

by JW EQUINE

The term heart has several connotations in the Thoroughbred world, but they are all positive. So, if bigger is better, how can we breed for a large heart?

At the 2001 CTBA Harris Ranch Seminar, Marianna Haun spoke of her latest project regarding heart size, a

not nearly as successful as sires as they were as broodmare sires. Given his background and his research associations, Dr. Antczak was in an ideal position to look for an explanation for what students of pedigree and Thoroughbred breeders have known for some time—some stallions actually exert their greatest influence through the progeny of their daughters.

Ya Gotta Have Heart?

speech on “The Hidden X.” Her initial research was initiated in 1983 as a way of explaining Secretariat’s extremely large heart. All of this appeared in her first book, *The X-Factor*, where she attributed this phenomenon to the mare Pocahontas (1837). Since that first book, Haun has found evidence to suggest that Everlasting, the Eclipse daughter that appears twice on the x-line of Pocahontas, may be a source of the large heart through horses other than Pocahontas.

Furthermore, she claims that approximately 28 percent of Arabians have the characteristic, leaving one to wonder if the onset of the large heart doesn’t trace farther than the origins of the breed. Perhaps to a daughter of an Arabian?

In Haun’s ongoing research, electrocardiograms or ultrasounds are used to measure heart weight, stroke volume, cardiac output and aerobic power to establish a “heart score.” Haun also suggests that other physical characteristics seem to “follow the X”—height, ears (size and shape), etc. Of interest was Haun’s disclosure that, when measured, neither Mr. Prospector nor Danzig displayed a large heart which put them in the same category as Bold Ruler and Caro, that of successful sires without the trait.

Haun has just released a sequel, *Understanding the Power of the X Factor*, but I would be remiss if I did not mention that the X-factor theory is not without its detractors, some of whom contest the influence of heart size on sprinters, while others have difficulty with what they see as supposition regarding the genetic origins.

Professor of Equine Medicine and Immunology at Cornell University’s College of Veterinary Medicine and one of the organizers of the Horse Genome Project, Dr. Doug Antczak, offers a theory he calls the “Maternal-Grandsire Effect.”

Dr. Antczak found it curious that some stallions were

Some genes are programmed to be expressed or repressed, depending on the gender of the parent responsible for contributing the gene. Such imprinted genes are not missing—they are just inactive or switched off when transmitted by one gender or the other. Moreover, these imprinted/silent genes can be re-expressed in the next generation if contributed by a parent of the opposite gender. A female can pass on information through an imprinted gene, but only her son’s offspring are able to demonstrate the effect. A male can pass on information on an imprinted gene but only his daughter’s offspring are able to demonstrate the effect. This leads to some very interesting zig-zags across a pedigree page.

Dr. Antczak summarized that the Maternal-Grandsire Effect in horses could very well be the result of imprinted genes whereby performance related genes from a stallion are passed on in an inactive form and are not activated again until passed on by a mare, in this case his daughter. If Dr. Antczak’s theory proves true, about 50 percent of the daughters of such a stallion could be superb broodmares, which seems to be pretty much the case in real life. It is not too difficult to see a pattern for the building of a broodmare sire, which is seldom the aim of breeders despite the fact that it is the broodmare sires that seem to have an enduring effect within the breed.

If the imprinted genes that have been identified in humans equate with genes in the horse, then an imprinted gene connected to the growth of heart muscle (already studied in humans) may also explain Secretariat’s large heart (22 pounds compared to the average of 8.5 pounds). As Dr. Danika Metallinos said in her speech at the aforesaid CTBA seminar, all imprinted genes relate to growth and development in mammals. If this is indeed the case, it would shed a slightly different light on the X-Factor theory of sex-linked heart size as reported in Ms. Haun’s book.

