

**HOW GENETIC TESTING AND CHOOSING A SIRE COMBINE
TO BREED A FOAL!
By Caroline Sussex**

The Stud Book Committee of the Arab Horse Society recently discussed genetic testing and education. Despite many articles and information available in publications and on the internet, it was felt that further explanation was needed so that people could view this subject in the light of the new world of genetics – which has moved on in leaps and bounds over the past few years.

WORLD ARABIAN HORSE ORGANISATION (WAHO)

The WAHO Conferences always have experts from the field of genetics giving us the latest updates on genetic testing in all sorts of fields. Here it is stressed that in the human, there are many, many genetic disorders and of course in all species genetics plays a huge role in so many ways – stem cells and their uses are to take modern medicine by storm and could change the whole future of mankind. Below is a quote from the WAHO article on Genetics.

“It is important to understand that SCID, CA and LFS, the three conditions for which testing is now available, are all autosomal recessives, which means that carriers of these genes are completely free of clinical signs and do not have any negative consequences to their health or performance. Autosomal recessive traits are found in many mammal species. “Autosomal” means the trait is not sex linked, and “recessive” means that in order for a foal to be affected, it must have 2 copies of the mutated allele, receiving one copy from each parent. It is only when two carriers are bred together that an affected foal can be produced. Following the diligent work of many researchers in many countries over the past decades, these tests can now be used as tools by responsible owners when planning breedings, along with all the many other considerations that go into making such decisions. “

Breeding a carrier to a carrier will result in a one in four chance of a foal being clear, two out of four foals being carriers and one out of four affected – which would mean the loss of a foal within the first three months or one that would need to be euthanized later. Breeding a carrier to clear will mean that 2 out of four foals will be clear and 2 out of four foals will be carriers.

THE ARABIAN

In the Arabian breed there are at present three carrier tests for these genetic disorders. These are SCID (Severe Combined Immuno-Deficiency), LFS Lavender Foal Syndrome (LFS) and Cerebellar Abiotrophy (CA). There are also similar but different disorders in other breeds, for instance, Fell Pony Syndrome is a good example. Here the desperate need for a genetic test to prevent the Fell Pony from completely disappearing was found. The carrier test has saved this breed and doubled the numbers as carriers were no longer being bred together in such a small gene pool.

PRIOR TO TESTING

Prior to worldwide testing in Arabians being available (the first was CID in 1999), people had been breeding Arabians for over 100 years. The gene pool was widening as inter breeding between countries was not possible unless you imported a horse from overseas. At this time, the disorders we now have carrier tests for, were unknown. It was only by taking dead foals to a specialist centre (Newmarket for the

UK) that SCID (CID then) could be confirmed. Sadly people starting guessing which stallions were carriers which was wrong as loss of foals happened far more frequently in the past due to lack of management, veterinary medicine etc. and all sorts of other tragedies that happen during foaling.

MANY REASONS FOR FOAL DEATHS

It must be stressed that death due to genetic disorders was rare in comparison to all the other reasons why a foal could be born dead. The Equine placenta contains vital clues to neonatal problems. In an exceptional talk given by Dr Wilsher at the 2013 Colloquium of Equine Breeding, Dr Wilsher says that the placenta is critical to the development of the foal. Incorrect or inferior placentation at any stage of gestation can have serious implications for the development of the foetus. Mares can abort due to infection, and overfeeding at the wrong time can result in smaller foals. Length of the umbilical cord should be around 55cm but varies from 32-90 cm. Short cords can produce premature rupturing and oxygen starvation while long cords of 84cm plus can cause strangulation, twisting and necrosis at the cervical pole. These are just some of the reasons for a foal to die. They can also die from dysmaturity, suffocation in the sac if not broken fast enough, unfortunately the list is endless.

BREEDING YOUR MARE – PROS AND CONS

So when contemplating breeding your mare you should decide where her good and weak points are. Peoples' ideas vary on what they wish to achieve. Correct conformation, good free natural movement and temperament would be the ideal. A mare with a slightly weak back end should be put to a stallion with strong hind quarters and limbs but it would not be sensible to breed to a stallion with offset front legs or a really straight shoulder unless the mare was exceptional in these areas. Of course we would be wrong to say we could ever have the perfect horse and the aim of breeding is to always improve on the parents.

VISITING THE STUD

Once you have chosen your stallion, and hopefully looked at some progeny and their performance, ensured that the stallion is registered in the appropriate register and is available by natural cover, it is always advisable to visit the stud and a contract should be available for signature, so both parties know what they are liable for.

TESTING YOUR MARE

Once your short list is made, if your mare has not been tested for the three recessive genes, it would be advisable to do so. Many mares have been tested and if you purchase a mare, you should ask if the mare has been tested. If she has you should get copies of the relevant paperwork to prove her carrier status. If your mare comes up clear, then you can choose any stallion you want!

CARRIER PARENTS AND CHOICES

Should your mare carry a recessive gene, then you may be limited in the choice of stallion. Discussions with the stallion owners could be in confidence between the two of you as some owners prefer not to make the status of their horse public, which should be respected. Vice versa, if you have a carrier mare, you may not wish to make the status of your mare public.

If the stallion owner has not tested his stallion, but your mare is clear, then you need not worry you can go ahead and breed to the stallion. If your mare carries a recessive gene, eg. SCID, then you should ask the stallion owner to test as it would

not be safe to breed your mare without knowing the status of the stallion. If the stallion owner refuses to do this, then it would be wise to eliminate that stallion from your choice. If the stallion has been tested and is clear for SCID but positive for CA, then you are free to breed your mare. The resultant foal would have to be tested for both recessives, but in my experience so far, no resultant foal has carried both recessive genes when parents carry different recessives.

BREEDING CRITERIA AND TESTING

For many of us, testing is just a part of life. I personally am so pleased that at last we do have a test for LFS, which had been lingering around in the backgrounds of horses, and was little known about by many people, including vets. Once the LFS test was available new knowledge was derived about LFS in that all pale foals are in fact LFS. Although these foals could be born alive, they will not survive and euthanasia was sadly inevitable as fast as possible. Many more carriers were found than anyone realised throughout the Arabian breed.

THE FIRST TEST – CID NOW SCID

When the test for SCID came out in 1999, the Animal Health Trust asked for breeders to donate DNA as a trial. Many breeders took advantage and got their horses tested for free. I think that people are unaware at just how devastating (as a breeder and owner) it can be to find their horses to be carriers before it became part of our culture. I have talked to many people who still have fears and misunderstanding from the past. I hope I have helped them to realise that the test is a very positive tool, not negative and was a very big leap forward.

JONES FAMILY

I would also like to thank the Jones family for bringing in the US National Champion Stallion, Master Design. At the time, SCID had been known about and testing was available. The Jones told everyone that this special horse was a carrier of SCID and therefore only tested clear mares were accepted at stud. This did not stop a rush to use Design and where would this country be without this valuable blood in our programmes. So thank you Sue, Emrys, Ryan and Rhodri – you not only purchased an exceptional horse who has had such an impact on British breeding but you managed to eliminate from people's minds the issue that he carried a recessive gene as this superior stallion was all that mattered.

THE PARADIGM HAS SHIFTED

In 2011 the carrier test for LFS and CA was discovered. Once again, the Arabian horse world was thrown into confusion. New breeders were possibly unaware that many of us had all been through the trauma of SCID many years before, and now we had to retest our horses for another two recessive genes. Michael Bowling's exceptional article – The Paradigm has Shifted is on the AHS website along with other articles on genetics including the exceptional one from WAHO.

THE FUTURE

To those who say openness is the way forward – I trully wish it was. However, it is clear that people still feel they cannot use any carrier which results in shrinking the gene pool by more than 50% and eliminating such exceptional horses as Master Design along with almost certainly many other performance stallions who have won at the very top of their chosen profession.

PRESERVATION OF THE ARABIAN HORSE

We need to preserve the Arabian horse, and we need as wide a gene pool as possible. Genetic testing is here – and we are so pleased that it prevents any foal from dying from these disorders.

FUTURE GENETIC DISORDERS

New genetic disorders are being investigated all the time and so we could be testing for even more recessives in the future. Tests do not yet exist for other known disorders in the breed such as JES (Juvenile Epilepsy Syndrome), GPT (Guttural Pouch Tympany), or OAAM (Occipital Atlanto-Axial Malformation)

For now, we need to move forward and genetic testing should become standard practise for all breeders. That is all we should be worrying about and in time, more and more foals will be clear and nature will naturally increase the number of horses with no recessive genes. However, at the present time, it is very dangerous to imagine that you must not breed from carriers as the whole breed will be much poorer in its gene pool and the Arabian of lower quality as a result.

More information available on www.arabhorsesociety.org>studbook & Registration>genetic disorders and www.waho.org>General Interest>Genetic disorders in Arabian horses