

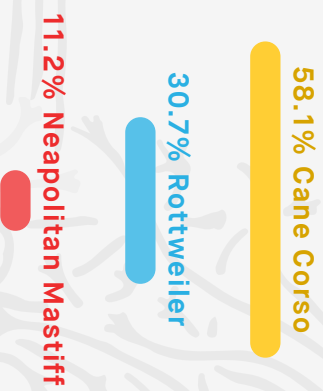
OWNER'S NAME: Carey Smith

DOG'S NAME: Rocco

TEST DATE: March 10th, 2018

This certifies the authenticity of **Rocco's** canine genetic background as determined following careful analysis of more than 200,000 genetic markers.

Welcome to the  
**Embarc** family!



WOLFINESS **0.3% LOW**  
MATERNAL HAPLOTYPE **A275**  
PATERNAL HAPLOTYPE **H7**



Adam Boyko, Ph.D.  
CHIEF SCIENCE OFFICER



Ryan Boyko  
CHIEF EXECUTIVE OFFICER

## BREED MIX



## GENETIC STATS

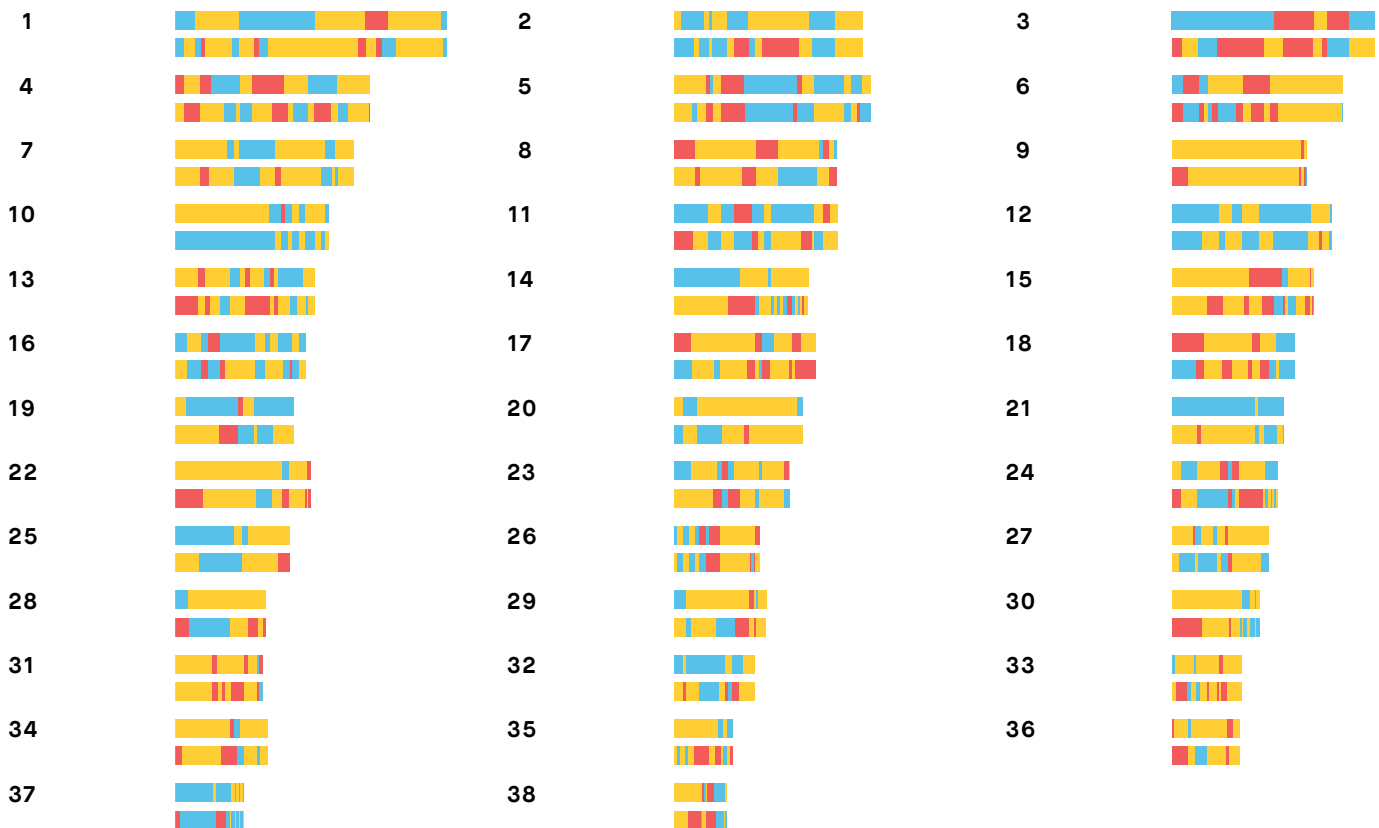
Wolfiness: 0.3 % **LOW**  
Predicted adult weight: **109 lbs**  
Genetic age: **63 human years**

## TEST DETAILS

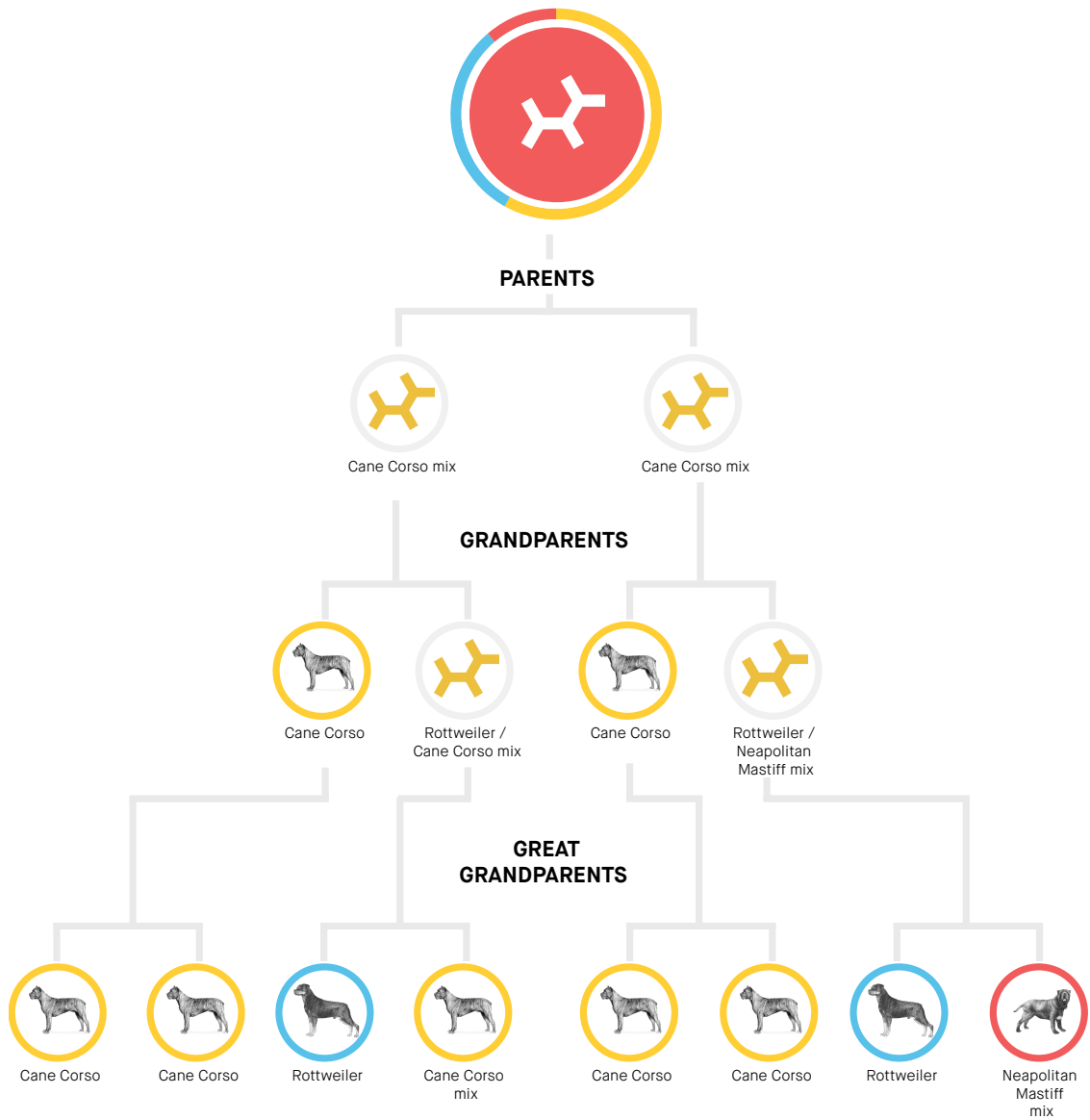
Swab number:

## BREED MIX BY CHROMOSOME

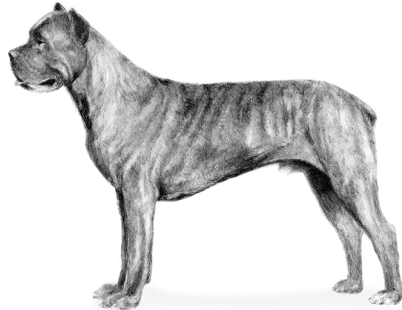
Our advanced test identifies from where Rocco inherited every part of the chromosome pairs in his genome.



## FAMILY TREE



Our algorithms predict this is the most likely family tree to explain Rocco's breed mix, but this family tree may not be the only possible one.

**Alternative Names****Fun Fact**

The Cane Corso is seen as the most athletic of the Mastiff-type dogs, excelling in agility and speed.

**CANE CORSO**

The Cane Corso is a Mastiff-type dog that likely descended from Roman war dogs. They were bred in Italy to function as a guard dog and to hunt large game, while also fulfilling general farmland tasks. As farming changed and became more mechanized in the 20th century, Cane Corso numbers declined hugely. However, the breed avoided extinction and was rebuilt in the 1970s. While first entering the USA in the late 80s, this breed wasn't officially recognized by the AKC until 2010.

The Cane Corso is physically impressive, boasting a muscular shape and possessing great strength. This is an intelligent breed that requires mental stimulation as well as plenty of exercise. They have a strong personality that can see them try to be dominant with their owner, so training them while young is important to avoid this happening when they are fully grown and more difficult to control. The Cane Corso has a short coat which makes it relatively easy to maintain - although their size can make brushing a time-consuming task. The Cane Corso is ranked as the 35th most popular breed.

**RELATED BREEDS**

**Rottweiler**  
Sibling breed



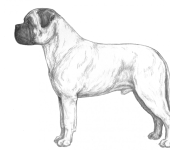
**Neapolitan Mastiff**  
Sibling breed



**Boxer**  
Cousin breed



**Dogue de Bordeaux**  
Cousin breed



**Bullmastiff**  
Cousin breed



**Bulldog**  
Cousin breed

## ROTTWEILER



Descended from ancient Roman Molosser-type dogs, the Rottweiler is one of the oldest herding breeds. In Germany where the breed was developed, Rottweilers were especially useful guarding valuable shipments as well as driving cattle and other stubborn livestock that tended to ignore border collies and other less powerful breeds. With the advent of railroads, the breed almost became extinct by the end of the 19th century, but is now one of the most popular breeds in the US and abroad.

Because they are protective, these loving and loyal dogs can also show aggression if not properly socialized and trained. With proper training, however, they are not only great family dogs and household protectors, but also suitable for police and military work. Intelligent, energetic and loving, these dogs need exercise and stimulation (as well as cuddles). They have a short, high-shedding coat and a high tendency of drooling. They are also at risk of hip dysplasia and bone cancer and vulnerable to parvovirus.

### Alternative Names

### Fun Fact

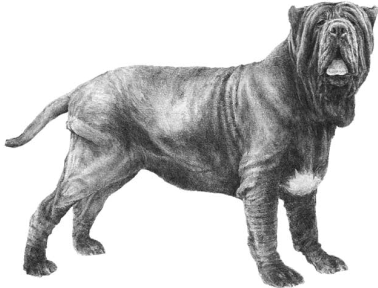
Snoring is more common in Rottweilers than in most any other breed!

## RELATED BREEDS



**Great Dane**  
Cousin breed

## NEAPOLITAN MASTIFF



Unless you've been to Jurassic Park, you've never seen anything like a Neapolitan Mastiff. These majestic guardians of startling appearance are massive, powerful dogs. The U.S. Neapolitan Mastiff Club describes their dog's head as "astounding"—and give them credit for hitting upon just the right adjective. The profuse hanging wrinkles and folds, and pendulous lips, make the Neapolitan Mastiff look like a marzipan Mastiff that's been out in the sun too long. And yet, the breed's inner dignity and nobility can only be described as beautiful. The Neapolitan Mastiff, also known as the Mastino, is an estate guard dog from Italy. The breed traces its roots to the dogs of war used by the Roman Army. The breed then existed on estates and farms across Italy for the past two millennia, known as the "big dog of the little man" - the extraordinary dog of the ordinary man. It's fun inventing new ways to describe this astonishing dog, but acquiring a Mastino should be the product of serious consideration. If you've read our pages devoted to other big protective breeds, you already know how important it is to apply firm training and socialization early, while the pup is still small enough to handle. Mastinos might not be a good fit for novice dog owners. But for experienced big-dog owners looking for something different, the Mastino is as different as it gets.

### Alternative Names

### Fun Fact

Did you know the Neapolitan Mastiff can weigh over 150 pounds?

### RELATED BREEDS



**Cane Corso**  
Sibling breed



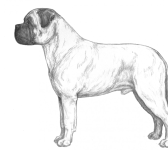
**Rottweiler**  
Sibling breed



**Boxer**  
Cousin breed



**Dogue de  
Bordeaux**  
Cousin breed

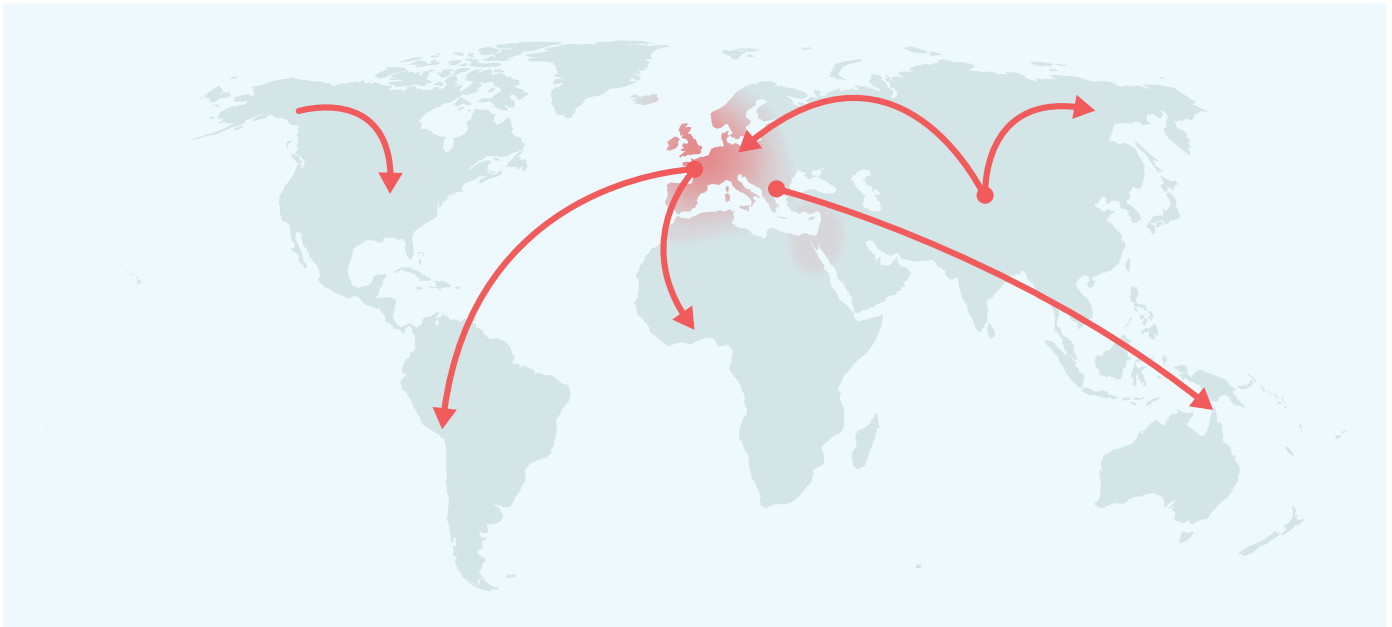


**Bullmastiff**  
Cousin breed



**Bulldog**  
Cousin breed

## MATERNAL LINE



Through Rocco's mitochondrial DNA we can trace his mother's ancestry back to where dogs and people first became friends. This map helps you visualize the routes that his ancestors took to your home. Their story is described below the map.

### HAPLOGROUP: A1e

This female lineage likely stems from some of the original Central Asian wolves that were domesticated into modern dogs starting about 15,000 years ago. It seemed to be a fairly rare dog line for most of dog history until the past 300 years, when the lineage seemed to "explode" out and spread quickly. What really separates this group from the pack is its presence in Alaskan village dogs and Samoyeds. It is possible that this was an indigenous lineage brought to the Americas from Siberia when people were first starting to make that trip themselves! We see this lineage pop up in overwhelming numbers of Irish Wolfhounds, and it also occurs frequently in popular large breeds like Bernese Mountain Dogs, Saint Bernards and Great Danes. Shetland Sheepdogs are also common members of this maternal line, and we see it a lot in Boxers, too. Though it may be all mixed up with European dogs thanks to recent breeding events, its origins in the Americas makes it a very exciting lineage for sure!

### HAPLOTYPE: A275

Part of the large A1e haplogroup, this haplotype occurs most commonly in Neapolitan Mastiffs. It's a rare find!

## PATERNAL LINE



Through Rocco's Y chromosome we can trace his father's ancestry back to where dogs and people first became friends. This map helps you visualize the routes that his ancestors took to your home. Their story is described below the map.

### HAPLOGROUP: D

The D paternal lineage is very common in well-known populations of dogs. Breeds belonging to the D lineage likely have direct male ancestors that can be traced all the way back to the origin of domestic dogs themselves! One popular breed that commonly sports a D lineage is the Boxer. Boxers were developed in the late 19th century from Mastiff dogs, so it is no surprise that D is well represented among Mastiffs, Bulldogs, as well as Terriers. Intriguingly, D is also found among Lhasa Apsos, an ancient Tibetan breed, and Afghan Hounds. While the presence of this lineage in Polynesia or the New World can be chalked up to interbreeding with European dogs brought during voyages of discovery or later settlement, D is also well represented among village dog populations in the Middle East and Africa. If the fact that we find dogs bearing a D lineage in the Middle East (not to mention the large amount of diversity among Middle Eastern D lineage males) is any indication of ancient residence in that region, then the presence among Oceanian village dogs is peculiar. Rather, it may be that D is

### HAPLOTYPE: H7

Part of the D haplogroup, this common haplotype has been found in French Bulldogs, Afghan Hounds, Bull Terriers, and village dogs spanning from South America to Africa and into the South Pacific.



## TRAITS

### Coat Color

E Locus (Mask/Grizzle/Red)	<b>E<sup>m</sup>E</b>
K Locus (Dominant Black)	<b>K<sup>B</sup>k<sup>V</sup></b>
A Locus (Agouti)	<b>a<sup>Y</sup>a<sup>t</sup></b>
D Locus (Dilute)	<b>dd</b>
B Locus (Brown/Chocolate/Liver)	<b>BB</b>

### Other Coat Traits

Furnishings / Improper Coat (RSPO2)	<b>II</b>
Long Haircoat (FGF5)	<b>GG</b>
Shedding (MC5R)	<b>TT</b>
Curly Coat (KRT71)	<b>CC</b>

### Body Size

Body Size - IGF1	<b>NN</b>
Body Size - IGF1R	<b>GG</b>
Body Size - STC2	<b>TT</b>
Body Size - GHR (E195K)	<b>GG</b>
Body Size - GHR (P177L)	<b>CC</b>

### Other Body Features

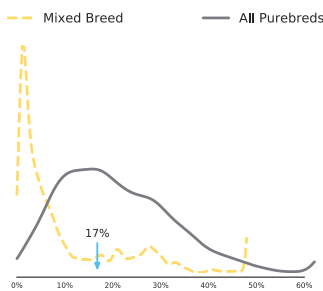
Brachycephaly (BMP3)	<b>CC</b>
Natural Bobtail (T)	<b>CC</b>
Hind Dewclaws (LMBR1)	<b>CC</b>

### Performance

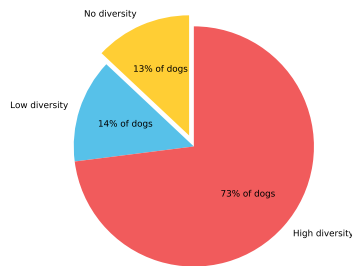
Altitude Adaptation (EPAS1)	<b>GG</b>
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### Genetic Diversity

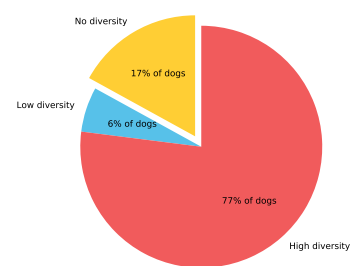
Inbreeding Coefficient **17%**



MHC Class II - DLA DRB1  
**No Diversity**



MHC Class II - DLA DQA1 and DQB1  
**No Diversity**



## CLINICAL TRAITS

These clinical genetic traits can inform clinical decisions and diagnoses. These traits do not predict a disease state or increased risk for disease. We currently assess one clinical trait: Alanine Aminotransferase Activity.

### **Alanine Aminotransferase Activity result: Low Normal**

Rocco has one copy of a mutation associated with reduced ALT activity as measured on veterinary blood chemistry panels. Please inform your veterinarian that Rocco has this genotype, as ALT is often used as an indicator of liver health and Rocco is likely to have a lower than average resting ALT activity. As such, an increase in Rocco's ALT activity could be evidence of liver damage, even if it is within normal limits by standard ALT reference ranges.

#### More information on Alanine Aminotransferase Activity:

Known to be highly expressed in liver cells, activity levels of alanine aminotransferase, or ALT, is a common value on most blood chemistry panels and is known to be a sensitive measure of liver health. Dogs with two ancestral G alleles show "normal" activity. Dogs that have one or two copies of the derived A allele may have lower resting levels of ALT activity, known as "low normal". If your dog's result is "low normal" then when a blood chemistry panel is being interpreted the values that you and your veterinarian consider "normal" may need to be adjusted. Please note that neither a "normal" nor a "low normal" result for this predicts a disease state or increased risk for liver disease. Moreover, this mutation does not associate with increased levels of ALT: If your dog has high ALT levels, please consult your veterinarian.

## HEALTH

Good news! Rocco did not test positive for any of the genetic diseases that Embark screens for.

**0**  
AT RISK

**0**  
CARRIER

## OTHER CONDITIONS

Good news! Rocco tested clear for 3 genetic conditions that are common in his breed mix.

- Multidrug Sensitivity (MDR1)
- Canine Multifocal Retinopathy cmr1 (BEST1 Exon 2)
- Degenerative Myelopathy (SOD1A)

## FULL TEST PANEL

To help ensure healthy breeds, every test includes analysis of our full panel of over 160 genetic diseases.

Rocco is also clear of 162 other genetic diseases that Embark tests for.