Heredity of coat types

In the association of rough-haired Kromfohrländer it isn't allowed to breed with another variety of Kromfohrländer than the rough-haired type - although there are existing three varieties:

- the rough-haired type (comparable with rough-haired Teckel),
- the smooth-haired type (comparable with smooth-haired Teckel)
- and the shorthair type (comparable with the Teckel with short coat).

What's the reason, that breeder decided only to breed with rough-haired Kromfohrländer?
To explain this procedure, it's important to have an idea from all three coat-types:

The rough-haired dog, like Kromfohrländer, but also all other breeds with rough coat, consists of two layers of hair:
the "warming" undercoat and the guard hair.
The guard hair is growing, dies and has to be plucked out, the new guard hair is growing and, depending on hair-growth of the dog, you have for example to pluck it out twice a year.
The rough-haired dog is a creation of humankind - all dogs with a hair type comparable to "wolves" are able to remove their dead hair themselves by running through bushes with thorns. But in the case of rough-haired dogs the hair is still too tight although it is dead, and the dog can not get rid of it. Therefore, understandably, in nature you never will find a rough-haired wolf and it is the responsibility of the owner to help his rough-haired dog when it is changing coat.

That means that the guard hair of a rough-haired dog is changing length of hair all the time, depending on the hair's growing and dying. The undercoat of the rough-haired dogs is always the warming layer, making it a permanent hair.

The coat of the smooth-haired dogs is nearest to the one of the ancestor wolf - his undercoat is soft and long (compared to rough-haired) and the outer coat is protecting the dog. The smooth-haired dog doesn't show any beard, typical are "Fahnen" and "Hosen" what means the longer hair on the front and behind legs. Also the tail is characterized by longer hair.
The outer coat of the smooth-haired dog is firm, but silky.

While shedding the long-haired dog loses its undercoat and our Spitz at home (also representatives of smooth-haired dogs) looked very miserable at that moment:
the nice standing hair stuck to the body due to the lack of undercoat and the dogs looked more like a wilted flower than a living ball of wool.

Smooth-haired dogs can, same as wolves, do their own grooming:
They slip through prickly bushes and tear out their undercoat with the help of thorns and tendril. In nature it takes a little time but our dogs get the help of their owners....
When old undercoat is lost, the growing of the new undercoat is beginning; for the wolves this is happening at regular intervals depending on the season, whereas our domesticated dogs are no longer depending on the seasons.

The short-haired-dog is characterized by a coat which is, as the name says, short all over the body.
The muzzle has no beard, the undercoat is a little shorter than the outer coat. Some owners of this variety, who thought they would get a kind of very easy coat get quickly to the terrifying realization that this variety seems to loose hair all the time and the prickly hair clings to cushions, car seats or clothing. The removal of it is time-consuming, unless you have the correct device.
Because this variety is not desired in the breed, the following comments refer to the rough-haired and smooth-haired variety.

Comparisons are often better illustrating what I mean and for this, I refer to the smooth-haired variety of the Kromfohrländer as "salt" and to the rough-haired version as "sugar".
You can imagine that mixing these two ingredients would result in a horrible taste - nowhere you will find this mixing at home.
The same is true with the smooth-haired and the rough-haired varieties of Kromfohrländer: mixing the hair-varieties, in which one of them owns a permanent outer coat and changing undercoat and the other one a changing outer coat and permanent undercoat, has the same effect like mixing sugar and salt - they are incompatible!
The result is a Kromfohrländer for example looking like a rough-haired one because of his beard, but his coat is silky and smooth, all characteristics of the smooth-haired variety. It's neither fish nor meat, as we say in Germany.

"Baron vom Kleefelder Graben" was such a typical version of Kromfohrländer:
he showed a beard, which assigned him to the rough-haired variety, but his coat identified him as a representative of the smooth-haired variety. In Germany more than twenty years ago, you could find these "mixings" on dog-shows and the judges often brooded, in which category they should file them....

Even under this aspect it's self-explanatory, that mixing of the hair-varieties "smooth x rough" is of little help.
Under the argument of a broader distribution some people advise to mix the hair-varieties to obtain better health and genetic basis with Kromfohrländer.
But: Kromfohrländer are very closely related - so closely related that Mr. Schelling from veterinary-university of Zurich, Switzerland, wasn't able to find a genetic marker for the inherited disease "footpad hyperkeratosis", although he had blood samples from both varieties available.

Figuratively speaking the glass of water is full when it comes to the total population of Kromfohrländer, - more than full.
Taking a full glass of water with "smooth-haired Kromfohrländer" and mixing it with a full glass of water with the "rough-haired Kromfohrländer", what do you think, is the result?

Yes, a full glass of water! A mixing of the hair-varieties is resulting in a melting pot, but the same problem you wanted to solve, you will have a few generations later - only with more dogs in hair-variety you ever wanted....

Breeding rough-haired Kromfohrländer, the mixing of hair-varieties carries a permanent danger.
And to understand this, you should have heard the name "Mendel" and his law of inheritance and you should have a little understanding of this topic.
Really, the laws of inheritance are essential for the breeding of dogs and everybody who wants to understand the breeding of rough-haired Kromfohrländer has to learn this topic.

Genes determine the appearance of the dog and a dominant and/or recessive gene is responsible for the inheritance of the coat.
I will try to explain this difficult context as comprehensible as possible and I hope you will understand.

The dominate gene is suppressing the recessive gene, that means, if there is born a dog with a recessive gene for "smooth hair" and a dominant gene for "rough hair" , this dog shows all characteristics of a rough-haired dog; responsible for the inheritance of the coat is always a pair of genes.

Smooth hair is controlled by a recessive pair of genes; this gene pair can produce only one variety of hair - the smooth coat. With this combination you never can produce rough hair.
Mating a smooth-haired dog with another smooth-haired dog will always result in a litter of smooth-haired Kromfohrländer.
So it is possible as a breeder of smooth-haired Kromfohrländer to promise your buyers, that the litter only will show smooth-haired puppies although you can find rough-coated Kromfohrländer in the pedigree of the parents.

If you own a German breeding book and want to look this up, have for example a look at the B-litter "vom Kleefelder Graben", but there are even more mix-breedings in the breeding book.

But in a lot of cases the hair-varieties of the puppies are not correctly registered at the final inspection of the puppies and unfortunately they were not corrected in the breeding book later.
So you can only continue to research successfully if you know the correct hair-varieties of the adult dogs and you have to correct the breeding book yourself.

(An example is the "A"-litter "von der Zapfenwiese": the parents of this litter are rough-haired:

Looking to the stud book, the dogs "Alpha", "Anton" and "Arco" are described as rough-haired puppies.
But that’s wrong: the adult dog "Alpha" is a smooth-haired Kromfohrländer, well, a dog with no beard and long and silky coat.
His brother "Anton" shows short coat, also a dog without beard, but in contrast to "Alpha" with short coat on the whole body - same as "Arco", who is wrongly registered as rough-haired puppy; he has also short coat.)

But now I proceed from these concrete examples to a general explanation:
I will describe the hair-varieties with letters:

A big "A" represents the dominant gene of rough-hair, the little "a" is representing the recessive gene of the smooth-haired dogs.

We have just read that the dominant gene is suppressing the recessive gene of smooth hair and in this combination a rough-haired dog would be born. This pair of gene is characterized by the dominant gene of rough hair, "A", and by "a" as the recessive gene of smooth hair; this results in the combination "Aa".

If you only find smooth-haired dogs in a litter, as previously described, it's sure that the parents only own a pair of recessive genes.
In this case we get the following combination: the mother owns a pair of genes with only recessive character, "aa", and the father shows the same recessive combination, namely "aa".
In letters again: "aa" = mother x father = "aa" and in result all puppies possess the gene pair "aa", combining always one gene from the mother and one gene from the father = born are only puppies with smooth coat!

Would you like to breed rough-haired dogs, then there is ideally the following combination:
"AA" = mother and "AA" = father, this combination makes sure, that only rough-haired dogs are born.
In the case of gene-pair-combinations "AA" and "aa" you are talking about homozygosity for the variety of hair.

Unfortunately, dogs have no display, on which you can read what gene pair they possess.....

But we know yet, that gene pair "aa", crossed with gene pair "aa" only results in smooth-haired dogs ("aa" x "aa" = "aa") and that the combination "AA" crossed with "AA" only results in rough-haired dogs ("AA" x "AA" = "AA").

However, the combination "Aa" show's also rough-haired dogs – which brings up the question, why it's so dangerous for breeders of rough-haired dogs to cross their dogs with smooth-haired ones, if the gene for rough hair is dominant?
A good question and it's of utmost importance to get to the bottom of it!

And again we use our "letters" as an aid and cross them, starting with a freely chosen combination:

We are crossing "**A***A*" (homozygote for beard) with "Aa" (heterozygote, dog is showing beard and looks like a rough-haired dog, the gene for smooth hair is repressed)and are getting the following result, if all pairs of genes are evenly mixed and the litter consists of four children:

- **A**A = one puppy is homozygote for beard
- **A**a = one puppy is heterozygote, shows a beard and is attributed to the rough-haired dogs
- *A*A = one puppy is homozygote for beard
- *A*a = one puppy is heterozygote, shows a beard and is attributed to the rough-haired dogs.

The whole litter shows dogs with beard.

Now we are mixing the heterozygote dogs from the previous combination:

"**Aa**" looks like a rough-haired dog, crossed with same type of dog with the gene pair "*A*a" and we get this combination:

"**A***A*" and "**A**a" and "**a***A*" and "**a**a", so:

- "**A***A*", one puppy homozygote for beard
- "**A**a", one puppy with beard but heterozygote
- "**a***A*", one puppy with beard but heterozygote
- "**a**a", one puppy homozygote for smooth hair

And now we can better isolate the danger point:

Combining smooth-haired dogs with smooth-haired dogs never results in other types of dogs than the parents themselves.

If you breed rough-haired dogs and you combine two dogs *looking* like rough-haired dogs but not being homozygote for beard, this will lead to the fact that you also have homozygote smooth-haired puppies in this litter.

Thus – if you have, as assumed above, four puppies in this combination, you have as a breeder of rough-haired dogs already lost one puppy for the rough-haired breed because this puppy is born as a homozygote smooth-haired dog..

But let's have a look at the combination of a homozygote dog for beard with a smooth-haired dog:

"**A***A*" for a dog which is homozygote for beard crossed with a homozygote smooth-haired dog, "**a**a":

"**Aa**" and "**A**a" and "*A***a**" and "*A*a", so:

- "**Aa**", one puppy with beard, but heterozygote
- "**A**a", one puppy with beard, but heterozygote
- "*A***a**", one puppy with beard, but heterozygote
- "*A*a", one puppy with beard, but heterozygote

All puppies look like rough-haired dogs, with beard, no puppy without beard.

Well, what happens, if we are crossing these seemingly rough-haired, but heterozygote dogs with a smooth-haired dog?

Interesting thing:

Mother is in combination of "**A**a" a rough-haired dog as in the previous example, the father is a smooth-haired dog with the well-known formula "a**a**".

This is the result from mixing "**A**a" x "a**a**":

"**A**a" and **Aa**" and "aa" and "a**a**", so:

- "**A**a", one puppie with beard, but heterozygote
- "**Aa**", one puppie with beard, but heterozygote
- "aa", one puppie homozygote for smooth hair **!**
- "a**a**", one puppie homozygote for smooth hair **!**

Two puppies are *looking* like rough-haired dogs, but they are heterozygote and two puppies are born as smooth-haired dogs. **While breeding rough-haired dogs in this litter you are loosing two puppies, if the mother is heterozygote - <u>and</u>: looking at your dog, you can not see whether your dog is heterozygote or not!**

Breeding rough-haired dogs is more difficult then breeding smooth-haired dogs and while mixing the varieties, it's sure, your offspring is characterized by a certain loss of puppies with the desired rough fur.
In Germany, breeders never looked for Kromfohrländer which are homozygote for rough hair, so it seems like a lottery if you are breeding Kromfohrländer with beard and looking to their offsprings - in only a few cases you know, that a rough-haired Kromfohrländer is homozygote about his hair.....

Let's have a look at the real world. Here are some of the latest examples from German studbook - provided the hair varieties were entered correctly.
These examples will show you how important it is, to have correct records:

The rough-haired Kromfohrländer female "Gisella vom Isarflimmern" (studbooknr. 05/3059) was mated with the smooth-haired Kromfohrländer male "Benito vom Burgkopf" (studbooknr. 04/3010).
We assume that Gisella is homozygote for beard (so rough hair) and their formula would read as follows: "**A***A*" x "a**a**". The result would be as follows:

"**A**a" and "**Aa**" and "*A*a" and "*A***a**", all puppies are heterozygote, but looking like rough-haired dogs with beard.
Looking to the studbook, all eight puppies are entered as rough-haired puppies (studbooknr. 08/3860 - 3867).

The assumption, that "Gisella" is homozygote for beard seems to be right, otherwise, if she would be heterozygote with the formula "**A**a", then mathematically also puppies with the formula "aa" (long-haired puppies) must fall.
(Unfortunately, only in theory. In practice Mendel is also a bit unpredictable ;-)))

To find out if "Gisella" is homozygote for beard, it's necessary to have at least three litters with males without beard with the same result as described, all puppies are born with beard. But a true breeding female, which is homozygote for beard is such a valuable dog, that as a true breeder of rough hair, you never will take her for mixed pairings.

If now one female from Gisella´s "B"-litter is reused, for example "Bibiana" (studbooknr. 08/3866, she is allowed for breed from RZV and the breeder wants to mate her), her genetic formula is "**A**a", heterozygote, but looking like a rough-haired dog with beard.

If she is mated to a smooth-haired dog (which the breeder wanted to do), we obtain the following constellation:

"**A**a" from mother "Bibiana" x "a**a**" from a smooth-haired Kromfohrländer results in:

"**A**a" and "**Aa**" and "aa" and "a**a**", in the litter are born:

- two puppies with beard, but heterozygote
- two puppies with smooth coat, homozygote

(The pairing has not been accomplished until yet)

And all the time you should remember the fact, that you are crossing two varieties, which do not fit together; you get a mixing of hair in your offsprings which are neither rough-haired nor smooth-haired!

For a breeder of rough-haired Kromfohrländer a very bad result is the following.

Let's have another look at the studbook of RZV: the "H" - litter from the kennel "vom Strithorst":

The rough-haired "Amanda vom Strithorst" (studbooknr. 02/2533) was mated with the smooth-haired Kromfohrländer "Glenn vom Katenbach" (studbooknr. 05/3063).

The result leads to the unequivocal conclusion, that "Amanda" is heterozygote:

in her "H" litter there are puppies without beard.
This is only possible in the combination "Aa" from Amanda and "aa" from "Glenn vom Katenbach" ("Aa" x "aa").

The litter shows four puppies (studbooknr. 09/4165 - 4168), three puppies are entered as puppies without beard, one puppy is entered with a question mark, so the controlling person didn't know, which variety of hair this puppy will have.
(In this case it would be very interesting to know, which variety this dog is now!)

For a reputable breeder of rough-haired Kromfohrländer, at best, only one puppy remains for breeding, but in this litter you don't even know, if this dog is rough-haired.
If not, the whole litter is a loss for a breeder of rough-haired Kromfohrländer.....

This is a classical example for the difficulty to breed Kromfohrländer with homozygosis for beard and how great the danger is that the potential of the breeding of rough-haired dogs is weakened because of the mixing of hair-varieties!

And believe me, it's not for nothing that Pinscher and Schnauzer separated in two different breeds, although once they have been one and the same breed.
Also, the breeders of Teckel have good reasons to strictly separate the existing three hair-varieties - you understand why if you know genetics and coat.

If you are not interested in genetics, but want to know how it works in practice with beardless and rough-haired dogs, I recommend the pages of the mediators of dogs from the South (for example Mallorca or Greece):
there you will mostly find beardless dogs! Only with a selective breed rough-haired dogs will last.

Résumé:
If you want to breed rough-haired Kromfohrländer seriously, the goal must be to breed dogs that are homozygous concerning the beard!

The crossing program in our kennel has the goal to breed rough-haired Kromfohrländer and due to all the previously mentioned reasons, we only use dogs with beard for our breeding.

If it would be allowed to take all hair varieties, you would perhaps get the same result concerning vitality and character, but without the breed standard you have no breeds and if you mix all hair varieties you get "mixed" dogs:
This has nothing to do with a serious dog breeding.

The smaller the gene pool of a breed is, the more targeted breeding must be.
The greater the variety of hair types within a small dog population is, the more dogs seem incorrect.

For the sake of completeness a little word about short-haired dogs (short hair without beard):

their genetic formula is the same as for smooth-haired dogs, in other words "**aa**", which means that if you mix smooth-haired dogs with short haired dogs, the offsprings will never have a beard, regardless to antecedents with beard - only the length of the coat differs.