



## CID: The Paradigm Has Shifted

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*Author's note: This piece illustrates the vitality of a new communications medium, for it grew primarily out of Internet discussions of the subject. Special thanks to Mary Anne Grimmell who planted the seed of "putting into laymen's language" the potential uses and misuses of the new CID test, along with the positive impact it will have on breeding farms, large and small, and who assisted in reviewing the story in draft.*

### **CID: PROGENY TESTING**

**Remember that progeny testing was previously the only way to know whether an Arabian horse had the CID gene. One could wait, and hope the gene did not turn up by accident; or one could make a systematic effort, and breed a stallion to known carrier mares, as one prominent breeder did with an imported horse a few years ago. (I am not aware that any other stallion was formally progeny tested, though there may have been one or two that I missed. Obviously if any horse had been so tested, and turned up negative, it would have been trumpeted from the housetops. Even at the highest estimates of CID gene frequency, most horses are expected to be negative; this implies that few were tested.)**

**To achieve 95% confidence of knowing an individual Arabian did not have the gene, one would**

Everything you know about CID has to be re-examined in the light of a single new fact. It is now possible to know where the CID gene is. This changes the shape of our world. No CID foals ever need be produced again.

CID can be openly discussed, because acknowledging one individual has the gene will no longer cast a pall over a whole breeding program or line of breeding. Individual horses can be tested and their individual status can be known; matings can be planned accordingly; guilt by association, and the notion of contagious genes, can finally be laid to rest. The rumor mill will have to find something else to grind. Statements of the form "Our neighbor's daughter's boyfriend's cousin knew someone who bred a mare to that horse and had a CID foal" will no longer carry any weight (not that they should ever have done, but the climate of ideas will change, and the impossibility of proving a negative will no longer apply). The delusion that CID is the only lethal gene of concern in Arabian breeding can be put out of its misery as well, and the substantive discussion of other problems, and the search for other gene tests, can begin -- inspired by the success with this difficult and challenging problem. The paradigm has shifted. New ways of thinking will be required.

- A. What are the drawbacks to CID (or any lethal defect) without a gene test? I submit, the following:
- 1) Foals die.
  - 2) Breeders suffer major emotional and financial hardships.

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**have to see a) 11 healthy offspring from known carrier mates; or b) healthy inbred offspring from 22 of the tested animals's own offspring. That awkward gender-free sentence is the only one I am going to have to write, since obviously no mare could ever be rigorously progeny tested to be CID-free, and also have a breeding career as such. Most Arabian stallions would end up siring more offspring in their progeny testing phase than they did in their breeding careers. (Note that breeding a prospective sire to 22 of his own daughters would have the advantage, over the 11 offspring from carrier mares, of potentially turning up any lethal or seriously deleterious gene(s), not just CID. Note also that it is 11 offspring from known carriers-- which could include several offspring from any one carrier-- but it is offspring from 22 different daughters.) That testing, to that level of confidence, has been prohibitively expensive -- this is plain from the fact that essentially no one did it. And it would generate a whole crowd of young horses that needed to be somewhere, after the testing was done, whether the results were positive or negative.**

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- 3) Potential newcomers are put off becoming involved with the breed: at best they cannot be sure their new horses are not carriers, and they are at some risk of having known, but unadmitted, carriers foisted off on them.
- B. What becomes of those drawbacks, given a carrier test?
  - 1) No foals need die, because no one need unknowingly cross together two horses with the gene.
  - 2) Breeders can test their stock and know how to avoid the problem.
  - 3) Potential buyers can test their prospects and know where they stand. The paradigm shifts, and new ways of thinking are required.

Every individual of every species carries genetic defects, and CID is not the only lethal operating in the Arabian breed. Acknowledging the existence of a problem, and developing a rational means to deal with it, is the opposite of denying that it is a serious one. All the drawbacks of CID arose out of the fact that we could not tell where the gene was. Now we can. Vicki Hearne's *Adam's Task*, a book of long essays on animal training, describes human-animal interaction as a form of language. One of Hearne's recurring themes is "the stories we know" about animals, or about the ways humans interact with animals, or the way animals interact with humans (she refers to animals as "knowing stories" too). Her position is that we can operate only in terms of the stories we tell ourselves, because that is the practical form our knowledge takes.

This notion has wide applications. For many years Arabian breeders told themselves the story that the Arabian, as "the oldest and purest breed of horse," must by that nature be free of lethal defects. Many of them even

extended this story to say that, if a lethal gene ever appeared, it must be the result of a pedigree flaw (not in the sense of introducing a gene from outside, but of somehow "causing" defects by violating the

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### **CID: COMBINED IMMUNODEFIENCY**

**The genetic immunodeficiencies are a complex set of conditions; since the early 1950s close to 20 different syndromes have been reported in humans and examples have been recorded in a few other species. The first indications of what came to be recognized as severe combined immunodeficiency (SCID) of Arabian foals were clinical reports out of Australia in the 1960s, and the syndrome was described in the U.S. in 1973. Its inheritance as a simple autosomal recessive was established by 1977. The disease can be tentatively diagnosed from a blood sample of a young foal. A white blood cell (lymphocyte) count of less than 1000 per mm<sup>3</sup> (vs 2500-3000 for a healthy foal) and lack of IgM (immunoglobulin M) are presumptive evidence of SCID; confirmation is by post-mortem showing underdeveloped thymus and lymph nodes. Lacking immune capacity, such foals will succumb before 5 months of age of massive infections.**

**With the SCID gene test:**

**-Sick Arabian foals of untested parents can be tested for the presence of the SCID gene in double dose, which will provide rapid and**

breed's metaphysical purity). I recently commented to someone that Arabian horses have been held to be immune to the laws of biology: their genetic problems are viewed as the effects of past moral transgressions (this is a prominent theme in 19<sup>th</sup> century nature philosophy, and in early 20<sup>th</sup> century racism). The story of population genetics now tells us that lethal genes, like other genes, are part of a breed's and a specie's history. Every individual of every species is now held to carry some lethal or highly deleterious gene(s) in hidden form. The longer a species has been under domestication, with matings controlled by humans and limited by studbook breed definitions, the more such genes will have a chance to arrive at substantial frequencies, and therefore to become unhidden through homozygous expression. In other words, the story that many Arabian breeders tell themselves, which amounts to saying that CID was a temporary aberration and if we can only get rid of that gene we will be "safe" again, is mis- (or dis-) information. There are candidate lethals described in the genetics or veterinary literature, some of which are better established than others (in terms of mode of inheritance, or the simple fact of being inherited; some are at present merely suspicious, since they appear to be recurring and breed-specific.).

The success of the CID story is that the gene now can become unhidden without killing foals. Our constructive response now is not to obsess over CID, which has been made harmless. It is to look for modes of inheritance, and for gene tests, which will put the other problems in the same position. People have been breeding blind with regard to CID for decades (its recessive nature has been known for over 20 years, never mind how long it existed before being defined). Now that situation has changed. With a gene test, CID is going to become a matter of fact. It will not be a whispers-behind-the-hand subject as it has been for so long. Some discussions of this topic seem to assume that the way things are (attitudes and assumptions, the stories we tell ourselves) are going to remain the way they are right now, forever. They will not. The paradigm has shifted. New ways of thinking are not only required, they are inevitable.

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**-Mare owners considering outside stallions for prospective matings can ask to see evidence of SCID gene status, and make informed breeding decisions.**

**-Within a breeding program, excellent individuals which happen to possess the SCID gene may be bred so as to retain their good qualities and yet avoid producing affected foals, and gradually reduce the gene's frequency.**

**-It should be emphasized that SCID is a recessive genetic defect; no evidence has ever been found for any defect or weakness in heterozygous animals.**

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