URBAN ANIMAL

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COMPREHENSIVE

canine DNA screen

ADVANCED GENOMICS TESTING FOR YOUR DOG'S HEALTH

REPORT FOR MORPHEUS

ThermoFisher SCIENTIFIC

CANINE TRAITS & DISORDERS PANEL

POWERED BY GeneTech

URBAN ANIMAL

Canine DNA Screen

Report for

Morpheus

Basic Details

Breed:	**Morpheus**	Sex :	**Male**	Age :	**2 weeks**
Parents:	**German Shepherd (M) German Shepherd (F)**	Weight:	**1 kgs**	Height:	**8 cm**
Known health conditions:	**No known health conditions specified**		**/**		**/**

Sample Details

Reference Id:	**REF21121001**	Collected:	**12/12/2021 5:30PM**	Sample Type:	**Swab Kit**
Lab Ref Id:	**SLCTD01001**	Received:	**13/12/2021 1:00PM**	Reported:	**26/12/2021**

Reference Details

Referring Vet:	**Dr. Shalini Upadhyay**	Clinic's Name:	**Animal Care Clinic**
Clinic Address:	#14 Rajbhavan Road, Beside Yashoda Hospital,		
Owner name:	**Kamakshi Setubandhu**	Email Address:	**k.setubandhu@gmail.com**
Owner Address:	721, Block-D, Lake View Apartments, Rajbhavan Road, Somajiguda, Hyderabad, Telangana 500082		

Genomics Test Details

Panel:	**Thermofisher Canine GenomicsTraits and Disorders, Version 1 Panel - Canine Traits and Disorders, Version 1**		
Laboratory:	**GeneTech**	Technology:	**NGS**
Machine:	**Ion GeneStudio S5 and Ion Chef**	LibPrep Solution:	**Ampliseq based AgriSeq**
Panel size:	**154 markers 97 SNPs, 6 MNPs, 13 Ins, 38 Del**	Marker Coverage:	**134 Genetic Disorders, 20 Traits**

SUMMARY OF RESULTS

Disorders	**1**
Carrier	**2**

DISORDERS IDENTIFIED
Achromatopsia-2

CARRIER STATUS IDENTIFIED
Amelogenesis Imperfecta
Leukocyte Adhesion Deficiency, Type III

Traits	1

TRAITS IDENTIFIED
Coat Color, Brown

TABLE OF CONTENTS

Introduction

Dogs are true companions of humans. There are many health issues that can affect dogs starting from common infections and allergies to complex genetic conditions which may set in early or could be late onset. It is vital to be aware of the health risks to the dog and provide care necessary for its healthier life and overall well-being.

About Canine DNA Screen

Canine DNA screen is a genomics test for dogs offered to pet owners and veterinarians. It allows identification of multiple diseases in a single test and makes it possible to profile the pets in advance, and provide better management and care for the pet. GeneTech's Canine DNA Screen genetic panel is based on Thermofisher's Canine Disorders and Traits Panel which was developed based on extensive research in Canine Genomics and Veterinary Science.

The genomics panel offers screening for diseases recommended by ISAG (International Society for Animal Genetics) and more. The panel identifies selected 134 gene variants that are associated with common inherited conditions in different dog breeds along with 20 different variants associated with breed traits related to coat, hair and tail. Next generation sequencing (NGS) is used by the laboratory to identify gene variations or mutations.

Canine DNA Screen is a screening test and further confirmatory tests may be required based on clinical correlation and veterinarian's recommendations.

What is a Genetic Disorder?

A genetic disorder is a health condition caused by an abnormal genetic change usually called as mutation. Although some of these mutations occur spontaneously, a majority of them are inherited and are hereditary. Around 400 hereditary diseases known in canines are caused by mutations in 19,000 genes spread across 78 chromosomes. Genetic disorders either result in multi organ defects and metabolic dysfunction or may alter only one functional system of dog's health such a vision, skin, immune system, nerve and muscular function etc.

These genetic disorders are not uncommon and are not exclusive to pure breeds although they might be extensively reported in few selected breeds.

How is a genetic disorder inherited from a parent to the pup?

Inheritance is the process by which genetic information is passed on from parent to offspring. Nature provides two copies of gene for all bodily functions of which one copy comes from father and other from mother. Every genetic disorder inherits in a specific manner as given below:

- **Autosomal Dominant:** If a disease is expressed in a dog with one copy of abnormal gene and one copy of normal gene. The risk on passing on such a disease to offspring is 50%.
- **Autosomal Recessive:** If a disease is expressed in a dog only if both copies of the gene are abnormal. Such a pattern is common with 25% risk to offspring if both parents are unaffected carriers with one abnormal gene copy each.
- **X-linked:** The disease is expressed only in male dogs and female dogs are unaffected carriers.
- **Complex:** The inheritance of disease is called complex when it results due to multiple genes and their interaction with environmental factors.

There are some disorders for which the inheritance pattern is unknown and a few with more than one inheritance pattern associated.

How does Canine DNA Screen help?

- Early diagnosis and preventive care are possible before the symptoms set inEarly diagnosis and preventive care are possible before the symptoms set in
- Potential dog owners may choose to adopt a dog based on test result
- Carrier status for diseases can be identified, which allows choice of right parents in breeding programs to reduce disease risk in pups
- Veterinarians can offer evidence based, effective management and treatment to the dog

A GUIDE TO THE DNA SCREENING REPORT

Introduction to genetic terms used in the report

DNA is the genetic material present in every cell containing a code that controls various functions in your pet's body.

Gene is a unit of DNA with genetic information or code to produce a specific protein or an enzyme in your pet's body to perform a specific function.

Gene Mutations or Gene Variants are specific changes of the genetic code at specific locations on the genes. These change of code result in a protein variation resulting in a health issue.

Genetic Disease or Disorder is a particular abnormal health condition affecting function of a body or a part of dog's body due to a genetic change. Based on the organ system involved, dog's genetic disorders can be one the following types:

How does Canine DNA Screen help?

- Ophthalmic (Vision problems related to eye)
- Dental (Teeth and denture related)
- Neurological (Disorders of the nervous system)
- Immunological (Conditions with immune dysfunction)
- Endocrine (hormonal or endocrine disorders)
- Skeletal (Bone defects)
- Respiratory (Breathing conditions)
- Hepatological (Liver disorders)
- Dermatological (Skin conditions)
- Metabolic (Abnormal body metabolism or enzyme defects)
- Hematological (Blood tissue related disorders)
- Gastrointestinal (Digestive system defects)
- Muscular (Muscle dysfunction)
- Renal (Kidney and urinary defects)

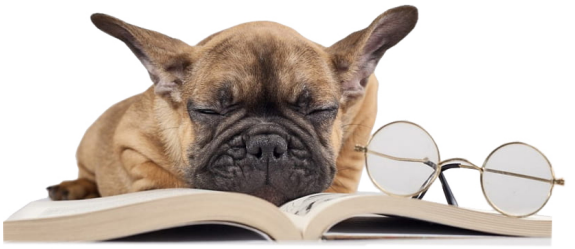
Genetic Trait is a distinguishing quality or characteristic of the dog determined by genetic factor or change.

Autosomal: Dogs have 78 chromosomes (39 pairs) with 38 pairs are autosomes (non-sex chromosomes) and one pair of sex chromosomes (X and Y).

Inheritance is the process by which genetic information is passed on from parent to offspring. Nature provide two copies of gene for all bodily functions of which one copy comes from father and other from mother.

How to read Canine DNA Screen Result?

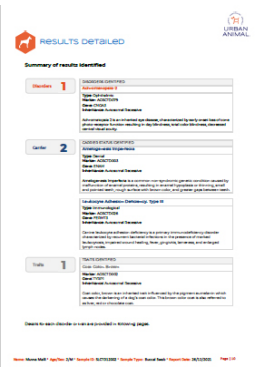
We have designed this report carefully to provide you with as much information as possible in a simple yet comprehensive fashion. The detailed Table of Contents page guides you to various parts of the report.t



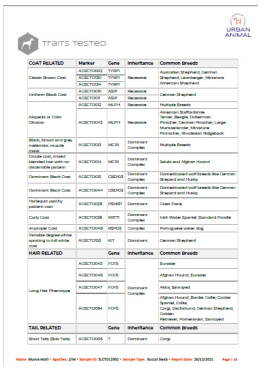
Canine DNA Screen aims at identification of the following by testing 154 genetic markers:

- Is your dog affected with any of the inherited genetic conditions tested?
- If your dog an unaffected carrier for any of these conditions?
- What are the genetic traits (among those the panel tests) that your dog has inherited?

Results Summary Page



Detailed Results Page



List of Traits Tested

List of Disorders Tested

DISORDER DETAILS PAGE

One page for each positive marker identified. Find details below on how to read/use this page.

Marker details table
Provides details about the marker that tested positive along with full gene name.

Onset and Prognosis
Not all genetic diseases express at birth and presentation of symptoms may vary within the breed or across breeds. Progression of the disease may be slow or rapid. This section describes what is known about this condition in this regard.

Dog Breeds
Some diseases are widely reported in certain breeds which are mentioned in this section.

Management
Disease management is provided in a distilled fashion in this section. Preventive measures, dietary management, medical care, and promising treatments in development are covered.

Discuss your pet's report with veterinarian before implementing any of the recommendations provided in this section.

Limitations of Canine DNA Screen report

Product and Technology Limitations

- The test is limited to the genes and diseases tested in the panel. Genetic disorders associated with genes not included in the panel cannot be diagnosed.
- A genetic disease can be caused by multiple variants of a gene. However, only selected variants (which are commonly reported for certain breeds) are included in the panel for testing. In case your pet is clinically showing symptoms of any genetic condition and your Canine DNA Screen report is negative for the disease, please consult our geneticist for available confirmatory options.
- The panel is based on current research. More and more genes and their association with diseases are being discovered. Newer versions of the panel will be released periodically and shall be used. Write to us if you need more information on this.
- Complex polygenic genetic disorders caused by multiple genes are not covered in this test.
- Clinical correlation of the genetic report is strongly recommended.
- Recommendations provided in the report are general. Veterinarian consultation is mandatory.
- Next Generation Sequencing technology was used to generate the data for analysis. Next Generation Sequencing (NGS) is the latest technology for multi-gene sequencing with 99% accuracy and sensitivity.

URBAN ANIMAL

Results detailed report

Summary of results identified

Disorders	**1**

Disorders identified

Achromatopsia-2

Type: Ophthalmic

Marker: AGSCTD079

Gene: CNGA3

Inheritance: Autosomal Recessive

Summary: Achromatopsia 2 is an inherited eye disease, characterized by early onset loss of cone photo-receptor function resulting in day blindness, total color blindness, decreased central visual acuity.

Carrier	**2**

CARRIER STATUS IDENTIFIED

Amelogenesis Imperfecta

Type: Dental

Marker: AGSCTD003

Gene: ENAM

Inheritance: Autosomal Recessive

Summary: Amelogenesis Imperfecta is a common non-syndromic genetic condition caused by malfunction of enamel proteins, resulting in enamel hypoplasia or thinning, small and pointed teeth, rough surface with brown color, and greater gaps between teeth.

Leukocyte Adhesion Deficiency, Type III

Type: Immunological

Marker: AGSCTD026

Gene: FERMT3

Inheritance: Autosomal Recessive

Summary: Canine leukocyte adhesion deficiency is a primary immunodeficiency disorder characterized by recurrent bacterial infections in the presence of marked leukocytosis, impaired wound healing, f ever, gingivitis, lameness, and enlarged lymph

nodes.

Traits	1

TRAITS IDENTIFIED

Coat Color, Brown

Marker: AGSCTD002

Gene: TYRP1

Inheritance: Autosomal Recessive

Summary: Coat color, brown is an inherited trait influenced by the pigment eumelanin which causes the darkening of a dog's coat color. This brown color coat is also referred to as liver, red or chocolate coat.

Details for each disorder or trait are provided in following pages.

Ophthalmic
Achromatopsia-2

Marker:	**AGSCTD079**	Gene Name:	**Cyclic Nucleotide Gated Channel Alpha 3**		Gene:	**CNGA3**
Category:	**Ophthalmic**	Condition:	**Achromatopsia-2**		Inheri tance:	**Autosomal Recessive**
Chr#:	CHR10	Genotype	Reference:	Var Found:		OMIA #:

About the Condition

Achromatopsia, also called as day blindness or color blindness, is characterized by cone photoreceptor dysfunction of the eye, leading to severely reduced or complete vision loss during day light hours. Dogs show signs of avoiding bright light or distress in bright light (photophobia), nystagamus (uncontrolled eye movements) and sometimes total colour-blindness. CNGB3 gene associated Achromatopsia is a rare genetic condition with complete loss of cone photoreceptor function while rod photoreceptors remain intact. Cataract development may also occur frequently in affected dogs.

Onset and Prognosis

Symptoms appear early between 8-12 weeks of age when owner observes pup's difficulty in negotiating obstacles. Initially cones start developing but once non-functional, their inner and outer segments gradually deteriorate, followed by a slow loss of cones throughout the dog's lifetime. Cone function loss is confirmed by electroretinography.

Dog Breeds

CNGA3 gene associated congenital Achromatopsia is reported in German Shepherds and Labrador Retrievers.

Genetics and Inheritance

Mutation in CNGA3 gene causes dysfunction of retinal phototransduction pathway, leading to congenital Achromatopsia-2. It is an autosomal recessive disorder, resulting when two copies of CNGA3 gene carry the mutation, one copy inherited from each parent. Unaffected carrier parents have 25% risk of having a pup with Achromatopsia-2.

Management

1. Although currently, there is no cure, clinical trials in the area of gene therapy are showing encouraging results for treating CNGA3 associated Achromatopsia-2. 2. Avoid additional damage to retina by walking the dog in shady regions, avoiding bright and direct sunlight. 3. Regular ophthalmic check-ups, electroretinography as directed by Veterinarian 4. Avoid using affected dogs and unaffected carrier parents in breeding programs

References

1.Tanaka, N., Dutrow, E.V., Miyadera, K., Delemotte, L., MacDermaid, C.M., Reinstein, S.L., Crumley, W.R., Dixon, C.J., Casal, M.L., Klein, M.L., Aguirre, G.D., Tanaka, J.C., Guziewicz, K.E.**: Canine CNGA3 Gene Mutations Provide Novel Insights into Human Achromatopsia-Associated Channelopathies and Treatment.**PLoS One 10:e0138943, 2015.