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## KITS AND CABOODLE

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# Peas in a Pod: Expression of undesirable genes in ferrets

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Seventeen years of breeding ferrets has certainly added to my college education in genetics. Remember Mendel's peas? Well, most genetic traits in ferrets are considerably more complex than the height and flower color of pea plants, and the lack of research in this area leads to even more confusion. For example, there is circumstantial evidence that insulinoma in ferrets might be carried through a bloodline, but research must be carried out to either prove or disprove this hypothesis. I personally have seen some evidence that cardiomyopathy is a genetic disorder and have traced the genetic origin of a cyst that appears near the opening of the uterus.

To make matters more complicated, although some diseases, such as insulinoma, in ferrets may be carried in the genetic code, these diseases are probably not always caused by the expression of undesirable genes. In other words, if several ferrets in a bloodline that have been raised in different homes develop a particular disorder, it is likely that this is a genetic disorder and the suspected bloodline should be discontinued. If only one ferret in a different bloodline, however, develops the same disorder, it is likely that this disorder in this particular ferret was not caused by the expression of genes.

### Tracing Genetic Disorders

Obesity and coat condition are genetic traits but are obviously not serious enough to suggest neutering the parents. Obesity or undesirable coat condition can be bred out by careful selec-

tion of the breeding pair. Other genetic traits are more serious problems, such as congenital deafness, juvenile cataracts, kinked tails, obesity, coat condition, monorchism (one testicle retained in the body cavity), and cryptorchism (both testicles retained). Breeders who cannot be positive that instances of these disorders in their kits are not genetic in origin should have the parents of these ferrets neutered. In some cases, the lineage of seemingly unrelated ferrets with a common disorder can be traced to find a common ancestor. All breeder animals with this ancestor should be neutered.

Case in point. Last year I heard from a person to whom I had sold a breeding jill. The jill had developed a cyst near the opening of her uterus when she had started her first estrus cycle. I had seen this condition previously only once—7 months before in a jill that had been born in the same year and that I had kept for breeding. My jill suddenly began to strain to urinate, and I palpated her abdomen to find a large mass directly in front of the pelvis. I had to put pressure on her bladder to force the urine out. My veterinarian suspected a tumor because of the sudden onset of the symptoms. The jill's condition led me and my veterinarian on a wild goose chase to figure out what was wrong with her. Finally, we opted for exploratory surgery and found the cyst. Neither I nor my veterinarian had ever seen this condition in a ferret, so I did not consider it to be a genetic disorder.

My jill's dam was from England and the sire was American. I had bred the sire several times already and had never seen anything unusual in his offspring. When I got a call that a second jill had the same problem, I traced for common

ancestors. The English jill was common to both my jill and the second jill I received a call about, and the American hob's bloodline was common to both jills. I then called all of the people who had kits that had come from either of these parents. I found one more case that did not contain the English jill's lineage, and then a second jill that I had kept for breeding developed the cyst just two months later. Her only common ancestor to the other three jills was the American hob. As this example shows, keeping complete and accurate breeding records is vital to ferreting out genetic problems.

In her July 25, 1998, speech at the AFA-sponsored "Medical Management of the Ferret," Dr. Judi Bell, DVM, MS, PhD, noted that cleft palates and head deformities are seen more often in ferrets such as dark-eyed whites, pandas, and blazes, which have heavy roaning or white patches in the coat. Dr. Bell cautioned against mating ferrets with any of these color patterns as their cross will likely result in an exaggerated expression of undesirable genes, especially those causing deafness due to Waardenburg syndrome. These ferrets, according to Dr. Bell, should be bred (if bred at all) to ferrets that do not have roaning or spotting, such as sables, chocolates, color points, or champagnes. Waardenburg syndrome can also cause neural tube defects in kits. Many times, if such an abnormal kit is present, the jill will have trouble delivering. Drugs such as Oxytocin usually do not help in these circumstances, and the jill requires a cesarean section. Also, an abnormal kit can prevent the rest of the litter from being delivered properly, which can greatly reduce the kits' chance of survival.

### Abnormal Prenatal Development

Some disorders in ferrets appear to result from abnormal prenatal development instead of gene expression. Neural tube kits and cleft palates appear to

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be genetic disorders while heart deformities and jills that leak urine seem to form prenatally and do not seem to be present in some bloodlines more than others. In large litters, generally more than 8 or 9 kits in an average-sized jill, kits are sometimes born with deformities that appear to be a result of uterine crowding. Crooked faces and crooked or misplaced teeth are two salient examples. If these traits show up in a large litter and they have not been seen previously in the bloodlines, it is likely that the deformities are the result of too many babies and not enough room. If there is even the slightest doubt, however, about a genetic cause, the affected ferret should not be used as a breeder. The breeder must use judgement when deciding whether to breed the parents of that kit again, however.

## Behavioral Traits

Behavioral traits are rather interesting to track over the years. Jills that are



*Although fancy kits are attractive to many pet owners, the long-term health of a breeding program depends on thoughtful choosing of breeding mates to avoid the undesirable traits associated with heavy roaring and white patches in a ferret's coat.*

daughters of good moms tend to be good moms themselves. Jills that survive bad moms tend also to be bad moms. For years I tracked this trait because I was not sure whether motherliness was learned behavior or genetic trait. For me the deciding factor came

when jills that were from bad moms were given to good moms to be raised and they still turned out to lack good mothering skills. As you can see from Cindy Sooy's article on page 20, however, there will always be exceptions to the rule!

## Weird Science

by Cindy Sooy  
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Everyone knows that certain traits in ferrets, such as color, temperament, bone structure and size, are hereditary and can be emphasized by selective breeding, but over the years I've noticed that other traits seem to be inherited too, and these are ones you wouldn't think of as being genetic.

Take sloppiness, for instance. I have a line of ferrets that are slob. They are beautiful ferrets, but their cages are a mess five minutes after I clean them. I find crumbs on the floor, in the hammock, and in the bedding. I know that sloppiness is not a learned trait because even the ferrets I've sold as kits are sloppy, and even the whole males that live alone are slob. I always laugh

when someone gets one of these kits from me and later calls and says, "She's beautiful, but she's a pig."

These sloppy ferrets love full trash cans. They will dig their way to the bottom and relish the aromas and textures of the garbage. Hygiene is the last thing on their minds. Cleaning their ears or giving them baths is an ordeal. I won't even mention the fuss when I try to clean their teeth! So far the sloppiness "gene" has been passed through four generations. One jill from the fifth generation seems to lack the gene, but then she is 50% English and isn't in one place long enough to make a mess. Her babies are only 10 weeks old and are messy as most kits are. Only time will tell if they inherited the sloppy gene.

Tail wagging is another trait that seems to be heritable, although I suppose it could be related to temperament. I have

several related ferrets that get very excited when a person or another ferret comes near their cages. They will quickly step from foot to foot, wagging their tails furiously. I also have two hobs, father and son, that stand on their hind legs to get attention. They look like bookends. Two daughters share this trait, but to a lesser extent than dad and baby brother.

What about pushing a ball with your nose—not something usually mentioned in a genetics class, but again I have related ferrets that do this. It's pretty comical to watch. So far, I've had mostly females that do this trick and only one male. If I could find an unrelated male with this trait, maybe I could breed for it. I could put together a ferret soccer team. Now that would be something to see.

Ferret genetics are truly weird science.