

TOTAL TESTED BY UC DAVIS

Date statistic			
15 december 2009	20 february 2010	22 April 2010	14 October 2010

3

Total			
1075	(100%)	1981	(100%)

3

N/N - Clear			
818	(76%)	1548	(78%)

2

N/CA - Carrier			
219	(20%)	397	(20%)

6

CA/CA - Affected^			
32	(3%)	36	*

(2%

* Includes only foals tested by UC Davis, number does not automatically represent all CA

affected foals born since testing began in 2008

^ Includes 2 Danish Sports Horses with Arabian Ancestry.

Data provided by Dr. Cecilia Penedo, Veterinary Genetics Laboratory, UC Davis

TOTAL DISCLOSED ON THE CA WEBSITE

Date statistic	11 february 2010	30 April 2010	20 October 2010
Total	999	(100%)	1822
N/N - Clear	831	(83%)	1556
N/CA - Carrier	145	(15%)	236
CA/CA - Affected	21	(2%)	29

STATISTICS

By Emma Maxwell ©

20 Jan 2010

Just to make sense of the percentage of carriers in the breed it is worth remembering to calculate how many affected foals are likely to be bred for a given percentage when breeding without access to tests.

A 20% carrier ratio SOUNDS terrible, it means one in five horses is a carrier. However if you bred together a herd of horses in which 1/5 stallions is a carrier and 1/5 mares is a carrier your chances of breeding two carriers together are $1/5 \times 1/5 = 1/25$. So in 25 matings you only have one chance of breeding a carrier to a carrier. Your other 24 breedings will be clear to clear or clear to carrier, none of which can produce an affected foal. Of your carrier to carrier matings only 1/4 is likely to produce an affected foal so the overall likelihood of breeding a CA affected foal from a herd with 20% carriers is $1/4 \times 1/25 = 1/100$. Given all your other potential causes of fatality a 1/100 chance is not terrifying enough to call CA a plague.

I agree with SKM that the high rates of carriers in the first 1000 tested horses are likely to be heavily skewed towards testing potential carriers, firstly horses who have produced a suspicious foal, and secondly all the horses who are by or out of a known carrier. Still, we can do the same maths on say a 40% carrier rate to see what results we get. $2/5 \times 2/5 = 4/25$ chances of breeding carrier to carrier. $4/25 \times 1/4 = 4/100$ or 1/25 foals affected. Even given misdiagnosis or sweeping under the carpet I do not think we have seen this rate of affected foals in the population at large so I would be confident in assuming the rate is nearer 20%, even given the prolific use of some carrier stallions in recent history.

However with a test available, none of these figures particularly matters as we can avoid ever breeding another carrier to carrier. It should be the case that all owners of stallions who stand at public stud feel obligated to test before asking people for money to breed to their horse. It is then up to the mare owner to decide whether to look elsewhere or test their mare and continue.

Again in the light of the maths, pedigree examination is remarkably unhelpful. It doesn't matter which horses in the past were carriers, because half their offspring will be clear. Only if you have the direct product of a known carrier of CA do you know that chances of your horse being

a carrier also are significantly raised. In the first generation your horse has a 1 in 2 chance of also carrying. Yet if you have the grand product of a known carrier, you only have a $1/2 \times 1/2$ chance of it inheriting carrier status from that grandparent. This ratio ends up at $1/4$, or 25%. This is pretty near the suspected rate in the population at large and so it is not a useful predictor that your horse might also be a carrier. Thus naming 'lines that carry CA' is mathematically irrelevant - you cannot make useful predictions armed with a pedigree. Of course we have all been guilty of speculation about who carried it down to the present day, but we should remember that it doesn't actually help us make better choices in the future. You can only make use of the information when it pertains to a particular horse that you are about to breed to another particular horse, only then is it more valuable information to add to the pot before making a breeding choice.

Addendum by Lisa Goodwin-Campiglio: ©

For a quick way to ascertain the Percentage of genetic influence passed forward from each generation, use the following table:

(F = Generation)

F1 = 50% (parents) $1/2$. Has 2 horses in this generation.

F2 = 25% (grandparents) $1/4$. Has 4 horses

F3 = 12.5% (great, grandparents) $1/8$. Has 8 horses

F4 = 6.25% (great, great, grandparents) $1/16$. Has 16 horses.

F5 = 3.125% (great, great, great, grandparents) $1/32$. Has 32 horses.

F6 = 1.56% (great, great, great, great, grandparents) $1/64$. Has 64 horses "

It is also a statistical fact that the greater the number of horses tested (ie. the broader the base) the more likely the percentage of carriers will drop. With this in mind , Emma's statement must be heeded well: " carrier to carrier matings only $1/4$ [one out of four] is likely to produce an affected foal so the overall likelihood of breeding a CA affected foal from a herd with 20 % carriers is $1/4 \times 1/25 = 1/100$ [one out of four times one out of twenty-five equals one out of one hundred]. Given all your other potential causes of fatality a $1/100$ chance is not terrifying enough to call CA a plague."

In the general breeding population, just how many of us have bred over one hundred foals?

No way could the presence of CA be considered a 'plague'. It is the sensible thing though to try to avoid having an affected foal, to use known carriers with responsible breeding selections and

to be informed.

For those who chose to use it, the present CA test is a very useful breeding tool.

15 Dec 2008 by Lisa Goodwin-Campiglio ©

Previous hypothetical statistics have been that 35 to 55% of all Arabians are derived from CA Carrier bloodlines. Mathematically that would break down to 25% of all Arabians *are* Carriers. Statistically that means that 3% of all foals born each year would be affected.

These statistics are based on collected information from numerous older stud farm's stable records, the test herds, research of Drs. De Lahunta, Fanelli and Sponseller and private records. With the current CA Marker Scanning Test available, Dr. Cecilia Penedo, PhD, who leads research into the disease at the University of California, Davis, 20 affected foals have been referred to her lab in the past five years. She and her colleagues have analyzed data from more than 250 horses related to the affected foals, and found that 30% of those animals are carriers of the disease.

However, to establish any general statistics of any accuracy a larger database of information is necessary. A minimum of 1000 individual Arabians must be tested, or otherwise confirmed as Carriers by being a parent of a confirmed CA affected foal, in order to obtain the correct ratio of CA Carriers and CA Affecteds to the number of "normal/clear" horses in the breed population. At the moment the analyzed data from 250 horses is far short of the required 1000 to draw any specific conclusions.

There is a large factor of genetic researchers who feel that the Bedu stallion ZOBAYNI was one of the source carriers. This stallion exists in the background of 90% of the Arabian breed. That is a statistical fact. Nevertheless, there is also a number of researchers who do not think that ZOBAYNI was a suspect CA Carrier. Others still are designating MESAUD or PHAROAH as possible CA Carriers. Most agree that there were more than one and that more generations of repetitive breeding selections has narrowed the genetic pool down to the point where this recessive mutated allele has a greater chance to express itself.

A great many more samples need to be tested before any definitive percentages of this neurological condition can be established for our Arabian breed

To prevent CA AFFECTED foals, [test](#) before you breed!