

EPIGENETICS: Inheritance may not be limited to DNA

by Luke Fausett - Utah

In the last several years, a relatively new and rapidly expanding field of science, known as epigenetics, has emerged. Epigenetics calls into question some of the very basics of genetics that are currently being taught.

Many people don't even agree on a definition of epigenetics. Ali Shilatiford, PHD, and a team of his colleagues have proposed the operational definition of EPIGENETICS-"A rapidly growing research field that investigates heritable alterations in gene expression caused by mechanisms other than changes in the DNA sequence," in an article titled, "Definition of 'Epigenetics' Clarified" on the [Science Daily](#) website.

For years, the accepted scientific principle has been, that genes were the only way for traits to be passed on from parent to offspring and that environmental influences can't alter traits passed on to future generations.

Now many studies are showing that changes in the environment *can* alter traits for multiple generations. One such study was published on the online journal [Science Daily](#) in which a strain of genetic white-eyed fruit flies were used .

If the embryos of such flies, which are normally nurtured at 25 degrees Celsius, is briefly raised to 37 degrees Celsius, the flies later hatch with red eyes rather than the white eyes. If the flies are again crossed, the following generations are partially red-eyed, without further temperature treatment. Even though, only white-eyed offspring are expected according to traditional genetics. The DNA for eye color remained the same in both the red-eyed and white-eyed flies. Other studies are showing similar results.

Is this why there is even larger differences in identical twins as they grow older? Is this why one identical twin may come down with a certain disease while the other one doesn't?

Research also seems to indicate that while certain genes don't change they can be "turned on" or "turned off" by environmental factors such as nutrition and other environmental factors.

Learning about epigenetics has me wondering about many things. I have heard the argument many times, that much of the research on chinchillas such as, malocclusion, fur chewing, nutritional needs aren't "valid research" because they haven't been submitted for peer review or published in scientific journals. I wonder why the idea 'DNA is the only way traits are inherited, and environmental changes don't alter gene expression in all but the most extreme cases' became accepted as a scientific principle for so many decades.

In the 1920's, a well-known experimentalist, Paul Kammerer argued that acquired traits could be passed down through generations. In 1926, Kammerer fell into disgrace and was considered a fraud. Kammerer later committed suicide. Yet, almost a century later he is considered by many in science to be one of the fathers of epigenetics.

It also supports some of the points that Ralph Shoots made at the nat'l meeting during his presentation:

That most of the very successful, top breeders of many species of animals aren't genetic experts.

That phenotypic traits are what is important to be successful in breeding to improve.

That proper nutrition and environment are key in producing quality animals.

I think that I may need to take a look at trying to use the new advances in science to benefit my herd, but still balance it with the tried and true methods that have been developed over the centuries of animal domestication, even if they haven't been submitted to peer review by scientists or published in a science journal.

As this case proves that even science peer review isn't perfect. Yet, I don't think I can ignore all scientific advances and research, either. I guess I need to figure out how to do a better job of balancing the two. So I "don't throw the baby out with the bath water " in either case?

Does it really matter whether the improvement within my herd came from adding a genotype that was previously missing or if the improvement was made by "turning on" a gene that was not active or ,by making the proper nutritional/environmental changes necessary?

Selective breeding for improvement has been going on for centuries. I wonder if I have been a little too quick to discard many of the tried and true methods, in favor of the newest science of the moment?

I don't claim to be a genetic expert, so I don't know what effect epigenetics will have on chinchilla breeding and long term health, if any. I know there are some chinchilla breeders with genetic degrees and others who have far greater genetic backgrounds than I, that can share their view with a follow-up article.

Well, that is a few of my thoughts on the subject. I look forward to hearing your thoughts and ideas on the subject.