

Foundation Foxtrotter Heritage Association – Its Foundation is Weak - Synopsis

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1. Introduction

The Foundation Foxtrotter Heritage Association ([FFHA](#)) is a supplemental registry for horses that are registered in the Missouri Fox Trotting Horse Breed Association ([MFTHBA](#)) registry and also meet the FFHA's additional criterion for membership. The FFHA's stated mission, according to their [mission webpage](#), is to maintain a gene pool of original Foxtrotter blood. They promote the use of a quantity called the V-factor as an additional criterion for eligibility. Details of how a V-factor is calculated are not provided anywhere on the FFHA website. There is a page called [V-Factoring](#) where many unsubstantiated claims concerning what is known about equine gait genetics are made. Research studies that supposedly support the conjectures made about what is known in equine gait genetics are mentioned but their specific references are not provided which prevents the reader from reviewing the studies' results for themselves. The V-factor discussion also includes a reference to personal research that is claimed to have been done by the author and from which conclusions are drawn by the author, but there are no details about the study given, not even when and how the study was carried out. If studies actually exist, there is no legitimate reason for them not being fully disclosed. Withholding specifics about referenced studies casts major doubt on the validity and credibility of the conclusions drawn by the author.

The reasons given for V-factoring have moderated over the years. The current form of the V-factoring document has been heavily edited compared to what was on the FFHA website in 2009. The [2009 V-factor document](#) made even more outrageous claims than are being made in the current document.

2. Credentials

Before the discussion starts, I would like to state my credentials. I have advanced degrees in population genetics, sometimes called statistical genetics, from Michigan State University and I have done collaborative research with numerous researchers leading to over 90 [publications](#) in peer reviewed journals. I am a Professor Emeritus, I taught graduate level statistics courses, carried out research, guided graduate students for masters and Ph. D degrees, served on numerous graduate student committees, and was a consulting statistician for the Kansas Agricultural Research Experiment Station for 39 years at Kansas State University. I have years of experience of doing research, analyzing data, and reporting results.

3. Presentation of findings and credibility

When scientists draw conclusions they are always backed up by data and research results. This is done uniformly across all sciences to ensure that an investigator writing from a certain point of view doesn't skew the interpretation of the data to make them support, or seem to support, whatever the investigator's personal bias may be. The V-factor discussion is written as if it were a discussion of scientific findings but it gives almost no actual references to existing research, with one exception, and it does not provide any details about the private research the author claims to have done. In the two instances where data are referenced, the conclusions drawn in the V-factor discussion are not supported by the data. The complete lack of supporting research evidence and data brings the credibility of the V-factor and the FFHA into question. Thus far the FFHA has given no objective data that support the claim that V-factor is related to the gaits of horses in any breed.

4. Why we care

We care because we are concerned that anyone newly exploring the MFT breed may stumble upon or be directed to the FFHA site and be convinced that the V-factor of a horse is something they should pay attention to. We feel strongly that they should be warned about the total lack of objective evidence given for the V-factor's use before they accept any claims made about it or consider using it as a criterion in evaluating the quality of a Missouri Foxtrotter. We also encourage anyone already aware of the V-factor to read this document before they buy into the claims made about it and its purported relationship to the gaits of gaited horses.

5. Gait and Breed History

There have been gaited horses in the world for a very long time. Mankind preferred them for transportation for centuries for obvious reasons.

<http://onlinelibrary.wiley.com/doi/10.1111/age.12120/abstract;jsessionid=6A496CAB184C58653D7B0A76E5B41D3F.f02t01> Below is the summary of this article which was published in 2012.

” Summary

For centuries, domestic horses have represented an important means of transport and served as working and companion animals. Although their role in transportation is less important today, many horse breeds are still subject to intense selection based on their pattern of locomotion. A striking example of such a selected trait is the ability of a horse to perform additional gaits other than the common walk, trot and gallop. Those could be four-beat ambling gaits, which are particularly smooth and comfortable for the rider, or pace, used mainly in racing. Gaited horse breeds occur around the globe, suggesting that gaitedness is an old trait, selected for in many breeds. A recent study discovered that a nonsense mutation in DMRT3 has a major impact on gaitedness in horses and is present at a high frequency in gaited breeds and in horses bred for harness racing. Here, we report a study of the worldwide distribution of this mutation. We genotyped 4396 horses representing 141 horse breeds for the DMRT3 stop mutation. More than half (2749) of these horses also were genotyped for a SNP situated 32 kb upstream of the DMRT3 nonsense mutation because these two SNPs are in very strong linkage disequilibrium. We show that the DMRT3 mutation is present in 68 of the 141 genotyped horse breeds at a frequency ranging from 1% to 100%. We also show that the mutation is not limited to a geographical area, but is found worldwide. The breeds with a high frequency of the stop mutation (>50%) are either classified as gaited or bred for harness racing.”

This article makes it clear that today's gaited horses all have a common gene (DMRT3 mutation) that allows them to gait. The study found nothing unique about TWHs. It is important to understand the origins of the Missouri Foxtrotter (MFT) and Tennessee Walking Horse (TWH) breeds. Early gaited horses in America have similar origins that include: the American Saddle Horse, [American Saddlebred\(ASB\)](#), [Tennessee Walking Horse](#), and the [Missouri Foxtrotter](#), as well as others. The American Saddle Horses eventually became the American Saddlebred breed after being crossed with Thoroughbred and Standardbred horses to make them showier. The TWH registry includes Canadian Pacers, Narragansett Pacers, through the plantation horses of the south, Thoroughbred, Standardbred, Morgan, and American Saddlebred in its origins. The Missouri Foxtrotter origins include the Arabian, Morgan, American Saddlebred, Tennessee Walking Horse, and Standardbred breeds. Clearly there is a lot of commonality in the origins of the Missouri Foxtrotter and the TWH breeds. It is important to note that it is not uncommon for a horse registered TWH to have had a fox trot gait. In fact, many such horses were included in the MFTHBA registry until the MFTHBA books were closed in early 1982 because prior to that time a horse could be registered as a Missouri Foxtrotter based on a gait inspector's recommendation.

6. Strength of Pace argument based solely on Standardbred horses

In the discussion of [V-factoring](#) an assertion is made early in the discussion that pace is over taking the gaited breeds. It was stated even more strongly in the 2009 version of the document. There are no data or examples given to backup this assertion. There is not one shred of evidence provided that supports such a statement. An Internet search did not turn up any hits when searching on “pace gaited horse” and other similar search strings that had anything to do with pace taking over a breed or it being uncontrollable. You can check this for yourself. If all gaited breeds were being overrun with uncontrollable pacing in their horses, it would have generated many discussions and complaints, and information would be on the Internet on how to deal with it by now.

The discussion on the FFHA site goes on to say that pace had even affected the Standardbreds. The author does not give a specific reference for a study claimed to have been done in the late 1900's where crosses were made using trotting stallions on both pacing mares and trotting mares, and using pacing stallions on pacing mares. It is reported that a large majority of offspring paced from the cross of trotter-pacer, a substantial percentage paced from the trotter-trotter cross, and that 100% paced from the pacer-pacer cross. The discussion goes on to say that it was *deduced* from this research outcome that **pace is stronger than trot**. We have to ask: “Deduced” by whom? It was certainly not by the authors of the article. The fact that crossing trotters to trotters resulted in both trotters and pacers being produced and crossing pacers to pacers resulted in 100% pacers being produced supports the conclusion that pace acts like a recessive genetic trait and trot seems to be dominant to pace. Clearly the author of the V-factor discussion does not understand the most basic concepts of genetics. Her conclusion is exactly the opposite of what the results reported support. (Details behind why her conclusion is wrong are given in Section 8: Gene Frequency Basics in the article that is at: <http://www.kenkemp.net/ffha/2013vfact.pdf> which is a lengthier, more detailed discussion of the V-factor). It is this study that the V-factor author believes provides the evidence that establishes that Pace is stronger than Trot, but this study shows the opposite is actually true, therefore everything about the V-factor based on this incorrect conclusion made by the V-factor author is also not true and thus the V-factor has no foundation.

7. Misinterpretation of published research

1. Study details

Subsequent to the claim that "we know pace is stronger than trot", which we definitely do not, the author of the FFHA discussion makes reference to research done by Dr. Cothran in 1987 using American Standardbreds. The paper itself is not cited by the V-factor author but I found the published results of the research and they are very different than what the author of the V-factor would have us believe. The publication is: "Genetic Differentiation Associated with Gait Within American Standardbred Horses" (Cothran, et al. 1987).

2. Conclusions drawn by the study's researchers

According to the researchers themselves the above study was done in order to assess how effectively the two groups of horses, pacers and trotters, within the American Standardbred breed have been genetically separated over the years up until the time of the study. *There was interbreeding of trotters and pacers early on in the breed's history but that was followed by very little interbreeding of the two groups thereafter.* The authors of the study estimated the frequencies of known genetic marker alleles in the two gait groups in order to see if the two groups were as similar as would be commonly found within other horse breeds or if they were more different than that. The genes that were studied were at 23 loci that have alleles that affect cell and blood serum proteins and some enzymes. The conclusion reached in this study was that there were substantial differences in the gene frequencies at the 23 marker loci between the two groups of horses **within the American Standardbred breed**, more than what is usually found between random samples of horses within the same breed. This is not surprising given the unique history of the breed and the different origins of the trotters and pacers within it. The question of interest is whether the differences that exist between the two groups are due to their different origins and the continued breeding separation based on gait or are they due to the fact they have different gaits, or perhaps it is some of each. The authors did not claim to know the answer to this question based on this study. Here is part of what they concluded: **Page 294, paragraph 2: "The genic differences between Standardbreds of the two gaits may be historical in nature, a result of different origins of the trotting and pacing segments of the breed (Hervey 1947). If this is the case, significant gene frequency differences have been maintained despite considerable interbreeding during the formative period of the breed and in the face of continuing gene flow."**

8. Conclusions on V-factor webpage

Here are the conclusions made on the [V-factor](#) webpage regarding this study: "*Dr. Gus Cothran of Texas A&M participated in a study whereby geneticists were able to identify the difference between pace and trot at the molecular level. This was the first time science could substantiate a genetic difference between the two gaits. ...*" This is a gross misrepresentation, fraudulent really, of the results of this study. It showed no such thing. It looked only at gene frequency patterns for 23 marker loci. All it showed was that the pacers and trotters within the Standardbred breed had markedly different gene frequency patterns for the marker alleles and the authors stated clearly they did not know if this was related to the two groups having different gaits or if it was due to the history of the breed which includes the different origins of the trotters and the pacers within the breed and a long maintained breeding separation after an early short period of interbreeding after which they were maintained essentially as two separate breeding populations within the same breed. The researchers' conclusion clearly allowed that it may be the latter conditions. However, the author of the V-factor page concluded her summary of this research with: "***The results show there is as much difference between pace and trot as there would be between totally unrelated breeds. That is a very substantial difference.***" The V-factor author purposely makes it sound like this study established that trotters and pacers are as different as two different breeds, period. No qualifications given. The fact that this study was done on 23 marker alleles within the Standardbred breed and applies only to that breed because its history is so unique and the fact that the trotters and pacers within the breed are bred as if they were in separate breeds is intentionally never mentioned. The authors of the research clearly pointed this fact out for the reader. This is not something that one could have missed. The author of the V-factor page chose to misrepresent the findings in order to support her prior biased opinion regarding the differences in horses that pace and those that trot. The only reason the author of the V-factor page could have had for not giving a specific reference to this study, as is always done by scientists when reporting results, has to have been so she could give her biased point of view on what the findings were without having to deal with the actual details of the findings that were reported. The results of this study were intentionally misrepresented in order to deceive the reader. Clearly unethical behavior to say the least and totally unacceptable!

Not revealing that this study was limited to Standardbreds has more significance than it may at first seem, not just because of the Standardbred's origins and their breeding separation but also because Standardbreds are not gaited horses. The term "Gaited Horse" is applied to horses that have one or more intermediate gaits, between a walk and a canter, other than an ordinary, 2-beat trot which is sometimes referred to as a hard trot. The trot is a rough riding gait because a horse leaps into the air to switch diagonal leg pairs as it moves forward. What goes up must come down and when it does, the rider gets jolted. A pace is very similar except that a horse switches lateral leg pairs rather than diagonal pairs of legs as it leaps into the air and moves forward. Gaited horses' intermediate gaits always have at least one foot on the ground and that allows them to move forward without leaving the ground so there is much less up and down motion and much less bouncing for a rider. The running walk, stepping pace or amble, fox trot, rack and similar gaits in various breeds are called "soft" gaits because they feel smooth and riders do not suffer jarring like that of a normal trot or pace. The Cothran study could not have shown that soft gaited horses that fox trot and those that are move more laterally or actually pace are vastly different genetically, because Standardbreds do not do any soft gaits. They have different speed gaits, either trot or pace, but they are not gaited horses. They are race horses. There is absolutely no evidence from this study that gaited horses that pace and those that trot or fox trot are largely different because not one gaited horse was included in this study. Of course anyone familiar with MFT horses already knows that horses that fox trot and horses that pace are not very different. Many Foxtrotters do both gaits. The DMRT3 findings show that horses that pace are homozygous for the DMRT3 mutant allele. The gene allows a horse to pace but the researchers also found that there are many horses that are homozygous for the allele that do not pace. Thus, the DMRT3 mutant allele doesn't cause a horse to pace, it makes it possible for them to pace. The authors refer to it as a "gait keeper" gene. There are obviously other genes or factors involved in determining whether or not a horse will pace. The V-factor author would have us believe that the different frequency patterns in blood marker genes between the trotters and pacers in the Standardbred breed, give evidence that the genes inherited for gait (not blood marker alleles) in soft gaited horses for those that fox trot and those that move more laterally or pace, are as different as the genetic differences that might be found in completely different breeds of horses. What a stretch that is! In fact it is not just a stretch, it is a total fabrication for the sole purpose of deceiving readers in trying to make them believe there was a study done that supported something that it never supported and never even dealt with.

9. Private Research

The paragraph after the discussion of Cothran's findings in the V-factor discussion claims that in private research that horses that fell within a certain ratio of pace to trot consistently performed the same gaits or preferred to perform the same gaits. There are many pertinent questions to be asked about this so-called research that was supposedly done by the author of the V-factor discussion. Why wasn't the actual number of horses involved stated? Was it a dozen, 50, 100, 250? The credibility of such a study would heavily depend on how many horses were involved. Why is there no description of how the experiment was performed, where it was done, were the horses videotaped? What protocol was used to assess gaits? Were the horses ridden, if so by whom, were they running free, who did the assessment and what was their training? What criteria were used in categorizing a horse's gait? Were the horses foals, yearlings, trained or untrained mature horses, were they on grass, dirt, in a ring, or ridden or led down a road. How long did it take to do the study? When was it done? Where the results of this study are is the major question. I have asked the author to show me the results but she never has. Anyone who carried out such an extensive and elaborate evaluation of gait would want to tell what they did, how they

did it, and give details of what was found? Anything this noteworthy should have been published. Why is there no discussion of the pace-to-trot ratio that is referred to in this paragraph? Is the reader supposed to already know what it is? It just appears as “a certain ratio of pace to trot”. We would never see a real scientist make reference to a “certain” ratio of anything. There is no introduction regarding what this ratio is, how it is computed, how it is inherited, how pace is determined, how trot is determined, how intermediate gaits are classified, or what, if any, genetic basis there may be for using such a ratio. Because there is no precedent to using ratios of traits in ancestors as a criterion in selecting breeding stock, it should be thoroughly explained and justified on a genetic basis including at least a hypothetical mode of inheritance and there should be data supporting the hypothesis that genetic ratio effects are heritable. Where is even a logical argument that such a ratio makes sense genetically? It is very strange that the claim is made that the ratios required to produce various gaits were determined in this study, yet not one ratio for one gait was given. Why wouldn't the author of such ground breaking and revolutionary research reveal the details of the findings and specify what the ratio range is for at least the running walk and the fox trot? Isn't that what this research was supposed to be about? Is it not important for the reader to know what those ratios are? Where are the data that back up the revolutionary and extraordinary claims? Are we to accept the word of someone who has so obviously misrepresented research done by actual geneticists even after the those researchers have clearly explained and summarized it? We have to question whether any such research was actually done at all. It makes no sense that someone claiming to have done so much work and who was able to acquire so much revolutionary information in equine gait genetics in a single study would then not give specifics about the study and its findings. Who else was involved? Are we to believe she did all this by herself? Something is really fishy here. Before you believe any of what is claimed about the effects of ratios of traits in ancestors, try searching on the subject and see what you find. If you don't find anything, there is a good reason. It does not exist.

10. Pace/trot ratio

The above seems to be the only discussion provided to validate the use of what goes on to be referred to as the “pace/trot ratio”. Apparently what this refers to is the ratio of ancestors in a horse's 5 or 10 generation pedigree that are categorized by the author as being trotters or pacers. It is claimed that it is this ratio of ancestors in a pedigree that ultimately determines gait in an individual horse. Of course there is a multitude of problems with this concept. A major one is that there are no known data to substantiate any form of ancestor gene ratio effects in inheritance, i.e. that the effects of a ratio of traits in ancestors even exist let alone that they are heritable in an animal's offspring. Another is how would one know by looking at a horse's pedigree whether an ancestor gaited or not, let alone what gait it did if it did one? Plus there are unknown ancestors in many pedigrees and how do they and their get, get categorized? If a plausible explanation for how the effects of ratios of gait genes could be inherited were given, it may be an interesting idea to follow. It is amazing that this claim of trait ratio effect is being treated as it were known to exist but it is put forth with absolutely no data, no references that support it, and no genetic model to explain how it could possibly work. Yet, this unproven and illogical idea seems to be the very foundation of the Foundation Foxtrotter Heritage Association's V-factor. Thus, the association has no more of a foundation than does the idea that trot to pace ratios determined from a horse's ancestors listed in a 5 or 10 generation pedigree strongly influence a horse's gait when those ratios are based on pedigrees that include no information about gaits. Think about it. There is no evidence at all that there is such a thing as heritable effects that originate from a ratio of traits in an animal's ancestors. Combine that with the fact that the pedigrees that the trot/pace ratios are based on do not give any information regarding any ancestor horse's gait. Put those two things together with an arbitrary cut off V-factor value of

128 that is supposed to somehow be related to the ratio of pace to trot genes in a given horse, and we have the magic formula for maintaining foundation type Missouri Foxtrotting Horses in the MFTHBA registry. Anyone who believes this most likely has already invested in the construction of river bridges being built in Arizona.

11. TWH - the source of pace evils and “Quantitating” pace

The author toned down her attack on the TWH breed in the current version of the V-factor document compared to the [2009 version](#) where it was claimed that it was the introduction of the TWH to the MFT breed in the '70's & '80's that was the undoing of the fox trot gait in the MFT breed and the TWH is what provided the opportunity for the pace to "quantitate" over generations. The MFTHBA books were closed in January, 1982, so not much could have been imported from TWHs in the '80's. The claim is made that a gaited TWH (I assume this may be one that fox trotted) carried more pace genes from a closer source than was present in the old Saddle Horses. The question here is how it is that a horse (a TWH) can carry more pace genes from a closer source (whatever that means because the TWH and MFT breeds come from very similar sources originally and the DMRT3 paper referenced above, indicates that the mutation that allows horses to gait happened many centuries ago, and unless a gene mutates it stays the same from one generation to the next, so how close it is to a source has no effect on its strength) and those extra pace genes somehow do not affect the gait of the horse that is carrying them because it fox trots (this would be the case for inspected TWHs that were registered up until 1982 when the books were closed, but when those same genes are passed on to offspring they make the offspring pace and then make the offspring's offspring pace, and so on, for all subsequent generations, and this, apparently, is the basis for pace “quantitating” in the MFT breed as the result of having TWH ancestors according to the thinking of the V-factor author. This is either a fairytale or new concept in genetics that is certainly worthy of a full explanation as to how this happens genetically because it has never been described before. Why are the effects of the pace genes expressed so differently in parent and offspring or from one breed to another? Many old time MFT carried genes from foundation horses like Allen-F1, Roan Allen, Merry Boy, Midnight Sun, and Merry Go Boy, all of whom were registered TWHs. Of course there were American Saddlebreds (ASB) too and they also carried pace genes. Were they somehow different? It seems reasonable to assume that a natural fox trot is the result of approximately the same configuration of gait genes regardless of how a horse is registered. One would have to have strong evidence that the combination of genes required for a fox trot in one breed is different than what is required in another breed before inferring what is claimed about the influence of TWH is true. Why would the genes carried by the old time TWHs be so different than those in the same breed in the 1970's? Where did those very different genes come from? There is no evidence that pace genes in TWH's of the 1970's are more powerful than the existing pace genes in the MFT breed. Without evidence that this is the case, there is no basis for assuming some pace genes are stronger than others, if there are others. The argument being made by the author of the V-factor is that the genes that make a horse gait are different among the three breeds (ASB, MFT, & TWH) with the TWH genes somehow being stronger because of where they came from originally. Again, without evidence that there is a mutation in one or more of the genes that affect gait in the TWH breed that didn't happen in either of the other breeds, this assertion is indefensible and absurd. Both MFTs and TWHs have common ancestors from which they inherited the same gait genes plus the MFT breed

carries genes from TWH breed that go back to the origins of the MFT breed and early foundation horses. There is no evidence that the genes carried by the breeds are different or have different potency in their effects and there certainly is no evidence that TWH's carry more pace genes. To make such a claim requires proof if one is to be taken seriously. Obviously no proof is given. The idea that TWH have more pace genes is just another of the many unsupported assertions made by the author of the V-factor. It has no validity at all. It shows a serious lack of understanding of basic genetics.

The recently published (2012) article: "Mutations in DMRT3 affect locomotion in horses and spinal circuit function in mice." in Nature ([Nature, Vol 488, 4, August, 2012](#)) reported the discovery of a mutant form of the DMRT3 gene that affects locomotion in both horses and mice. They found that a horse must have at least one DMRT3 mutant gene to be able to do a soft gait of any kind and must be homozygous for it to be able to do a soft gait and/or to be able to pace. They found that all the gaited horse breeds carry the DMRT3 mutant gene, including MFTs and TWHs. Their findings are based on sampling horses from many different breeds. The authors make no reference to gait genes behaving differently in TWHs than any other gaited horse breed. They also make no mention of the ratio of the gaits of ancestors affecting a horse's gait. Their results are based on real data and the research was carried out by trained geneticists. Their conclusions are based on known genetic modes of inheritance and are straight forward interpretations of their data. They clearly differentiate the effects of the DMRT3 mutant gene being absent, heterozygous, or homozygous. Note that they explained what was done, how it was done, when it was done, where it was done, by whom it was done and they published their data, and then stated their conclusions. This is how scientific study results are almost always presented. Completely different than what we find on the V-factor webpage.

12. Controlling the "quantitating" pace

Finally, a claim is made in the V-factor discussion that prior to breed registries when pace became too overwhelming, breeders would introduce trotting stock to balance the pace/trot ratio. It goes on to say that after breed registries were formed and the books were closed, breeders no longer had that option. It is claimed that the result of closed books was to make most gaited breeds become overwhelmed with pace. Most of the gaited breeds have little or no TWH in them although they may have common ancestry. The TWHs themselves are not all pacers by any means. How is it that, according to the author of the V-factor, other gaited breeds have pace "quantitating" without the influence of TWH blood, but it is the presence of too much TWH blood in a horse's pedigree that is the main cause of the pace "quantitating" in MFTs? The FFHA isn't suggesting that the way to now control pace is crossing back to trotting stock as they say was done prior to registries existing. They aren't suggesting that it is highly advisable to not breed horses that pace or those that are too pacey. They are saying the way to control pace now is to go ahead and continue to cross gaited stock. Gaited stock in which they have claimed pace "quantitates" over time and always has, that has stronger pace genes, and has more pace genes. Even more interesting and more contradictory, it suggests that crossing to gaited MFT horses that are up to 50% TWH (a V-factor score of 128 is consistent with a horse that has 50% TWH ancestors and a V-factor of 128 or less is the criterion for FFHA registration eligibility) will control pace even as they claim the TWH breed is a fountain of pace and has been the ruination of the fox trot gait in the MFT breed up to this point. This suggestion is completely inconsistent with what has been reported earlier on the V-factor page. If pace truly "quantitates" in gaited horse breeds, how can continuing to cross to gaited horses correct the problem of too much pace and/or prevent further "quantitating"? Why is it not necessary to cross back to trotting stock if pace is stronger than trot? What is it about

limiting TWH blood to no more than 50% in a pedigree that would stop the "quantitating" of pace that supposedly happens almost universally among all gaited horse breeds, has from the beginning of time, and occurs within the TWH breed itself where their genes are supposedly closer to a "full pace progenitor" and a source of more and stronger pace genes? Such a breeding plan is based on nothing but inconsistencies and it makes no sense at all.

The use of the term "quantitates" to mean that a genetic effect gets stronger over generations is something the author of the V-factor has made up. You will not find this term being used this way by anyone who works in genetics or anyone who understands genetics. It is more proof of a lack of understanding basic principles of genetics by the V-factor author.

In the V-factor discussion it is claimed that Saddle Horse and Morgan constituted 80% of the genetic makeup of the foundation horses in the MFT breed. FFHA states on their mission webpage that their intent is to preserve the gene pool of old time Saddle Horses and Morgans that still exists in the MFT breed. It would make more sense to have minimum requirements for ASB and Morgan blood as a basis for eligibility in the FFHA than it does to have an arbitrary upper limit on TWH blood if preserving Saddle Horse and Morgan genes is truly their goal. Of course all three breeds have changed over time and there is no way to go back to the original breed characteristics other than selecting for the original breed characteristics. Breeding horses that are 50% TWH, or less, will do nothing to change MFT breed characteristics back to what they were when the breed was first formed. It is a ridiculous notion to think it will.

13. V-factor assumptions and calculation

Although it is never stated how a V-factor is determined on either the current or 2009 version of the V-factor webpage, the V-factor appears to be determined by counting, in some unspecified way, the number of times a horse's pedigree can be traced back to ancestors that were registered as TWH. It is stated that the pedigrees are traced to the 5th and 10th generation on the [FFHA bylaws webpage](#). No further details are available on the website, at least none that I could find. Given that it is the basis for eligibility, it should be clearly laid out as to what is involved in the process. The procedure appears to be completely ad hoc. One is apparently to assume that what is done is reliable, done without error, and that there is some genetic justification as to why a V-factor is a reliable estimate of the ratio of gait genes that an individual horse may or may not have inherited 5 or 10 generations down a pedigree. Like most things concerning the V-factor, the reader is expected to accept the idea on faith as no facts, no background, and no details are given.

According to the V-factor webpage a pure TWH has a V-factor of 256 which is the maximum score. To be eligible for registration in FFHA a horse has to have a V-score of 128 or less. Genes that come from any horse registered TWH are apparently considered to be from a pacer regardless of the gait the horse itself did. How much sense does it make to consider every TWH a pacer when most did not and do not display a pace as their preferred gait? Why is the thing that matters most in a horse's pedigree the number of ancestors that were registered TWH? It makes no sense genetically to ignore the trait that is being selected for in a genetic selection program, i.e. gait. There cannot be effective genetic selection for the fox trot gait if the actual gait the ancestors did is completely ignored. Many TWH's were brought into the MFT breed as inspected fox trotting horses meaning it was certified by an expert witness, who reviewed them at gait, that the horses fox trotted. Is it reasonable to assume that TWH's have different genetics for gait than do horses from other breeds that also display the fox trot gait? I think FFHA should be more interested in the gaits the ancestors of our horses displayed than they are in how or even if they were registered. If they fox trotted we can be confident their genetics were what we are looking for in foals we wish to produce today and know there is a chance at least some of those genes may

have been handed down to our horses of today. What does knowing how ancestors were registered tell us about the gait genes they carried? There certainly is no evidence that all TWHs carry the same gait genes (pacers) but that seems to be the way they are treated in V-factor calculations. Is there any better indication of the genes a horse carries for gait than the gait a horse does naturally? Pedigrees are of interest when breeding but never contribute nearly as much information about a horse as does the horse's own performance. If the V-factor is not related to gait, and there is no evidence that it is, nor is there any genetic argument to be made as to why it should be, but it is used as part of the criteria for selecting breeding stock, it will reduce the effectiveness of a breeding program by causing some horses with less gait quality to be included in a breeding program in place of horses that have superior gaits but also have higher V-scores. Breeders should concentrate on things they know are important. It is the gaits of the horses being bred that are most important when breeding for a particular gait not how they or their ancestors were registered.

14. Testing the Validity of the V-factor

The biggest disappointment in the V-factor and the FFHA is the lack of any preliminary testing of the validity of the V-factor idea before adopting it as the major underpinning for a new registry. A registry or subregistry should be based on sound science and the reason for its existence should be based on much more than someone's idea of what might be. A random sample of 40 to 50 horses would have been sufficient to establish if there is any relationship between a horse's preferred intermediate gait and its V-factor. V-factors and the preferred gaits of the horses could have been determined and then those data could have been analyzed to measure what, if any, relationship may exist between the two. Plots of the data and bar charts would have been very informative. Of course, any such study would have to be performed by real scientists with no vested interest in the outcome, i.e. have no association with FFHA.

It is not reasonable to assume V-factor is somehow related to gait when there has not been one shred of evidence put forth indicating there is. It appears FFHA does not really want to know if V-factor is related to gait. They have done no investigation and have collected no data in all the years of their existence. That speaks volumes. If they believed V-factor was related to gait they would have collected data and made the results known long before now. If they don't really believe the two are related, why would you?

With no idea of what the relationship between V-factor and gait is, or even if there is one, there is no basis for selecting an appropriate V-factor value for admission into the FFHA subregistry. The value of 128 has to have been picked out of thin air because there is no basis for choosing 128 or any other value. There would have to be data showing that there is some relationship before one could begin to determine within what range of values most horses fox trot. The FFHA has absolutely no idea what the preferred gait of a horse with a V-factor of 128 is. They have never collected any data to try to determine it. Yet they use V-factor values as the criterion for admitting horses into their subregistry. This practice has no scientific basis or even a logical basis and is obviously not a reliable way to improve or maintain the gaits of MFT horses. The V in V-factor must stand for Voodoo.

15. Breeding basics

It is well known that selection for or against a trait in a breeding population will change the frequency of the genes that affect the trait. Sound breeding practice for gait would be to select against too much pace in a population by excluding pacing horses and horses that tend to be pacey from the breeding population. If the goal of a breeding program is to

produce fox trotting horses, the best approach is to cross horses that fox trot naturally until more information becomes available that might indicate some other approach may be more effective. We have no such evidence now. There is a lot of evidence that genetic selection is effective and absolutely none that a V-score yields any useful information regarding a horse's gait or the quality of the horse in general.

16. The FFHA Organization

It is interesting to look at the FFHA organization itself as it exists today. It appears to be run by the Managing Director. According to the FFHA [By-Laws](#) webpage, the Managing Director deposits the funds that are paid in as membership dues, registrations, registration transfers, all gifts and donations, etc. It is specifically stated on the [By-Laws](#) webpage that the Managing Director will deposit funds, not the treasurer. There are currently no horses listed for sale on the FFHA's [For Sale](#) webpage. Although there are supposed to be 13 regional commissioners involved in running the organization and participating in monthly meetings, only one at-large commissioner is listed on the [Directors and Officers](#) webpage. There is no secretary or treasurer listed although the By-Laws state it is the treasurer's responsibility to do the accounting and post monthly reports. The organization seems to be a two person operation at this point in time. A search made on the [GuideStar](#) nonprofit organizations database did not return an entry for the FFHA. The business address given on the FFHA on the [Contact](#) webpage is a post office box number in Oxford, Arkansas with the same zip code as that of the Managing Director's post office box number in Oxford, Arkansas.

17. Conclusions

The desire to preserve old time breeding stock characteristics in Missouri Foxtrotters is laudable. Undue influence of show ring winners on breed characteristics is something that should be minimized as the fox trot rewarded in the show ring is sometimes not a true fox trot. Many breed enthusiasts prefer to have horses that are smooth, agile and have athletic ability as their trail partners and have little desire for horses with the extreme reach and/or exaggerated over stride and head nod that is rewarded in the upper level performance classes at the MFTHBA Celebration. Given that the FFHA is founded on the V-factor and that it has yet to be shown to be helpful in identifying horses that are foundation type horses or even horses that naturally fox trot, it is not clear how FFHA registry can be helpful in maintaining the characteristics in the breed that many of us would like to see maintained. Choosing horses based on their conformation, disposition, and gaiting ability will do far more for perpetuating a foundation type of horse than choosing horses based on their V-factor score could ever do. In fact taking the V-factor into account in making breeding or buying decisions will likely have a negative impact because it takes attention away from things that we know are important.

18. References

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[Mutations in DMRT3 affect locomotion in horses and spinal circuit function in mice.](#) (2012) Nature, Vol-488, Issue-7413, PP 642-646. Nature Publishing Group, a division of Macmillan Publishers Limited. All Rights Reserved.

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19. Links to FFHA information

[FFHA Mission Statement](#)

[FFHA Bylaws webpage](#)

[FFHA Vfactoring webpage](#)