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GENES (the good, the band and the recessive) Part 1:

Genes are what we continually hear people talk about. What is a gene? A gene itself is made up of DNA (deoxyribonucleic acid) which determines the genotype and therefore the phenotype (outward appearance) of the animal in question. The DNA itself is very long but is folded to make it take up less space. Thousands of genes combined together form what is known as a chromosome.

Inside all the cells in the body of the dog we find that each cell contains 39 chromosomes that are paired together (meaning that there are two copies joined together). This is not the case for the sperm and the egg cell. These cells only contain one copy necessary for fertilization. When the single 39 chromosomes of the sperm cell combine and join with the single 39 chromosomes of the egg cell, a new cell (individual) is created containing 39 paired chromosomes.

Dog breeding is like playing cards. You have two decks of cards, one deck of cards represents the chromosomes of the sire and the other deck of cards represents the chromosomes of the dam. Each dog has 39 chromosomes, thus each deck contains 39 cards (each card represents one chromosome of which thousands of genes are attached).

When the two decks of card are combined and shuffled we can compare this to the sperm cell fertilizing the egg cell. We remove ½ of these cards and this represents our new deck of cards. This can be compared to the new genotype of the new individual created during conception. If this sounds simple and logic it should be taken into consideration that each chromosome (each card) contains thousands of genes that each act separately becoming active or inactive when combined with the genes of the chromosome received from the other parent. This is a crude explanation bit it should give you a better insight as to how genes combine and interact during conception.

The above example illustrates that during conception there are millions of different genetic possible combinations that can be created. It is therefore impossible for two dogs in a litter to be 100 % identical (they may be similar in phenotype but not with regards to their genotype). This means that on the outside appearance (phenotype) a dog can never be 100 % “identical” to one of its parents or littermates. They may

resemble each other quite closely bit this is dependent as to which genes are inherited from which parent and in which sequence.

Yet in the world of dog breeding we are continually encountered with some dogs and bitches whose offspring have inherited a lot of their features (working ability and conformation). The question quickly arises as to how this is possible? Coming back to our deck of cards we take one card from the stack and examine it. Remember that this card represents one chromosome on which thousands of genes are attached. These genes each possess two alleles which determine as to how the gene is expressed. There are three possible options which are as follows:

1. One allele is dominant (A) and the other allele is also dominant (A) resulting in an (AA) genotype. This gene is represented in the dominant form. This gene is referred to as being homozygote dominant.

2. One allele is dominant (A) and the other allele is recessive (a) resulting in an (Aa) genotype. This gene is also represented in the dominant form (A) prevents (a) from displaying itself. This gene is heterozygote. On the outside (phenotype) the trait for this gene is identical to that of the gene that is homozygote (AA). For example a black Labrador that is dominant black (homozygote) cannot be distinguished by a black Labrador that carries yellow or chocolate (heterozygote) on the outside.

3. One allele is recessive (a) and the other allele is also recessive (a). This gene is represented in the recessive form (aa) (homozygote recessive).

In the case of example 1, this gene (trait) will always be passed on to the next generation and expressed in the dominant form regardless of what the allele of the other parent is. This is referred to as homozygote dominant (AA). The dominant black Labrador can only produce black offspring regardless of which colour the bitch is.

In the case of example 2, this gene (trait) is not always passed on to its offspring. This is dependant as to what the allele of the other parent is. Should the parent have a gene code of (Aa) and the other parent has the same gene code (Aa) then 75 % of the offspring will express the dominant trait (AA or Aa) and 25 % will not have this trait (aa). An example is the black Labrador that carries yellow who is bred to another black Labrador that also carries yellow. In the litter 75 % of the puppies will be black and 25 % will be yellow.

In the case of example 3, this gene (trait) is recessive and does not occur frequently in the population. It could be a desired trait or an undesired trait. Should one parent be

(aa) and the other also be (aa) then all the offspring will be (aa) and exhibit this trait. An example is of two yellow Labradors bred together producing only yellow puppies. Some readers may object since it has occurred in the past that on very rare occasions that two yellow Labradors did produce a black Labrador. This is referred to as reverse epistasis (when two recessive genes work against each other, but this is a VERY rare incident).

Unfortunately things still become more complicated because many of the desired traits breeders strive to breed for such as correct tail set, correct front and rear angulation and head type are regulated by many genes in long sequences (for example AABBCCDDEEFFGGHHIIJJKK). Most of the traits that are of interest to breeders are influenced and regulated by numerous genes. These are referred to as polygenic traits.

To ensure that all (or most) of the offspring look like one parent or have the desired attributes that were selected for to produce the desired traits in the offspring means that at least one of the parents must have the dominant genes (AA) for the desired trait and no (aa) genes. Unfortunately it is rare to find a breeding animal that contains such a dominant genotype for a certain trait (AABBCCDDEEFFGGHHIIJJKK). Usually such traits are exhibited by the parent(s) but in the heterozygote form (AaBbCcDdEeFfGgHhIiJjKk). The parents when bred to each other result in offspring having different genetic compositions for the desired trait resulting in not all or sometimes none of the offspring exhibiting the desired trait.

When a dog/bitch has the genotype of AABBCCDDEEFFGGHHIIJJKK for a specific trait this dog is homozygous dominant for that trait. This is often referred to as the dog being prepotent for such a trait or numerous traits. People will say that stud dog X can be bred to a goat and still produce Labradors! The ultimate test to find out as to how prepotent your dog is (confirmation lines) would be to breed him/her to a field trial dog (two totally different types). Should the dog/bitch in question be prepotent, than all of the offspring born would strongly resemble the dog or bitch in question. The offspring would have inherited the dominant gene from their sire or dam causing them to look like them and not like the other parent.

This is where line breeding becomes a useful tool in upgrading canine families. The principle of line breeding implies that the dog and bitch that are bred to each other are related with the intention of making sure that the genotype of the offspring contains the dominant genes required for the desirable traits (example front angulations). This increases the chance that the offspring will possess the homozygote dominant genotype for a particular trait(s). The intention is to ensure that the genotype is represented in a homozygote form (example AABBCCDDEEFFGGHHIIJJKK) thereby fixing this trait in the genotype of the next generation.

When an animal form such a combination is bred to an unrelated animal lacking the desired features, the underlying theory is that the offspring will inherit the dominant gene/allele from the line bred parent allowing the offspring to have a genotype containing at least one allele that is dominant (A_B_C_D_E_F_G_H_I_J_K_). This allows the desired trait to be expressed again in the next generation.

This is not to say that all line bred dogs are prepotent. It is also possible for a dog with an outcrossed pedigree to be prepotent (for example having no common ancestors in the first 5 generations). The chance is greatly lessened, but is possible when one breeds type to type with the hope that the desired dominant genes are on the correct chromosomes and passed on in the correct sequence to the next generation.

The above examples and explanations give a crude explanation as to how genes interact with each other. It should only been seen as a "blue print" with regards to understanding as to how genes interact with each other. The point made is that when conception occurs all of the millions of genes of both the sire and dam combine in this way resulting in numerous possible combinations. It may result in offspring displaying traits that their parents displayed and selected for but the contrary may also occur with undesirable genes and traits coming to the surface. People will tell you that "dog breeding is like gambling, you never know what you can expect." There is a lot of truth to this point but understanding genetics and knowing how certain traits are inherited results in the breeder being able to manipulate this genetic lottery to their advantage.

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Genetic Analysis (Part 2):

Genetic analysis with regards to dog breeding is not 100 % accurate. It is an indicator of the chance and probability that a certain gene/inherited trait will be passed on to the next generation. Traits influenced by only one gene such as coat colour gives us a 100 % probability with regards to the coat colour in the next generation. This is far more complex with regards to traits consisting of multiple genes (example tail set and head type).

Each sperm cell has a different genetic composition as does every female egg cell (oocyte) in the bitch. There are no two sperm cells or egg cells that are 100 % identical. Therefore it is a matter of probability that the correct sperm cell (DNA composition) combines with the correct egg cell so that fertilization can take place resulting in the desired genes combining with each other.

Take into consideration that the next time when your bitch is bred to remember all of the millions of sperm cells that are deposited by the male in the reproductive tract of the bitch. Of these millions of sperm cells only a few are able to fertilize the egg cells that are ripe at that time. Then take into consideration that the genes in the sperm cell have to complement the genes of the egg cell. That is why breeders prefer to breed dogs that are similar in type to one another in the hope that the same type is present in the litter and that both parents can complement each other with regards to the faults needed to be improved.

Uniform litters otherwise referred to as “peas in a pod” occur when all of the puppies in the litter exhibit the same physical features. Such features may include bone, coat texture, angulation or head shape. When this occurs it can be said that one or both of the parents carried a lot of the genes for the desirable trait in a dominant form in its DNA. Should the puppies in the litter strongly resemble each other, then this is a positive attribute with regards to future breeding. This gives the breeder an indication that all of the puppies possessed the desirable traits in their DNA is most likely in a homozygote or heterozygote form. Should one of these puppies be bred from in the future we have a strong indication to predict that such desired traits will also be passed on to their offspring.

Examining a dog only based on it’s outward appearance is not an indication that “what you see is what you get” in the next generation. It is only a possible indication! That is why I place such a strong emphasis on the family of the dog and to a lesser extent the dog itself when selecting breeding stock. Knowing who the littermates, cousins, aunts and uncles are gives me a good indication as to whether the desired characteristics of the dog in question are “accidental” or actually “fixed” in it’s DNA. This is known as predicting and evaluating the breeding potential of an animal. Is the dog in question from a strong family or a “flash in the pan” with no pedigree to support itself?

Even though a puppy has the correct genotype does not necessarily imply that the puppy will mature as indicated by his genetic makeup. Other factors include nutrition, exercise, upbringing and socialization. These factors combined are referred to as environmental factors. You cannot win a car race with a FIAT car (used for travelling in the city), but you can also not expect to win a car race with a Porsche that has not had it's oil changed or the tires examined on a regular basis. The point made is that you cannot expect to win with a dog of inferior conformation but also do not expect to win and succeed with a dog that has not been raised properly.

An example is of a dog from a family of dogs known for their bone and substance as well as having an outgoing temperament. When the litter is evaluated and the pick of the litter displays these characteristics then this is an indication but not a guarantee that the puppy in question will continue to develop these traits as an adult and live up to its "predicted" potential.

If such a puppy be placed in an environment where the nutrition is not optimal (causing the puppy to lose its bone and substance), raised on a slipper floor and allowed to play with a frisbee and not given a correct upbringing we get an animal who has not lived up to its genetic potential. Instead of the confident healthy adult with plenty of bone and substance we end up with a skinny insecure animal lacking the desired temperament.

The question arises as to whether this animal should be bred from. Always take into consideration that the environment plays a large role in this situation causing the genes to be suppressed in preventing them from revealing their true potential. In this case the genes are present but hidden due to the environment. Should such an animal be placed in an environment where it does get the correct upbringing should help in regaining its confidence and true temperament. In such a case if this animal were to be bred form to a suitable breeding partner, the puppies born should express the phenotype as indicated in their genetic package (provided that they are now raised properly in the proper environment).

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Is it a genetic disorder? (Part 3):

There have been many books written about defects in dogs which are thought to be inherited. Some of these disorders have been proven to be inherited through research whereas others are thought to be inherited, yet there is no reliable data to verify this.

It is a far common practice to talk about a disorder as being inherited when there is little or no proof to actually verify this 100 %. Accusations like this can be both dangerous and detrimental to both the dog in question as well as the breeder's reputation. When a defect occurs in a dog one should not immediately jump to the conclusion that it is an inherited defect. There are numerous other causes that can lead to the defect in the dog(s) in question. Possibly something might have gone wrong during the pregnancy such as the administration of certain medication that might have caused the defect. Another cause could be of an acquired disease that caused the defect in the dog(s) during pregnancy and thus unrelated to a genetic defect.

It is quite possible that more than one bitch in a breeder's kennel may produce a defective puppy, but this should not cause one to assume that it is an inherited condition. Despite the fact that the bitches in question had similar pedigrees, one should also take into consideration that they also shared a similar environment and this could be the cause for the defect. One should follow a step by step investigation before determining whether the defect was of genetic origin or not as is illustrated in the step by step approach as indicated below.

1. Defect has occurred in the litter.

2. Try to describe the defect as accurate as possible.

3. Look up the problem in published veterinary literature and other (reliable) canine literature.

4. If the problem has already been documented before then the veterinarian or breeder should provide breeding advice to both other breeders and the parent club involved. If possible set up a registry to record affected dogs and their parents to try to identify the carrier involved.

5. If the problem has not been reported before, one should investigate the underlying cause.

6. Determine if it is caused by genetics, medicine use, nutrition, or from a disease.

7. Talk to other breeders of your own breed and other breeds as well as the breed club. Send out questionnaires to these groups.

8. Repeat the mating to see if the defect reoccurs.

When trying to find the problem of the defect one should try to be as descriptive as possible. It is not sufficient to report to the breed club that a litter has eye, heart, or liver problems as these terms are vague when considering that there are many such problems in dogs. The best method is to consult veterinary advice for the necessary tests. This usually means common tests like blood tests, x-rays, and ophthalmology examinations as well as possible biochemical analysis. Ideally the help of a specialist from a veterinary faculty will also be of great help.

If a genetic disorder is thought to be the cause then veterinary journals can be a good starting point in finding the underlying cause. Veterinary journals only contain articles that have been approved by a scientific committee to be published. This means that statistics have been applied. Statistics is a mathematical equation used to determine as to how accurate the obtained results were and as to whether there is a relationship with as to the "suspected" cause of the problem." Not every article can be published; it has to pass a long list of criteria before it is approved to be published.

Examination of the defect in question in other species can also be helpful in understanding the problem better. It is also quite possible that the defect is an inherited disorder and already reported in another breed other than one's own.

It is also possible that the defect is actually entirely new in the canine population which means that one has to determine whether it is caused by a diet related factor, a disease, an infection or from a fault in the manufacturing of the dog food. Some problems can also occur during a certain point in the pregnancy of the bitch when certain body organs are being formed. Determining what the cause is may not be easy but if a non-genetic cause is suspected then the positive point is that a breeder's reputation is not destroyed and that valuable breeding animals are not culled from the breeding program.

When a genetic cause is suspected one needs to collect as much data as possible. This can be done through the breed club by sending out a detailed questionnaire to it's members. It would also be advisable to send such a questionnaire to other breed clubs in other countries to determine how far spread the problem actually is. It is in the benefit of the breed as a whole that all breeders and clubs collaborate together to solve this problem instead of only a few who admit that they have the problem in their kennel.

It is not sufficient enough to just collect pedigrees of the affected dogs. Rather one has to also collect data on the number of pups affected in each litter, the sex of the pups affected, age of onset, and any variations in the defect. Such data could help determine the mode of inheritance of the defect in question.

Far too often breeders with an access to only a small limited supply of pedigrees of affected dogs are far too eager to label a certain male dog appearing frequently in the pedigree as being the carrier of the defect. One might be correct but there could be more factors involved. The source might also be a female or the carrier might be farther back in the pedigree than the normal 5 generation pedigree indicates. The dog labeled by the breeders may not only appear in all of the affected pedigrees but also in the unaffected ones because he was one of the founding sires of the breed.

Behaviour disorders are even more difficult to determine as being of a genetic disorder or not because the socialization and upbringing of a dog are also important. Not every owner is as experienced with raising a puppy or as dedicated to their pet as one would hope. These factors are difficult to tabulate and there is a large error margin involved.

To determine and label a defect as being of genetic origin without sufficient proof is practiced far too often in the dog world. It in turn can do untold harm to the breed as a whole but also the dog involved. Such a breeder who has dedicated a large portion of his/her life can have their reputation quickly destroyed by circulating rumors that have no valid facts to support them.

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The X-factor (part 4):

Breed the best to the best and HOPE for the best is what breeders aim for when selecting breeding partners for their dogs. How often have you noticed that two champion parents together failed to produce a single champion or in that case a decent looking offspring whereas two average parents when bred together produced winning offspring every time the breeding was repeated? Sound familiar?

On January 17th 1869 in Italy a person named Federico Tesio was born. During his lifetime (85 years) he bred some of the best racehorses in the world. His horses dominated the racing scene winning most of the prestigious races entered. Their presence was also felt as to how they produced. Horses such as Nearco, Tenerani, Niccolo Dell'Arca, Donatello 2 and Ribot (to name a few) made their mark as successful racehorses but also as producers. With a small group of mares Tesio was able to dominate the thoroughbred breeding industry based on his breeding approach. When studying the pedigrees of his famous horses the same line breeding principle is continually applied:

Line breeding back to famous horses (champions and producers) primarily through their daughters!

You may ask yourself what horse breeding has to do with dog breeding. In the thoroughbred breeding industry there is only one objective and that is to breed a horse who will reach the finish line in the shortest period of time. To be able to do this requires a horse with the correct confirmation. Without the correct confirmation a horse may mentally want to win but does not have the correct construction to carry itself over the finish line (the selection criteria). Selected criteria include:

-correct straight legs

-correct shoulder placement for a long stride

-strong back

-well muscled hindquarters

-soundness (genetically)

-correct temperament

When examining the above selection criteria one sees that these criteria are quite similar to that what dog breeders want to achieve:

Breed type, temperament and soundness

Federico Tesio achieved his success based on his breeding method of line breeding back to famous horses through the maternal line.

Studying the pedigrees of influential dogs in our breed (confirmation and breeding) has continuously alerted me that they all have one thing in common. That is that they all had excellent mothers or were line bred to or descended from a strong maternal line. This is not a coincidence.

What Tesio focused on was the X chromosome that is passed down from the mother to her sons and daughters in each generation.

Every dog has 39 pairs of chromosomes. These chromosomes are paired together except for the X and the Y chromosome. The female has two X chromosomes (only one is active). Of these two X chromosomes only one is passed on to her offspring (either the active one or the non active one). The male on the other hand only has one Y chromosome (inherited from his father) and one X chromosome (which he inherited from his mother).

When a sperm cell and an egg cell (oocyte) combine during fertilization, each cell passes 50% of it's DNA to the new cell created. This cell forms the future individual and it continues to multiply and activate different genes to eventually produce the new individual. The process in which the DNA is passed on to the new fertilized egg cell results in a total new combination of DNA. This process during conception is known as "crossing over." This occurs with each chromosome.

However there is one exception which is the X and the Y chromosomes (the chromosomes that determine the sex of the individual). During the "crossing over" little DNA is exchanged between the X and the Y chromosome. Remember that the X chromosome is passed on from generation to generation. Hence a good brood bitch passes her X chromosome onto her daughters and her sons.

The X chromosome is larger than that of the Y chromosome and carries more genetic information. Her sons again can only pass it on to their daughters. That is why when I analyze a stud dog the first thing that I look at is who his mother, grandmother and great grandmother are.

Gregor Mendel (the father of genetics) was the monk who dedicated his life to growing peas to try to find as to how certain characteristics such as pea colour and size were inherited. His principles have become the foundation from which our current genetics and breeding plans with regards to dog breeding is based upon.

An American scientist (Thomas Morgan) went one step further and discovered what has been known as "sex-linked genes." He experimented with fruit flies and discovered the following:

-that male flies with white eyes bred to female flies with red eyes produced flies (male and female) that all had red eyes.

-male flies with red eyes bred to female flies with white eyes resulted in all of the males having white eyes and all of the females having red eyes.

The significance of this experiment was that some traits are sex-linked being determined by one parent. This was later attributed to the X chromosome that female fruit flies pass on to their sons and the X-chromosome that all of the female flies receive from the male parent fly.

During the conception (uniting of a sperm cell with an egg cell) the following can occur:

-the Y chromosome combines with one of the X chromosomes of the female (the active one or the non-active one). This results in a male. This male can either inherit the active X chromosome from his mother causing him to look more like her than his sire or the non-active one causing him to resemble his mother less.

-the X chromosome of the male (which he received from his mother, in this example the active X chromosome) combines with one of the X chromosomes of the female (active or inactive). Should the active one of the female combine with that of the male we get a female puppy who bears a strong resemblance to that of her mother. Should the female puppy receive the inactive X chromosome form her mother there is a stronger chance that she resembles her sire (active X chromosome who again resembles his mother).

To summarize:

A male dog who has an excellent mother (brood bitch or confirmation, preferably both) has received her X chromosome that contains her DNA. This X chromosome is again passed on to his daughters. This is referred to as a dog that is a "good brood bitch sire."

If you study the pedigree of influential sires you will find that they all had one thing in common. They all had excellent mothers. These bitches may not all have been champions but they were excellent producers being able to pass their strong X chromosome onto their sons who were able to pass it on to their daughters.

A good stud dog is created by a strong female line, the foundation of the pedigree. This is referred to some breeders as the bottom portion of the pedigree, the female line or the X-trial. It all comes down to one thing: the weakest link in the pedigree is the bottom half (mother, grandmother and great grandmother).

Some breeders try to increase the chance of their puppies inheriting the strong X chromosome from a famous foundation bitch by line breeding back to her. This is done through the sire and dam since both may carry the X chromosome.

This method can also be applied when breeding back to a famous sire that carries the strong X chromosome inherited from his mother. My own observations have taught me from studying the pedigrees of influential dogs and reading books based on the breeding methods of Tesio that the best results are achieved when line breeding back to a famous brood bitch or stud dog through:

-his daughters only

-his sons and daughters

But not when line breeding via his sons (they do not inherit the X-chromosome from their sire, they only acquire his Y chromosome).

For genes that are not connected to the X chromosome there is no difference as to whether it is passed form the bitch or not.

EXAMPLE:

<table>
<tr><td rowspan="4">Champion Xtra Supreme (XY)

(receives x chromosome from his mother which he pass on to his daughters)

Receives y chromosome from his father and passes this on to his sons)</td><td rowspan="2">Champion Born to Win (XY)

Passes y chromosome to his son</td><td>Speechless (XY)

(passes y chromosome to his son)</td></tr>
<tr><td>Diva (XX)

(passes x chromosome to her son)</td></tr>
<tr><td rowspan="2">Champion Xtra Fine (XX)

(passes x chromosome to her son)</td><td>Champion Mr. Wonderful (XY)</td></tr>
<tr><td>Champion Xtra Ordinary (XX)

(passes x chromosome to daughter)</td></tr>
<tr><td rowspan="4">Champion Xtra Unique (XX)

(passes x chromosome on to her sons and daughters)</td><td rowspan="2">Big Regret (XY)

(passes x chromosome to his daughter)</td><td>Once in a Lifetime (XY)

(passes y-chromosme to his son)</td></tr>
<tr><td>No Regrets (XX)

(passes x chromosome to her son)</td></tr>
<tr><td rowspan="2">Champion Xtra Special (XX)

(passes x chromosome to her daughter)</td><td>Gold Digger (XY)

(passes x chromosome to his daughter)</td></tr>
<tr><td>Champion Xtra Ordinary (XX)

(passes x chromosome to daughter)</td></tr>
</table>

The above fictive pedigree demonstrates as to how the X and the Y chromosome are passed on from generation to generation. In this pedigree the puppies from this combination are line bred to Champion Xtra Ordinary. Her X chromosome is passed on through both her grandson and granddaughter. All of the puppies will inherit at least one of her X chromosomes. The female puppies from this combination have the possibility of inheriting two of her X chromosomes giving them the possibility to excel in the show ring and in the whelping box. The males from this breeding will all inherit one of her X chromosomes giving them the potential to excel at stud.

The result of a successful litter is not just the result of one good chromosome but of all 39. Yet the X and the Y chromosome are the only ones that we can follow in a pedigree to be able to determine where the good genes come from.

Good brood bitches will have two good strong X chromosomes and are able to produce excellent offspring since they are able to pass on either one of their X chromosomes. When examining a pedigree the first thing that I ask myself is as to how strong the bitch line is? Has the bitch line been able to reproduce itself over and over again in each generation?

An example of this is of the Labrador Retriever "Covetwood Elouise of Carpenny." An English show champion, winner of at least 10 challenge certificates and Best in Show two times at the Labrador Retrieer Club Champion Show (Great Britain). Her fantastic show record speaks for herself, yet as a brood bitch she really revealed as to how she was able to pass her looks onto her children. When bred to Augustus Tuplady of Leospring a dog of field trial lines and a field trial winner himself, a son form that litter was Carpenny Anchorman, a show champion himself who was also Best of Breed at Crusts in 2004! In each litter when bred to different stud dogs she produced champions (Walpole and Rustina) who themselves went on to produce champion offspring.

With the wrong bitch a (future) stud dog can fail miserably! Therefore we cannot make judgment of a young sire based on one litter alone. In the ideal world it would be to breed him to 10 bitches of different bloodlines. Once these puppies mature and develop an indication can be given as to what his strengths and weaknesses are as a breeding animal. Remember no stud dog is perfect. Dominant stud dogs (prepotent) are few and far between! Find them and use them wisely!

With the genetically correct bitch, all stud dogs can succeed! With the wrong bitch a (potential) stud dog can fail (miserably).

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Thoughts on dog breeding (Part 5):

Line breeding:

Line breeding today has acquired "a bad taste in the mouth." When line breeding you are doubling up on desired traits and fixing them in the genotype of the animal in question. The good traits are doubled up upon and any recessive or undesirable traits are also expressed. The advantage of this is that should a genetic disease emerge than it is easier to find out as to where the problem originated from in the pedigree. When one applies the "outcross x outcross" method no one knows after a few generations as to where the problem originated from.

One should take into consideration that a lot of breeders are applying line breeding without them actually knowing it. People assume that line breeding is only applicable in the same parent appears in the pedigree in the 2nd or 3rd generation, yet line breeding also takes place much further in the pedigree including the 5th generation. Have a look at the pedigree of your own dog and you will most certainly find a dog that appears twice in his pedigree within the first 6 generations.

Genetically all that line breeding does is increase the chance that two alleles of a gene will be identical and therefore "fixing" the desired traits in the dog's DNA. When the sire and dam are related and both carry the desired traits, then by breeding them to each other the theory is that the chance of their offspring carrying these genes and expressing these desired traits will be greatly increased. It can be seen as "manipulating a genetic lottery" by increasing the odds in your favour that the desired traits you are looking for will be present in the next generation.

When a line bred dog is bred to another dog that is not related the resulting litter will be an "outcross" as no common ancestor appears on both sides of the pedigree in the first 5 generations.

Line breeding should not be used when both related parents have the same (serious) confirmation fault). This is a feature that can be detrimental to a breeding program when people get "obsessed" with a certain dog in the pedigree. These are usually top show dogs of the past. Just because the super show dog is in the pedigree of a dog does not guarantee that his offspring will also all inherit all of his desirable features. People become blinded by failing to recognize serious conformation faults that their descendant of this super show dog has. When choosing a breeding partner they end up choosing a stud dog also related to the same super show dog that also has the same conformation fault. Such people think that they are fixing the problem by line breeding back to the super show dog but are in fact ensuring that this undesirable conformation fault is firmly imprinted in the DNA of the offspring, making it more difficult to remove in future generations.

The pedigree (actually a book):

There is a big difference with regards to "looking" at a pedigree and actually being able to "read" a pedigree. Anyone can look at a pedigree and make kind remarks such as "very impressive" and "wow" without knowing what they are actually talking about. Reading a pedigree requires a different approach. It allows one to analyze and answer the following questions:

-what is the breeding plan of the breeder? What where they trying to achieve and improve?

-which dogs combined well with bitches?

-how strong is the bitch line? Has the bitch line been able to reproduce itself over and over again in each generation?

-was the breeder breeding for a specific type or was he/she influenced by the latest trends and gossip?

-Have the desired features been passed on from generation to generation or have they become "diluted?"

-Is there consistency in type from generation to generation?

Knowing the dogs in a pedigree allows us to know what their features and attributes were as well as their faults. Always take into consideration that no dog is perfect but that some are quite close to being perfect!

Reading a pedigree is useless unless you can visualize the animal in your mind. It's genotype is represented to an extent by his health certificates, show results and working tests.

Be able to recognize patterns in a pedigree. What this means are "bloodlines or genes" that match well together continually giving quality offspring. For example sire A produces very nice puppies with daughters of Sire B but not with daughters of Sire C.

During conception genes combine and reassemble creating a totally new genetic package for the individual. Not knowing which genes originate from which family, which dogs were and were not prepotent, which dogs had serious confirmation flaws causes the breeder to make the wrong selection criteria when choosing breeding stock.

The more quality specimens of the breed found in a pedigree is not a guarantee that the puppies born from such a breeding will also be as good. All it does is increase the chance of puppies being born that are better than the breed average.

Mentors:

People will tell new comers to the breed to do their homework. They will be told to talk to different people and ask a lot of questions and read as much about the breed and related issues as possible. The question remains as to how to approach this when asking questions. Can the person answering your questions give you the facts to support their answers? What are their facts based upon? What are the credentials of the person in question? What is their motive? Is their opinion based on facts or are their own emotions and sentimental feelings involved? Does the person recognize and appreciate a good dog when they seen one (have an eye for a dog)?

Would you go to your butcher shop for advice about your grandmother's heart medication? Probably not! Yet why is it that when it comes to breeding dogs that anyone and everyone is an expert without taking into consideration their own credentials and previous experience?

The essence of statistics and references:

When reading an article always be critical and don't believe everything you read. Take a good look at the references used (if they are mentioned at all). What type of references where used?

When reading a study related to a health issue in your breed always look at the statistics involved. What exactly are statistics you may ask? Statistics itself is a type of mathematics used to determine as to how accurate the results attained in an experiment or study actually are. It is an indicator to allow the reader to beware as to whether the results are misleading or biased and not accurate. It takes into consideration the error and accuracy percentage. It gives an insight as to whether there is any relationship with regards to the aspects tested.

Yet far too many studies are published without any statistics. Is the researcher trying to hide something? If I were to tell you that giving a dog five garlic tablets a day will result in him having better front angulation then when not given to the dog would still convince some people. Just show a graph and most people are convinced!

Selection criteria:

What you see when examining a dog is it's outward appearance (phenotype). Examining a dog's offspring gives you an indication of his/her genotype.

The intensity of selection is fundamental in improving the quality in your kennel. The intensity of selection is higher for stud dogs than it is for bitches. The reason being is that a good stud dog can spread his genes quicker in a population allowing the breed to improve over a certain period of time compared to that of a bitch. As a result greater emphasis and higher requirements are placed upon the stud dog compared to that of the bitch. When selecting a stud dog it's traits and attributes are always compared to that of the breed average. For example let us say that a stud dog has a very well developed shoulder and upper arm placement, something that is lacking in the breed. If this dog is used at stud his offspring's front angulation should improve and be better than that of the breed average. Another example is that of the percentage of offspring a stud dog produces that have elbow dysplasia compared to that of the breed average. Should a stud dog that has bred a limited amount of bitches and 5 % of his offspring have ED and the breed average is 20 % than this dog produces better than the average stud dog. Please not these numbers are fictional and not scientifically proven; do not assume that these figures are applicable to your breed. This is only an example.

To enhance the chance that the stud dog in question has the potential of passing on his front angulation, the breeder interested in using him should examine the front angulation of the stud dog's littermates, parent and grandparents. Should all of these individuals have correct front angulation than there is a certainty factor created that the dog in question will pass this trait on to his offspring. Should the dog himself exhibit the correct front angulation but his family was moderately angulated then the chance of him passing this trait on to his offspring is greatly diminished.

Different bitches will be more suited for certain sires. Remember that there is not a single stud dog that will suit the genetic needs of every bitch.

Breed type:

Type within a breed is based upon personal preferences. At a show a judge might prefer a certain type as opposed to another when making the final decision between two dogs well constructed.

Type is what distinguishes one breed from another. It pertains to the specific characteristics that make a breed unique. For a Labrador this are it's head, coat and otter tail.

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