	DL88693101	Jul 30 2001	F	Half(Sire)			SS-12021F28F-PI	SS-LP1988/28F-PI		
SILVERSONG'S IMAJICA	LS758009	Jan 16 2002	F	Half(Sire)			SS-13118G37F-PI	SS-LP2997/37F-PI		
EMPRISE MISS AMERICAN PIE	DN00711405	Jan 28 2002	F	Half(Sire)			SS-14744E61F-NOPI			
MACDEGA AUTHENTIC	DL91770501	Nov 5 2002	M	Half(Sire)		SS-5234	SS-13253E30M-PI	SS-LP3114/30M-PI		
BARE COVE BACK IN A JIFFY	DN03328904	Feb 28 2003	M	Half(Sire)			SS-14337E41M-NOPI			

Half Siblings(Dam)	Registration	Birthdate	Sex	Relation	ELBOW	CERF	HIPS	VON WILLEBRANDS
AYNSWORTH CHARCOAL SKETCH	DL65175401	Jul 17 1996	F	Half(Dam)		SS-3229	SS-7422G26F	
AYNSWORTH TIGER WOODS	DL68314201	Apr 6 1997	M	Half(Dam)	SS-EL79M25-T	SS-4053	SS-7889G25M-T	SS-VW34/12M-T
AYNSWORTH SUGAR BRITCHES	DL68314203	Apr 6 1997	F	Half(Dam)			SS-7950G25F-T	
AYNSWORTH CELEBRATION	DL68314202	Apr 6 1997	F	Half(Dam)		SS-3585	SS-8210G29F	

http://www.offa.org/hipgeninfo.html

General Hip Dysplasia Information

The Dysplastic Joint

Hip Dysplasia is a terrible genetic disease because of the various degrees of arthritis (also called degenerative joint disease, arthrosis, osteoarthrosis) it can eventually produce, leading to pain and debilitation.

The very first step in the development of arthritis is articular cartilage (the type of cartilage lining the joint) damage due to the inherited bad biomechanics of an abnormally developed hip joint. Traumatic articular fracture through the joint surface is another way cartilage is damaged. With cartilage damage, lots of degradative enzymes are released into the joint. These enzymes degrade and decrease the synthesis of important constituent molecules that form hyaline cartilage called proteoglycans. This causes the cartilage to lose its thickness and elasticity, which are important in absorbing mechanical loads placed across the joint during movement. Eventually, more debris and enzymes spill into the joint fluid and destroy molecules called glycosaminoglycan and hyaluronate which are important precursors that form the cartilage proteoglycans. The joint's lubrication and ability to block inflammatory cells are lost and the debris-tainted joint fluid loses its ability to properly nourish the cartilage through impairment of nutrient-waste exchange across the joint cartilage cells. The damage then spreads to the synovial membrane lining the joint capsule and more degradative enzymes and inflammatory cells stream into the joint. Full thickness loss of cartilage allows the synovial fluid to contact nerve endings in the subchondral bone, resulting in pain. In an attempt to stabilize the joint to decrease the pain, the animal's body produces new bone at the edges of the joint surface, joint capsule, ligament and muscle attachments (bone spurs). The joint capsule also eventually thickens and the joint's range of motion decreases.

No one can predict when or even if a dysplastic dog will start showing clinical signs of lameness due to pain. There are multiple environmental factors such as caloric intake, level of exercise, and weather that can affect the severity of clinical signs and phenotypic expression (radiographic changes). There is no rhyme or reason to the severity of radiographic changes correlated with the clinical findings. There are a number of dysplastic dogs with severe arthritis that run, jump, and play as if nothing is wrong and some dogs with barely any arthritic radiographic changes that are severely lame.

Orthopedic Foundation for Animals (OFA)

2300 E Nifong Boulevard
Columbia, Missouri, 65201-3806
Phone: (573) 442-0418
Fax: (573) 875-5073
Email: ofa@offa.org
Web: www.offa.org

CERF *http://www.vmdb.org/cerf.html*

Dedicated to the elimination of heritable eye disease in purebred dogs through registration and research.

WHAT IS CERF?

The Canine Eye Registration Foundation (CERF) is an organization that was founded by a group of concerned, purebred owner/breeders who recognized that the quality of their dog's lives were being affected by heritable eye disease. CERF was then established in conjunction with cooperating, board certified, veterinary ophthalmologists, as a means to accomplish the goal of elimination of heritable eye disease in all purebred dogs by forming a centralized, national registry.

The CERF Registry not only registers those dog's certified free of heritable eye disease by members of the American College of Veterinary Ophthalmologists (A.C.V.O.), but also collects data on all dogs examined by A.C.V.O. Diplomates. This data is used to form the CERF data base which is useful in researching trends in eye disease and breed susceptibility. Not only is this data useful to clinicians and students of ophthalmology, but to interested breed clubs and individual breeders and owners of specific breeds.

HOW DOES CERF WORK?

After the painless examination of the dogs eyes, the A.C.V.O. Diplomate will complete the CERF form and indicate any specific disease(s) found. Breeding advice will be offered based on guidelines established for that particular breed by the genetics Committee of the A.C.V.O. Bear in mind that CERF and the A.C.V.O. are separate, but cooperating entities. The A.C.V.O only provides their professional services and expertise to ensure that uniform standards are upheld for the certification of dog's eyes with the CERF organization.

If the dog is certified to be free of heritable eye disease, you can then send in the completed owner's copy of the CERF form with the appropriate fee ($12.00 for the original CERF Registration, or $8.00 if it is a recertification or kennel rate). Hybrid Registration is $15.00 per dog. Re-CERF or kennel rate (10 or more new) is $12.00 per dog. CERF has adopted a policy effective Jan. 1st, 2001 (by post mark) that a permanent identification in the form of microchip, tattoo or DNA profile will be needed for any dog to be registered with CERF. The certification is good for 12 months from the date of the exam and afterwards the dog must be reexamined and recertified to maintain its' registration with CERF.

Regardless of the outcome of the dog's exam, the research copy of the CERF form will be sent to the CERF office at V.M.D.B (Veterinary Medical Database) where its information will be entered into the database for that specific breed. This information will be used in generating research reports, but the individual dog's identities will become confidential and will never be released.

WHAT CAN CERF DO FOR ME?

- Provide a registry of purebred dogs that have been certified free of heritable eye disease.

- Provide various memberships which include the CERF Newsletter, and various registration and research reports to keep you up-to-date on various topics in canine ophthalmology.

- Provide various reports on the prevalence of eye diseases in certain breeds, including reports generated by the Veterinary Medical Data Base (V.M.D.B.) which compiles data from 24 participating veterinary colleges in the U.S. and Canada.

- Provide a centralized source to answer questions like: - "Is there an A.C.V.O. Diplomate located near me?" -"Are there any published materials on eye disease in dogs that can help me to better understand my dog's condition?"

If you are interested in learning more about the CERF organization, the CERF process, or would like to inquire about the CERF status of a prospective mate for your dog, please don't hesitate to call or write. We'd love to assist you!

http://www.vetgen.com/canine-vwd3.html

vWD Type III

Type III von Willebrand Disease (vWD) is a very severe form of the disease in which affected animals do not produce any von Willebrand Factor protein in their blood. This condition makes them more likely to bleed abnormally and severely. This can lead to life threatening consequences in situations such as accidental injuries, spaying, or neutering. Because it is an autosomal recessive disorder, Shetland Sheepdogs, Scottish Terriers and Kooikerhondje that are "Carriers" of the disease show no signs of vWD, yet can pass the gene along and perpetuate the disease through breeding. Without testing, the potential result is more affected animals.

Although there is a significant frequency of vWD in Shelties and Scotties, no effective treatments exist. Responsible breeders have attempted to use factor assay, protein-based tests for vWD but have been unsuccessful in reducing the frequency of the disease. There are simply too many variables, such as estrus and thyroid function which produce variation in test results, making these approaches less than ideal. Therefore, breeders have heretofore been unable to combat the disease by using responsible breeding strategies to reduce the incidence of vWD in future generations of dogs.

Based on research conducted at Michigan State University and the University of Michigan leading to the discovery of the mutations causing vWD in both Shetland Sheepdogs and Scottish Terriers, VetGen is proud to exclusively offer a non-invasive, highly reliable DNA-based test to detect mutated vWD genes. This test provides breeders and owners a definitive answer as to whether an animal is an "Affected", "Carrier", or "Clear". With this information in hand, breeders and owners have key insight into their bloodstock and can proceed to make informed decisions about training, showing, and breeding plans for each dog.

By following the simple instructions provided in VetGen's DNA Sample Collection Kit, dog owners and breeders collect DNA samples using a soft cheek brush. By gently brushing the inside of the dog's cheek, cells containing DNA are removed. It is this DNA sample that VetGen analyzes to determine the genetic status of each dog. As soon as VetGen receives the completed DNA Sample Collection Kit, >the DNA samples are processed and a diagnosis is formed. Within two to four weeks, this diagnosis is provided to the customer in a summary report.
Useful for dogs of any age, the DNA sample collection, analysis, and reporting activities can be completed before puppies are placed at 6 to 10 weeks. As a supplement to the summary report, VetGen can assist its customers with genetic counseling services to further help them make informed breeding decisions to eliminate the vWD gene from their bloodlines while maintaining the integrity of their breed.

Disease Gene Frequency Tested

VetGen has been asked by the respective breed clubs to post, from time to time, the statistical results of the vWD DNA tests by breed. The table below contains the results as of July 28, 2008.

vWD Genotype

vWD Type III	Clear	Carrier	Affected
Scottish Terrier	89.7%	10%	0.3%
Shetland Sheepdog	90.3%	9.4%	0.3%

Breeding Strategies

VetGen's DNA test findings can be extremely valuable when developing and implementing your breeding plans.

Interpreting Your DNA Test Results for Autosomal Recessive Diseases

There are three possible test results: Clear, Carrier, and Affected. Below is a description of what each result means to you as a breeder.

Clear
This finding indicates that the gene is not present in your dog. Therefore, when used for breeding, a Clear dog will not pass on the disease gene.

Carrier
This finding indicates that one copy of the disease gene is present in your dog, but that it will not exhibit disease symptoms. Carriers will not have medical problems as a result. Dogs with Carrier status can be enjoyed without the fear of developing medical problems but will pass on the disease gene 50% of the time.

Affected
This finding indicates that two copies of the disease gene are present in the dog. Unfortunately, the dog will be medically affected by the disease. Appropriate treatment should be pursued by consulting a veterinarian.

Affected (In the case of vWD Type I)**
This finding indicates that two copies of the disease gene are present in the dog. These dogs always have a potential to bleed given the right circumstance and will always pass on the disease gene (mutation) to their progeny. Please see the following page, for more detailed information. vWD Report Also, inform your veterinarian and consult with him/her regarding this test result.

** In the case of Type I vWD - All puppies will be genetically Affected (see "Notes" below).

Helpful Canine Breeding Chart

The chart provided below outlines the implications of various breeding pair combinations. Remember, it is always best to breed "Clear to Clear". If followed by all breeders, these strategies will ensure a significant reduction in the frequency of the targeted disease gene in future generations of dogs. However, to maintain a large enough pool of good breeding stock, it may be necessary for some breeders to breed "Clear" to "Carriers" (see below).

	Clear Male	Carrier Male	Affected Male
Clear Female	100% Clear	50/50 Carrier/Clear	100% Carrier
Carrier Female	50/50 Carrier/Clear	25/50/25 Clr./Carr./Affctd.	50/50 Carrier/Affected
Affected Female	100% Carrier	50/50 Carrier/Affected	100% Affected

Ideal Breeding Pair - Puppies will not have the disease gene (neither as Carrier nor as Affected).

Breeding Is Safe - No Affected puppies will be produced. However, some or all puppies will be Carriers. Accordingly, it is recommended that Carrier dogs which are desirable for breeding be bred with Clear dogs in the future, which will produce 50% carrier and 50% clear animals, to further reduce the disease

gene frequency. These offspring should be tested by VetGen's test for this defective gene, and if possible, only the clear animals in this generation should be used.

High Risk Breeding - Some puppies are likely to be Carriers and some puppies are likely to be Affected. Even though it is possible that there will be some clear puppies when breeding "Carrier to Carrier", in general, neither this type of breeding pair nor "Carrier to Affected" are recommended for breeding.

Breeding Not Recommended - All puppies will be genetically and medically affected

Notes

1. The breeds who have vWD Type III and where a DNA test is currently available are: Scottish Terrier; Shetland Sheepdog;
2. The breeds who have vWD Type 1 and where a DNA test is currently available are: Bernese Mountain Dog, Doberman Pincher, German Pinscher, Kerry Blue Terrier, Manchester Terrier, Pembroke Welsh Corgi, Poodle and Papillon.

Prices

1 = $140 ea

2-7 = $119 ea

8+ or clinic = $98 ea

http://www.vetmed.wsu.edu/depts-VCPL/

Multidrug Sensitivity in Dogs

Some dog breeds are more sensitive to certain drugs than other breeds. Collies and related breeds, for instance, can have adverse reactions to drugs such as ivermectin and loperamide (Imodium). At Washington State University's College of Veterinary Medicine you can get your dog tested for drug sensitivity and keep up with the latest research.

Drug sensitivities result from a mutation in the multi-drug resistance gene (MDR1). This gene encodes a protein, P-glycoprotein that is responsible for pumping many drugs and other toxins out of the brain. Dogs with the mutant gene cannot pump some drugs out of the brain as a normal dog would, which may result in abnormal neurologic signs. The result may be an illness requiring an extended hospital stay -

Get Your Dog Tested*

Instructions for Pet Owners

The testing process is simple and no special training is required to collect the sample, which is obtained by brushing cells from the inside of the cheek. You will receive brushes and sample collection instructions in the Test Kit.

Order a Test Kit online. Do NOT send money when you order the test kit. You will be asked to include payment when you return the sample to our lab.

In the Test Kit you will receive sampling brushes, instructions for collecting a cheek swab DNA sample , and a submission form. Please include payment when you return your sample.

Test results will generally be available within two weeks. Samples must be received by 9 a.m. on Monday to receive test results on Friday of the same week. Along with the test results, you will receive an explanation of the results.

Prices

$70 US Dollars per test for 1-4 tests included in a single shipment

$60 US Dollars per test for 5 or more tests included in a single shipment (a 15% discount).

Affected Breeds

Approximately three of every four Collies in the United States have the mutant MDR1 gene. The frequency is about the same in France and Australia, so it is likely that most Collies worldwide have the mutation. The MDR1 mutation has also been found in Shetland Sheepdogs (Shelties). Australian Shepherds, Old English Sheepdogs, English Shepherds, German Shepherds, Long-haired Whippets, Silken Windhounds, and a variety of mixed breed dogs.

The only way to know if an individual dog has the mutant MDR1 gene is to have the dog tested. As more dogs are tested, more breeds will probably be added to the list of affected breeds.

Breeds affected by the MDR1 mutation (frequency %)

Breed	Approximate Frequency
Australian Shepherd	50%
Australian Shepherd, Mini	50%
Border Collie	< 5%
Collie	70 %
English Shepherd	15 %
German Shepherd	10 %
Herding Breed Cross	10 %
Long-haired Whippet	65 %
McNab	30 %
Mixed Breed	5 %
Old English Sheepdog	5 %
Shetland Sheepdog	15 %
Silken Windhound	30 %

MDR1 Breeding Guidelines

This chart provides guidelines for consideration when owners are contemplating breeding dogs that may be affected by the MDR1 mutation. While it is ideal to use only "Normal/Normal" breeding pairs, one must always consider other genetic factors in addition to the MDR1 gene. Because the MDR1 gene is present in such a large percentage of Collies and Australian Shepherds, it may be necessary to breed "Normal/Mutant" dogs in order to maintain a large enough pool of good breeding stock. By using thoughtful breeding strategies including these guidelines, future generations of dogs will have a substantial decrease in the frequency of the mutant MDR1 gene.

MDR1 Breeding Pair Combinations and Outcomes

	Normal/Normal Male	Normal/Mutant* Male	Mutant/Mutant Male
Normal/Normal Female	100% Normal/Normal puppies	Normal/Normal and/or Normal/Mutant puppies	100% Normal/Mutant puppies
Normal/Mutant* Female	Normal/Normal and/or Normal/Mutant puppies	Any combination of puppies	Normal/Mutant and/or Mutant/Mutant puppies
Mutant/Mutant Female	100% Normal/Mutant puppies	Normal/Mutant and/or Mutant/Mutant puppies	100% Mutant/Mutant puppies

*Normal/mutant is the same as mutant/normal and "heterozygote"

Problem Drugs

Many different drugs and drug classes have been reported to cause problems in Collies and other herding breed dogs that carry the MDR1 mutation. We and other researchers have documented the toxicity that occurs with several of these drugs.

Drugs that have been documented to cause problems in dogs with the MDR1 mutation include:

- **Acepromazine** (tranquilizer and pre-anesthetic agent). In dogs with the MDR1 mutation, acepromazine tends to cause more profound and prolonged sedation. We recommend reducing the dose by 25% in dogs heterozygous for the MDR1 mutation (mutant/normal) and by 30-50% in dogs homozygous for the MDR1 mutation (mutant/mutant).
- **Butorphanol** (analgesic and pre-anesthetic agent). Similar to acepromazine, butorphanol tends to cause more profound and prolonged sedation in dogs with the MDR1 mutation.We recommend reducing the dose by 25% in dogs heterozygous for the MDR1 mutation (mutant/normal) and by 30-50% in dogs homozygous for the MDR1 mutation (mutant/mutant).
- **Erythromycin.** Erythromycin may cause neurological signs in dogs with the MDR1 mutation. A mutant/mutant collie exhibited signs of neurological toxicity after receiving erythromycin. After withdrawal of the drug, the dogs neurological signs resolved. There were no other potential causes of neurological toxicity identified in the dog.
- **Ivermectin** (antiparasitic agent). While the dose of ivermectin used to prevent heartworm infection is SAFE in dogs with the mutation (6 micrograms per kilogram), higher doses, such as those used for treating mange (300-600 micrograms per kilogram) will cause neurological toxicity in dogs that are homozygous for the MDR1 mutation (mutant/mutant) and can cause toxicity in dogs that are heterozygous for the mutation (mutant/normal).
- **Loperamide** (Imodium™; antidiarrheal agent). At doses used to treat diarrhea, this drug will cause neurological toxicity in dogs with the MDR1 mutation. This drug should be avoided in all dogs with the MDR1 mutation.
- **Selamectin, milbemycin,** and **moxidectin** (antaparasitic agents). Similar to ivermectin, these drugs are safe in dogs with the mutation if used for heartworm prevention at the manufacturer's recommended dose. Higher doses (generally 10-20 times higher than the heartworm prevention dose) have been documented to cause neurological toxicity in dogs with the MDR1 mutation.
- **Vincristine, Vinblastine, Doxorubicin** (chemotherapy agents). Based on some published and ongoing research, it appears that dogs with the MDR1 mutation are more sensitive to these drugs with regard to their likelihood of having an adverse drug reaction. Bone marrow suppression (decreased blood cell counts, particulary neutrophils) and GI toxicity (anorexia, vomiting, diarrhea) are more likely to occur at normal doses in dogs with the MDR1 mutation. To reduce the likelihood of severe toxicity in these dogs (mutant/normal or mutant/mutant), we recommend reducing the dose by 25-30% and carefully monitoring these patients.

Drugs that are known to be pumped out of the brain by the protein that the MDR1 gene is responsible for producing but appear to be safely tolerated by dogs with the MDR1 mutation:

- **Cyclosporin** (immunosuppressive agent). While we know that cyclosporin is pumped by P-glycoprotein (the protein encoded by the MDR1 gene), we have not documented any increased sensitivity to this drug in dogs with the MDR1 mutation compared to "normal" dogs. Therefore, we do not recommend altering the dose of cyclosporin for dogs with the MDR1 mutation, but we do recommend therapeutic drug monitoring.
- **Digoxin** (cardiac drug). While we know that digoxin is pumped by P-glycoprotein (the protein encoded by the MDR1 gene), we have not documented any increased sensitivity to this drug in dogs with the MDR1 mutation compared to "normal" dogs. Therefore, we do not recommend altering the dose of digoxin for dogs with the MDR1 mutation, but do recommend therapeutic drug monitoring.
- **Doxycycline** (antibacterial drug). While we know that doxycycline is pumped by P-glycoprotein (the protein encoded by the MDR1 gene), we have not documented any increased sensitivity to this drug in dogs with the MDR1 mutation compared to "normal" dogs. Therefore, we do not recommend altering the dose of doxycycline for dogs with the MDR1 mutation.

Drugs that may be pumped out by the protein that the MDR1 is responsible for producing, but appear to be safely tolerated by dogs with the MDR1 mutation:

- **Morphine, buprenorphine, fentanyl** (opioid analgesics or pain medications). We suspect that these drugs are pumped by P-glycoprotein (the protein encoded by the MDR1 gene) in dogs because they have been reported to be pumped by P-glycoprotein in people, but we are not aware of any reports of toxicity caused by these drugs in dogs with the MDR1 mutation. We do not have specific dose recommendations for these drugs for dogs with the MDR1 mutation.

The following drugs have been reported to be pumped by P-glycoprotein (the protein encoded by the MDR1) in humans, but there is currently no data stating whether they are or are not pumped by canine P-glycoprotein. Therefore we suggest using caution when administering these drugs to dogs with the MDR1 mutation.

- Domperidone
- Etoposide
- Mitoxantrone
- Ondansetron
- Paclitaxel
- Rifampicin

There are many other drugs that have been shown to be pumped by human P-glycoprotein (the protein encoded by the MDR1 gene), but data is not yet available with regard to their effect in dogs with the MDR1 mutation.

Frequently Asked Questions

Can Collie crosses or other herding breed crosses carry the mutant MDR1 gene and have an adverse reaction to a normal dose of drugs?

Yes, it is less likely in a mixed breed, but still possible. We have found the mutant gene in a Saint Bernard mix that had an adverse drug reaction. The veterinarian did note that each eye was a different color, like some Australian Shepherds.

How old must a dog be before it can be tested?

A puppy can be tested as soon as it is weaned from its mother. Why do we recommend waiting until the puppy is weaned? Since we sample the inside of the dog's mouth, and milk can contain a few cells from the mother, it is possible that the puppy's sample could contain enough of the dam's DNA to generate a false result.

Can mixed breed dogs have the MDR mutation?

YES! We have found the MDR1 mutation in many mixed breed dogs - even dogs that don't look like herding breed dogs. Mixed breed dogs should be tested for the mutation before receiving anti-mange doses of ivermectin.

Why are affected dogs called "mutants"?

A gene is a section of DNA that is responsible for producing a particular protein in the body. When a dog (or other organism) has a DNA sequence that produces a defective protein, that animal is said to have a mutation in that gene. Individual animals that have a mutation in a particular gene are considered to have the mutant form of the gene. Unfortunately, the word "mutant" in lay language often carries a negative connotation.

What heartworm prevention products can I use if my dog has the MDR1 mutation?

Fortunately, the dose of ivermectin, selamectin, milbemycin and moxidectin in the commercial heartworm preparations are low enough to be used safely even in dogs with the MDR1 mutation. It is only when the drugs are used at high doses, such as those used to treat mange (50 times higher dose than the heartworm prevention dose), that dogs with the mutation will develop neurological toxicity. Attempting to use large animal formulations of these drugs is likely to cause neurological toxicity because it is difficult to accurately measure

Can individuals outside the United States order a test kit?

Yes, we can run samples from any country **except** Australia , New Zealand or European countries (including Britain). For those countries, please see the links below. If you have questions please contact us at VCPL@vetmed.wsu.edu.