

Pedigree Analysis

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OVERVIEW OF THE ISSUE

The term pedigree is an old word which is derived from the French "pie de grue", meaning crane's foot. The drawn pedigree was first used in the breeding of cattle and other domestic livestock. Now after more than six centuries, the tradition of using it as a primary breeding tool continues. Over time breeders learned the important uses of a pedigree were to identify carriers along with the strengths and weaknesses of each ancestor. Thus, when the frequency of a trait or disease occurred among the ancestors it should serve as a signal that something is likely to be heritable.

The Traditional Pedigree is the most popular of the pedigrees used by breeders. Unfortunately, the Traditional Pedigree, as a breeding tool has many shortcomings. Most notable is the importance it places on memory and knowing the names and titles of the ancestors which are not heritable. The custom has been for breeders to recognize and associate names and titles with what could be remembered about the traits and characteristics of each ancestor. This approach lacked reliability and it did not capture the information needed to plan a breeding. Another problem associated with the Traditional Pedigree occurred when litters were evaluated. When something worked, credit was given to the pedigree and the breeder. When it didn't, there was no record or source of information to be reviewed. This made it ineffective as a breeding tool. Perhaps its major criticism was that it did not lend itself to collecting the right kinds of information in sufficient detail to be useful to plan a breeding. A review of how most Traditional Pedigrees are used show that scribbled notes around the edges and in the margins typically serve as the record system. Words such as "beautiful coat", "wonderful type", a title or the name of a famous offspring becomes the information a breed has to use. This approach fails to collect what is relevant or specific to making improvements. In short, breeders had no way to learn from their mistakes.

Two other pedigrees were developed to compensate for the limitations of the Traditional Pedigree. The first was called the Stick Dog Color Chart Pedigree. It's focus is on the traits of conformation. The other is called the Symbols Pedigree. It is used to track and analyze health, performance and other special traits of interest.

Figure 1. Traditional Pedigree

CERTIFICATE OF PEDIGREE	
	Am/Can GV Ch WeLove DuChain's R-Man ROM OFA
	BIS Am/Can Sel. Ch. Kismet's Sight For Sore Eyes ROM, OFA DNA certified
	Kismet's Sweetheart Deal ROM OFA
2003 Fut. Ch	O Danny Boy of Heinerburg, OFA Prelim DNA certified
	Ch Schokrest San Diego OFA
	Magic Moment of Heinerburg
	Cartel's Amber v Heinerburg (litter sister to Ch Levi OFA)
PUPPY "E" LITTER	
	BIS Am/Can Sel. Ch Kismet's Sight For Sore Eyes ROM OFA DNA certified
	Ch Tindrock-Kaleef Thyme
	Ken-Delaine's Katrina OFA ROM
Van Cleve's	Cassandra v Kaleef OFA, DNA certified
	Ch Brier Hill's Storm Buddy
	Ch Kaleef's Blondie HS
	Ch Hollow Hill's Sierra v Cherpa OFA

Notice that the Traditional pedigree in Figure 1 is easy to read, but it does not display the kinds of information needed to make decisions. For example, no information is collected about the carriers, normal or affected ancestors. It is not clear which ancestor(s) has the desirable and undesirable traits. The Traditional pedigree as a record, forces breeders to rely on titles, certificates and winning records all of which must be remembered.

STICK DOG COLOR CHART PEDIGREE

The Stick Dog Color Chart Pedigree was originally developed for research and computer analysis. Later, it was adapted to meet the needs of breeders.

Coding Traits

The Stick Dog Color Pedigree allows breeders to see the strengths and weaknesses of each ancestor based on the breed standard. The logic underlying this pedigree is that each ancestor is represented as a stick figure of coded information. Rather than a name and or title, each ancestor is drawn as a stick figure with seven structural parts: ears, head, neck, front, back, rear and tail. Each part is coded for its quality using four mutually exclusive colors. Each color is used to signify the rank or quality of the trait based on the breed Standard.

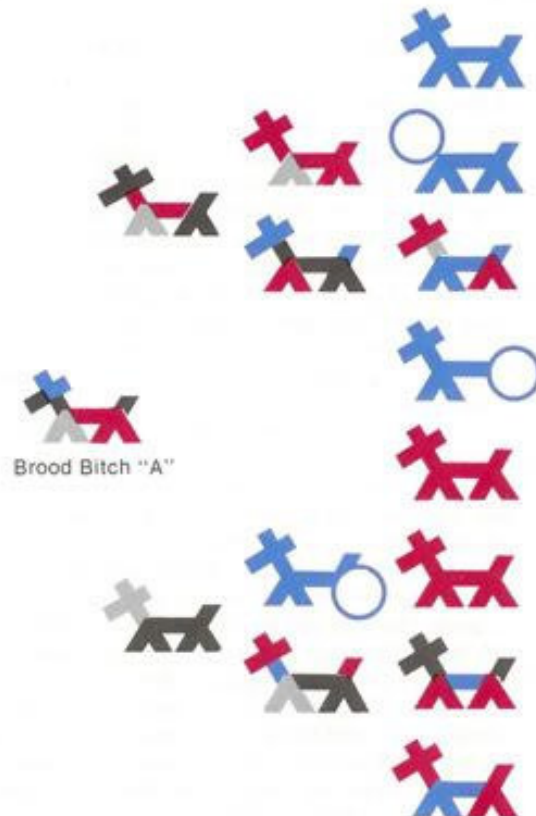
The Stick Dog Color Chart Pedigree helps breeders to identify and rank the traits of conformation of each ancestor using the seven key traits of conformation. Each trait is assigned a quality (rank) using a color-code. Notes are added to each stick figure to supplement and clarify the color codes.

Use of Color to Code Triats

RIBBONS	CODES	RANK FOR QUALITY
Blue	Blue	First place quality
Red	Red	Second place quality
Yellow	Yellow	Third place quality
White	Black	Fourth place quality

The rules used to code the quality of a trait or the lack there of, is straight forward. When a trait is coded with a first place color (blue), it is viewed to be correct or ideal based on the breed standard. For example, if the ears on a sire were coded blue and those on the dam were coded black, the breeder would know that the sire's ears were correct but the ears on the dam were not correct and lacking in some way. Thus, the color-coding of each ancestor identifies their qualities along with their specific strengths and weaknesses. The color codes also show if there are trends or problems and whether they are on the sire or dams side of the pedigree.

Figure 2. Stick Dog Pedigree



Notice that brood bitch "A" has a fourth place front as does her father, grandfather, and her grandmother on her mother's side. Thus, in the first two generations, three out of six ancestors or 50% of her ancestors all have the same fourth place front. This suggests that she inherits her faulty front legitimately from her ancestors. It should also be noticed that poor fronts occur on both sides of her pedigree. This is useful information when searching for the right stud dog and traits he is expected to improve.

SEARCHING THE GENOTYPES

Researchers and breeders often use the term phenotype and genotype. Phenotype refers to the characteristics that can be seen, meaning their external appearance. Hence, a dog that is observed to be black (phenotype) may or may not produce only black puppies. It could have a genetic make-up (genotype) that includes the genes for other colors. Since genotypes can not be seen directly, indirect methods must be used to learn about them. Indirect methods are not estimates or guessing games. Instead, they require the collection of detailed information about each ancestor and each of their littermates, usually for three generations. Those who do not collect and code information about the ancestors and their littermates usually rely on "type" breeding. This means they select sires and dams based on their appearance rather than on the traits observed in their offspring or the relationship that exists between them. Many times "type" breeding simply means breeding the winners to the winners. In practice, these breedings fail to take advantage of what the science of genetics has taught us about inheritance. Studying a pedigree for its genotypes means focusing attention on the occurrence of traits found among the ancestors and their littermates. While this approach requires more time, it is far superior to the Traditional Pedigree, which relies on learning names and titles.

SYMBOLS PEDIGREE

Breeders interested in health, temperament or special traits needed a third kind of pedigree. One that was able to capture and display the strengths and weaknesses of each ancestor **and all of their littermates**. Breeders needed a way to the carriers of certain undesirable health problems or some special trait of interest on either the sire or dams side of the pedigree. Knowing where and how often these problems occurred increases the probability that the carriers could be controlled or eliminated.

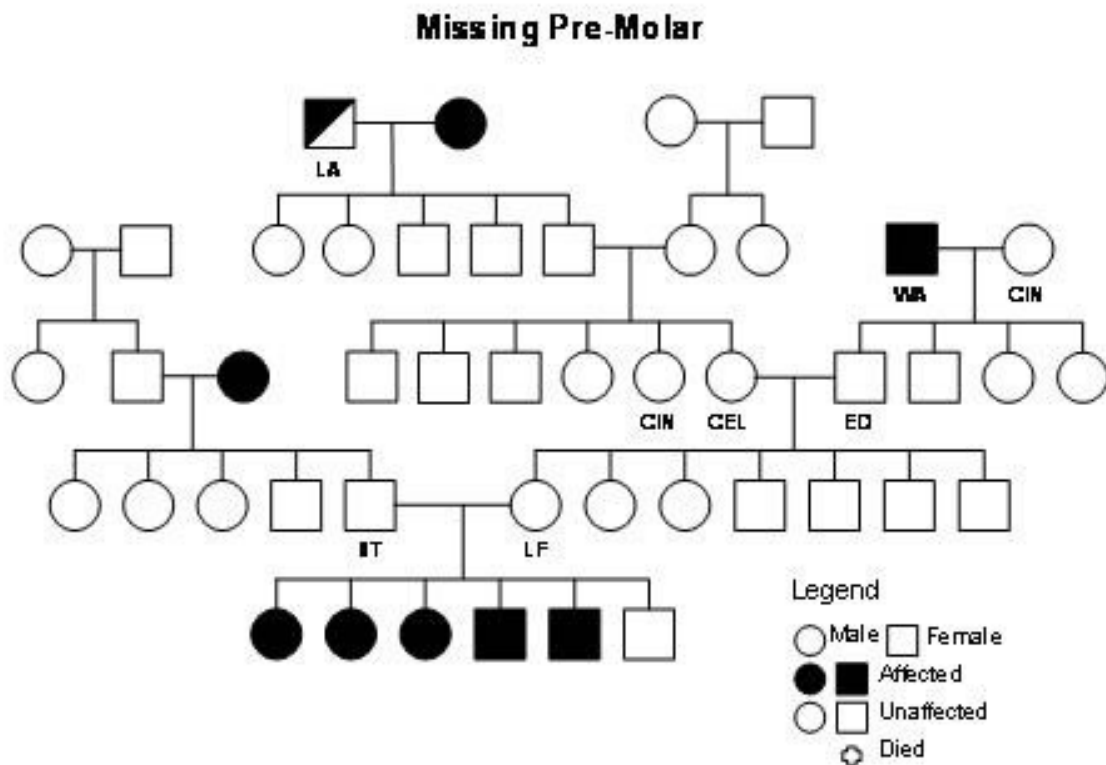
What every breeder wanted was an inside look at the genes carried by the ancestors. Since no single method can look directly into the genotype, breeders had to rely on the information they are able to collect. The best pedigree for this purpose is called the Symbols Pedigree. It focuses on the breadth of a pedigree, meaning the littermates. The Symbols Pedigree relies on the logic that a pedigree can be understood by learning about the traits and characteristics observed among the littermates of each ancestor. It is especially effective for making improvements in the core elements: health, performance, temperament and other specific traits of interest.

The Symbols Pedigree gets its name because symbols rather than names are used to identify each ancestor. The inclusion of littermates further distinguishes this pedigree from the others. Its great advantage is that it produces a record of information that can be used to make improvements and eliminate problems.

CODING

The Symbols Pedigree is a powerful tool because of the amount of information that can be coded and quickly recognized. Squares are used to represent the males and circles to represent the females. The littermates for each ancestor are also represented as either a circle or a square. As information is collected about each individual it is coded using designated colors that represent specific traits or diseases. Because breeders are interested in many traits and diseases they will use several colors to code this pedigree. Key words and phrases are also added to clarify and further explain the characteristics, conditions, test results etc. for each ancestor. The repetition of a color, key word or phrase usually signals that a genetic trend or pattern may be present.

Figure 3. The Symbols Pedigree



Notice in Figure 3, that the sire of the litter had three sisters and one brother and that the dam had four brothers and two sisters. This pedigree shows a litter of six pups (3-3). Five of these six pups had missing teeth.

A comparison between what the Traditional Pedigree and the Symbols Pedigree and Stick Dog Color Chart Pedigree should be convincing evidence that pedigree analysis can be improved by using these new breeding tools.

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