

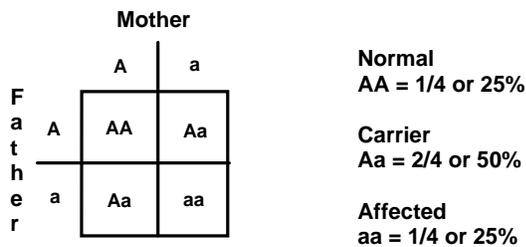
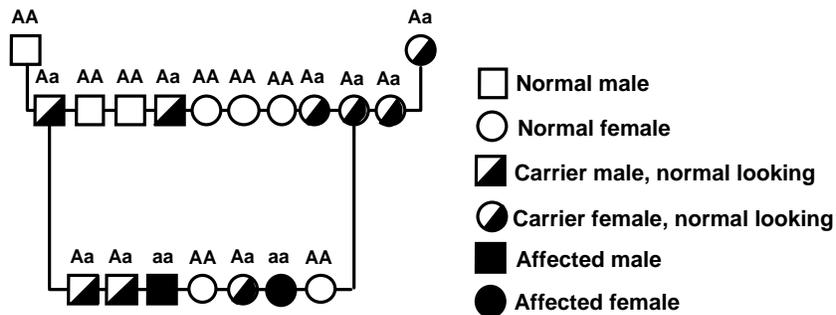
Lotus Puppies in the Silken Windhounds

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The diagnosis of “lotus pup” is made at birth by the puppy’s classical appearance: the hind limbs are tucked and folded under the belly and the front limbs are stretched underneath the chest with the wrists touching. The back may or may not be twisted (scoliosis) and the pup may or may not have trouble breathing. Some puppies may not show signs of “deformed” joints but may only have trouble breathing. Common to all affected puppies is the lack of vigorous movement.

We believe that the “lotus pup disease” is the same disorder as “fetal akinesia deformation sequence” (FADS) in humans, as children with FADS show the same clinical features as the lotus pups, including the inability to breathe properly. The exact cause for this disease is unknown at this time. However, several mechanisms have been proposed and we are willing to look at all of them in the Silken Windhounds.

For the breeder it is most important to know the mode of inheritance in order to avoid producing affected puppies. Careful analysis of the pedigrees from Silken Windhounds with lotus pups indicates that it is an autosomal recessive disease. This means that an affected dog must have two defective genes in order to show signs of disease, both male and females can be equally affected, and the parents can look completely normal. The figure shows the mode of inheritance as an example.



This drawing shows a situation where an accidental brother-sister mating occurred. All genes are present in pairs in each individual, except for those genes on the X and Y chromosome. Each parent passes one of its two copies of a gene to an offspring and there is basically a 50:50 chance, which of the genes from each parent gets passed on. In the example above, we will look at only one particular gene – let’s say the “A” gene. “A” stands for the normal copy of the gene and “a” stands for the defective or mutated copy of the LP gene. The checkerboard-square demonstrates the possible combinations if both parents were “carriers”. In autosomal recessive traits, such as in the lotus pups, carriers (**Aa**) “carry” the defective gene (**a**), but they also have a normal one (**A**), which allows them to be healthy. The checkerboard shows that there is – statistically – a 25% chance of having completely normal offspring, a 50% chance of having carriers, and a 25% chance of having affected dogs. The top of the pedigree above shows the first mating between two unrelated parents, one being a carrier and the other one normal. Remember that both of these parents look normal and do not show signs of disease (i.e. there was no way of knowing the mother was a carrier). If you were to do the “checkerboard” math again, you would see that a mating between **AA** and **Aa** would result in 50% **AA** and 50% **Aa** offspring. The second breeding in this pedigree was a carrier-brother X carrier-sister mating resulting in normal, carrier, and affected puppies. While the affected pups will be easy to recognize, the carrier and normal dogs cannot be distinguished just by looking at them. This is demonstrated in the drawing by the open symbols and the **AA** or **Aa** above each symbol.

This all sounds very straight forward, but some questions remain.

- A) Why do I have a litter of 8 pups and 7 are affected (lotus pups), when statistically speaking I should have only 2 affecteds? Well, first, nature doesn’t always follow the rules. Second, if you look at the bigger picture, you will find that the statistics actually do work out. If you were to breed the same parents several times until you had a total of 50 offspring, you would find around 25% to be affected. In fact, pedigree analysis of all of the affected pups has revealed that approximately 25% of all offspring from carrier parents are affected.
- B) Why does one affected puppy die right after birth while the other lotus pup lived for a couple of days? And why does one look severely affected while another in the same litter looked almost normal but died anyway? These are very good questions but difficult to answer. There are a couple of theories. We don’t know what causes the disease, but let’s assume for a moment that it is caused by the loss of a particular protein called “lotusprotein”. During pregnancy, the bitch supplies the fetal pups with nutrients and oxygen, but not all pups get the same amount of nutrients (that’s normal). Just like with the nutrients, it is possible that some of the fetuses get some “lotusprotein” from the bitch and others don’t get any at all. The protein that was passed from the bitch to the fetus will delay onset of disease, i.e. the pup that received protein in utero will show less signs of disease and may live a little longer than one that received no protein at all.
- C) How do I know if the dog I would like to use as a breeder is clear or a carrier? Currently, there is no reasonable way to distinguish carriers from normal dogs, as they look the same. To eliminate the occurrence of lotus pups from the breeding population, a DNA-based test would be extremely valuable. At this time, the only

way to know if potential parents are carriers, is by having affected pups born (both parents are automatically carriers) or if a test mating was done by breeding the parent in question to a known carrier. If more than 11 normal pups are born, then the prospective parent is most likely not a carrier. However, this is a very crude method of “genetic testing” (see table below) and, understandably, breeders would not necessarily want to produce affected puppies.

Results of test breeding between a known carrier and a prospective breeder

Number of healthy pups born	Chances of parent being clear (not a carrier)
1	25%
2	43.7%
3	57.8%
4	68.4%
5	76.3%
6	82.2%
7	86.6%
8	90%
9	92.5%
10	94.4%
11	95.8%
12	96.8%
13	97.6%
14	98.2%
15	98.7%
16	99.0%

Currently, we are trying to understand the mechanisms involved in the development of lotus pups. There are a couple of things you can do to help. If you have a lotus pup, please contact me as soon as possible. If your pup should die, please send it to me on ice but not frozen. Please include basic pedigree information (parents and possibly grandparents). The samples should be sent to the address below. **All information is handled confidentially.** Thank you very much for your participation in this important study that will benefit all Silken Windhounds!

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