Linebreeding (2)

Last time we discussed in broad terms how linebreeding works and how it can be used as a very effective tool for improving your pigeons. Before we proceed to discuss the two breeding scenarios which I presented at the end of the article, let me review two key points.

First, egg and sperm cells are made by a special kind of cell division known as meiosis. This is the mechanism nature uses to reduce the number of chromosomes by half so that after fertilization, the chromosome number is restored to the normal number (which in the pigeon is 40 pairs or 80 chromosomes). Critical to our discussion on linebreeding though is a second aspect of meiosis. Prior to the chromosome pairs segregating into separate egg or sperm cells, each pair of chromosomes actually align themselves side by side, each chromosome breaks into two pieces (rarely at the exact middle point) and then each piece rejoins with the analogous piece from the opposite aligned chromosome. So, while each chromosome in an individual comes from one particular parent, that same chromosome has genetic material from **both** of that parent's parents! This is important because it means that the genetic contribution of each of the four grand parents is not exactly 25% each, but on average 25% each. Some offspring will have more than 25% of a particular grand parent and others will have less than 25% of that same grand parent. Further, one grandparent may contribute more than 25% of one chromosome (e.g. #17) and less than 25% of another chromosome (e.g. #9). These variations occur for all grandchildren, but they can be even more significant in linebreeding where we have an individual present more than once in the pedigree. So why is this so important? It is yet another mechanism we see from nature that promotes variation and it underscores the point that not all children of a particular mating are even close to being equal. On average they may have a certain predictable value, but individually there is variation. And the degree of that variation can be significant. In all breeding we must strictly cull, but in linebreeding it is vitally important to remember that just because an individual is an amazing theoretical percentage of some great ancestor, it is not a guaranteed percentage or that it includes the important genes. To say you have a grandson of "Super 73" or a linebred descendant who is 40% "Super 73" is to say you have a good breeding **prospect**. To know whether or not it actually **is** a good breeder, will require that you breed it and then evaluate the performance of its offspring (as either racers or as breeders).

The second point I would like to review from the last article is a kind of practical algorithm or recipe for linebreeding. It is really all you need to know. Everything else that was discussed gave you an understanding of why this works, but the simplicity of the bottom line is really quite amazing:

1) Make sure the genes you need are actually **in your gene pool** (in the case of linebreeding we are presumably working around a genetically superior individual that we have identified).
2) **Stack the deck**. Put that genetically superior individual in the pedigree everywhere you can. Some people get concerned about how much loss of vitality will occur with intense linebreeding. My experience is that it takes quite a bit more than most people think for this to occur. Also, remember that any ill effects of inbreeding depression can be immediately reversed in a single outcross to an unrelated line, so this loss of vitality issue is something that can be managed and is certainly worth the effort in the case of world class individuals.
3) **Play lots of hands**. Remember that great pigeons do not come along in every nest even when bred from great breeders. Don't give up on a particular mating after just one round, nor think that a single great pigeon defines a hit pair. Of course we want breeders that consistently produce good racers, but to find the elite bird still may take several rounds. To put it another way, when you hit upon a super mating, you have a wonderful opportunity to find the few offspring that exceed the outstanding average of that pair.
4) **Know when you have a winning hand**. This is where so many people go wrong. Know what you are trying to produce and make sure you know how to recognize it. This seems so obvious and yet it is often the most difficult part of breeding. It requires that you have thought through what you are trying to produce and that you are consistent in this goal for a prolonged period. It requires that you can distinguish between the environmental and genetic contributions of the birds you evaluate. It also means you need to know how to effectively identify the losing hands and cull them from your program.

Lets try to apply all of this to the two scenarios I posed at the end of the last article.

Scenario 1: I think the Janssen Brother's "Oude Merckx" was an exceptional breeder. He shows up behind so many great racers and families. Let's assume you share this view and you have found a fertile cock which you can afford who has an exceptional race record and whose percent contribution from "Oude Merckx" is 20.3% (e.g. he appears 8 times in the 5^{th} and 6^{th} generations). Lets also assume you are not happy with your current gene pool and you are looking to improve. Ponder what you would do. If

you elected to obtain this cock, how would you manage his breeding program? There are of course no right or wrong answers here. This is just a scenario that will give rise to a rich discussion.

I hope you have spent some time thinking about this, because that is the real point. While I have offered an algorithm above for applying linebreeding, it still requires planning and careful thought. What follows is my answer. Yours may have been quite different and is just as correct / incorrect as mine. The real scoring of our answers comes with our results.

I interpreted the question to mean I was able to obtain just the cock, but no others. The first step is to identify which hen(s) he will be mated to in the coming breeding season. While it would be nice to be able to breed him to every hen in the loft and then evaluate the results, that usually isn't practical. My approach would be to select my three best proven breeding hens and polygamously breed the new cock to each of the three hens. If the new cock is old, I would go through the first round of weanlings and either set aside or mark with a colored snap band any male youngsters that look very promising. This is done to preserve the program in the event the cock becomes infertile or dies early on. Other than this exception, every bird raised would be placed on the young bird team and flown. At the conclusion of the young bird season I would evaluate the results and rate the three pairings. The actual numbers would vary according to the results, but in general I would then do something along these lines – keep the hen who produced the best young bird flyers mated to the Merckx cock. The two other hens would be replaced in the next breeding season with the best two flying daughters of the three original hens when crossed to the Merckx cock. If the flying records are close among the top three, I would consider conformation and select hens that are well balanced. I would also pair any remaining outstanding youngsters from the first year crop. I would probably avoid brother sister matings if possible. In all of these matings, I wouldn't breed anything from the bottom 50% (based on the young bird race results). The ones not used for breeding would either be culled or placed on the old bird team for further race testing.

Year 2: Race everything that is raised. This is a key decision year. If the results of the young bird races or the old bird races from the previous year's crop are not encouraging, consideration has to be given to the possibility that the Merckx cock we obtained was not of sufficient genetic quality to merit continuing this outcross. Sometimes this is the case. Since the scenario states we really believe the "Oude Merckx" is a key breeder, we might try to obtain other descendants to start over. Or, we might cautiously carry on for another year to evaluate old bird results. The point is that as we move forward, we are aware of the possibility that we may be going down a dead end road. That happens and the sooner we recognize it, the sooner we can take corrective action. Hopefully though, the results from year 2 racing are promising and we continue on to subsequent years.

Year 3 and beyond: By now we have a fair number of birds in the loft which are descendants of "Oude Merckx". We can afford to fly everything without fear of losing our genetic base. We also have good numbers being produced and tested so we can be very selective about what we retain for breeding. I would, at this point, follow the algorithm above - line up the "Oude Merckx" as much as possible in the pedigree using only the best racers or breeders of racers, test everything these matings produce, retain only the top 5% for further breeding and look for patterns among the matings that are working out well. After a few more years of following this approach we are likely to get to the point where we will have positively influenced the gene pool of our loft.

Scenario 2: Lets assume you have identified a superior racer. Like the first question you are not happy with your current gene pool and are looking to improve your lot. The breeder of this pigeon is retiring from the sport and holding an auction where the following lots of birds that are related to this pigeon are going to be sold. Lets (unrealistically) remove from consideration other real world issues and assume for the sake of our discussion that all of the offspring at the sale are of acceptable conformation and health. The flyer who owns this ace pigeon breeds from a family that he has kept for over 20 years with some, but infrequent, outcrossing. What are you going to do? Again, no right or wrong answers, just good fodder for discussion.

1) The Ace Pigeon. This is the first lot to sell. If you buy him you will have no money left to buy any others. The pigeon is 9 years old and still fertile.
2) The dam of the Ace Pigeon. She has produced two other Ace Pigeons when mated to two other cocks. She is 11 years old, but earlier this season she had one fertile egg. There are several months left in the breeding season. She will cost half you budget.
3) A squeeker that appears to be a cock. He is out of lots 1 and 2. It will cost half your budget.
4) A kit of ten grandchildren of the Ace Pigeon. Four cocks and six hens. This kit will cost all of your budget.
5) The sire of the Ace Pigeon. He is 10 years old and still fertile, but the Ace Pigeon is the only significant offspring he has produced. All others were average flyers. He will cost you half your budget.
6) A yearling cock and yearling hen directly off the Ace Pigeon. It will cost all of your budget.
7) A yearling cock off the Ace Pigeon. He will cost half of your budget.
8) A yearling hen off the Ace Pigeon. She will cost half of your budget.
9) Five squeeker grandchildren of the Ace Pigeon. They will cost half of your budget.

The point I wanted to make with this question is that there are probably a dozen different ways you could have purchased at this auction and there is really no way to know ahead of time which will turn out to be the best. So you go to the auction, examine the

birds and then go with what you perceive to be the best opportunity. There are so many variables. Clearly Lot 2 is special, but what if you never get another egg? On the other hand, maybe with a little rest and a fortified diet she has six fertile eggs next year. If I knew that would be the case, then Lot 2 could be a very key purchase.

How would I have bid? I would have probably tried to strike a balance between risk and opportunity. I would have tried to get Lot 3 (it carries a wonderful set of genes) and since its sex is not absolutely known I would have then gone for Lot 9 (it almost certainly gives a mate for Lot 3 and probably another pair). My six birds would have represented a very nice sample of the genes that are behind the Ace Pigeon and they would be young enough that I should be able to do something positive with them.

The Three Problems

At the beginning of the last article, I posed three problems that could be solved by linebreeding. Now that we have completed our fairly detailed discussion, lets revisit these three problems and make sure we understand how linebreeding can help.

Problem 1 – Key Pigeon is Unavailable for Breeding

I hope by now this one is self evident. As an example, "Super 73" was a very famous pigeon in the United States. Bred by G. Peters and imported by Campbell Strange, he was the sire and grandsire of many futurity winners. He is no longer alive and yet birds linebred around him continue to do well in the futurity races. In my loft I have over a dozen breeders that are at least 44% "Super 73", despite never owning anything closer than a linebred grandchild. I couldn't have afforded him even if I had known how prepotent a breeder he would become and yet here I am twenty years later with a very strong breeding flock of "Super 73's".

Some people will argue that to win races today, you can't dwell on the pigeons of yesterday. There is a certain amount of truth in that position. However, in the case of truly world class racing pigeons, certain of their genes are almost timeless. Furthermore, in linebreeding you are still shuffling the great genes of the linebred bird with those of your current breeders. You still test and you still cull. It can be an opportunity to make great birds today by taking advantage of the great proven birds of yesterday.

Problem 2 - The Once in a Lifetime Bird

What you would do with a "once in a lifetime" bird is very similar to the solution I offered earlier for Scenario 1. The biggest objection most people have to concentrating too much of a single bird in the pedigree is that vitality will be decreased. As I have said in earlier articles as well as above, this is largely overstated. While inbreeding depression is a very real phenomenon, superior selection can compensate for it for quite a few generations. Twenty years ago I bred Rex rabbits. This is a breed with a very plush fur. As you might expect, one of the desirable traits of a breed of fur animals is size since the size and quality of a pelt determines its value. At the time we started breeding Rex, the standard called for animals that were from 9 to 12 pound. They were almost impossible to find as most barely attained a weight of 7 pounds. Through a program of initial outcrossing and then intense linebreeding we were able (along with a dear friend of mine who shared this breeding philosophy) to attain lines that consistently produced 10 to 13 pound animals with superb coats. The small mature size all of the other breeders predicted our linebreeding would produce, never materialized. The reason? We kept size as a selection criteria along with coat qualities. At least some of the inferiority of linebred and inbred lines is due to faulty selection.

Problem 3 - Handling Key Introductions to the Breeding Loft

The answer to this problem is also contained in the solution to Scenario 1. One of the keys is to recognize that not all flock additions are going to have a positive impact. The strategy should be to breed heavily at the beginning of the introduction and to test nearly everything produced. By the end of the second year you should have a good idea of whether or not the introduction is working out. Don't be afraid to back it out. Conversely, if the introduction is pure gold, you have found out early so that you can take full advantage of the new bird's reproductive life. In those cases, make a point of successively breeding it to its best offspring year after year (as was described in my original article) for at least one round each year.

I hope this rather detailed discussion of linebreeding has been of some value. It is a tool I have used successfully for over four decades in multiple species. It isn't the only tool you need and it isn't the best tool to use in all situations, but when the situation fits, it is a dandy. If you have questions, I would encourage you to send them to "Winning". I would be happy to answer them and then share them with the other readers.