SPORTS / EXERCISE / FITNESS

The Implications of GMO's, Epigenetics and Chinese Medicine on Performance Enhancement

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Performance enhancement depends upon creating an optimal environment for training to occur. Here we are addressing going beyond the physiological factors of training into the synergistic variables that are considered part of a dynamic relationship with our environment. Career longevity in most sports is dependent upon preventing chronic injuries. Currently, in the sports medicine arena, injury prevention is implemented purely from a physiological perspective. In Chinese Medicine, the diagnostic methodology assesses and evaluates performance individually using the philosophy of TCM physiology that articulates diagnostic patterns of differentiation addressing dynamic relationships associated with our environment. TCM environmental variables that are analyzed and evaluated synergistically, which include emotional state, specific properties of food under/overconsumption, external pathogens, sleeping habits, occupation, mental state, relationships and interactions with others, exercise, consciousness and our perceptions of our self (or, "ourselves?") and the world around us.

Epigenetics is the scientific evidence that supports a dynamic relationship between the human and its environment because it has the ability to turn genes on or off, meaning certain genes can be expressed or inhibited. Genetically modified (GM) food, or genetically engineered (GE) food, is produced using biotechnology to alter genes in a laboratory process. These engineered genes can be from animals, viruses, insects, bacteria and humans and are artificially inserted genes into the cells of animals and/or agricultural crops. Genetically modified organisms (GMO) are the end product of this process. The implications and significance of making these interconnections between epigenetics, GMO and Chinese Medicine becomes extremely important in understanding our vital relationship with our environment, how it changes the perspective of how medicine views chronic injury mechanisms and prevention, both individually and globally, and the effects it will have on performance enhancement among athletes and non-athletes alike.

Changing Perspectives in Science

Science is in a wonderful transition - one that is moving towards a dynamic relationship with its environment. With these new discoveries comes change - more importantly, changes in perspectives in how we view the human in nature and human complexity.

Science has traditionally followed the perspective of identifying only physical matter in order to understand our relationship with nature as a more mechanistic backdrop separate from the environment. This long debate over nature versus nurture identified that there cannot be competing theories, only one theory can prevail. Thus, the position became to identify nature and its mechanisms with the goal to be able to dominate nature. The last goal in dominating nature has been achieved through genetics and biotechnology. We can now dominate nature with the ability to mix genetic information within species that otherwise would be impossible through normal evolutionary processes.

The understanding of human complexity was based upon the concept that the more complex an organism is, the more genes they should have. So, the accepted mind set within the scientific community was that human organisms should have 150-200,000 genes. The Genome Project presented politically and publicly was promoted as a humanitarian cause, yet created with the underlying agenda that encompassed a lucrative business opportunity for patenting genes and selling them to pharmaceutical companies. The Genome Project was a key turning point in understanding human complexity because it generated new scientific data, announced in 2003, that did not match what we thought we knew about genes. The more complex an organism is, the more genes it should have. More importantly, the significance is that it has now been scientifically validated that human complexity is identified as being a dynamic relationship with the environment. This opened the doors for epigenetics research, once considered fringe science, to take off in 2003 and it did. This is a huge shift from the purely mechanistic separatist perspective to more of a cooperative perspective. Epigenetics is providing scientific credibility and validity to environmental factors affecting genetic mutations by genes that can be turned on or off. In 2005, published research identified a surprising aspect - not only are environmental factors playing a big part of these genetic changes, these changes can be passed through four generations.

Concept of Food – Changing Tides

The quality of food within the sports medicine arena is focused on caloric balance between carbohydrates, proteins and fats for the individual athlete's metabolism and sport-specific needs. The role of vitamin and mineral supplementation is still based within two different schools of thought: 1) vitamin and mineral supplementation is needed due to the lack of quality food and soil depletion, and 2) vitamin and mineral supplementation is a waste of money and has no evidence to provide any benefit. The accepted mentality is that most athletes' vitamin and mineral intake can be supplied by eating "whole foods" rather than using supplements. However, the majority of the athletes I've observed eat processed foods served in restaurants, hotels, college cafeterias, while only a handful are very particular about eating gluten-free and organic, reading labels and paying close attention to what is going into their bodies.

In Chinese Medicine, food is used for performance enhancement on multiple levels not only to prevent chronic disease, but injuries as well. TCM diagnostic methodology takes into account everyday environmental factors that synergistically can affect the internal environment pre-disposing an athlete to injuries and disease. By doing daily diagnostic evaluations of TCM physiological patterns, we can keep the athlete finely tuned by identifying and counterbalancing TCM patterns of differentiation. Once diagnostic patterns are identified, we can then use food, herbs, acupuncture, gui sha, moxa, meditation, and other treatment methods to counterbalance the environmental contributing factors. Food is also used as medicine for the treatment of a wide variety of conditions, again providing an optimal internal environment that supports the physiological training environment and any imbalance can be addressed immediately before and after training daily.

Food Quality & Concern

The issue of the quality of our food is now getting even more convoluted. Originally the use of preservatives in the 1950s made food more convenient for the consumer and increased shelf life of the products providing greater profit margins for big business, which also promoted the industrialization of food even more. With the inclusion of GM foods within our daily food supply in the United States since 1996, this is another variable that needs to be addressed as far as food safety. The promotion of GM food is big business oriented with the pulse on dominating global agribusiness. This is seen within the exploitation of many poor countries lacking any regulatory standards and being taken advantage of by big agribusiness with the promise of increased net

yields of their crops with the genetically modified seeds. What has been happening is the yields for the first year are good, but the subsequent years decreasing crop yields are significantly destroying and altering the soil life forever due to genetic pollution. The consequences are even more staggering with regard to Chinese Medicine because once genetically modified plants cross pollenate with the local flora indigenous to a particular region, it will forever change the plant's property and medicinal use.

Food has already seen this process played out in Europe and the United States with the increased allergies since GM food has hit the market place. The implications with regard to performance enhancement is that processing foods decreases nutritional value and negatively impacts the immune system pre-disposing athletes to injuries and other conditions. Genetically altered foods can create new viral strains, increased allergies, and decreased nutritional values; they also impair the immune system and create horizontal transfer of transgenic DNA between bacteria. A number of studies have indicated that transgenic DNA can be taken up in the mouth, throat and GI tract of animals and can be transmitted to humans, potentially causing various unknown mutations that can be passed on through multiple generations with conceivably severe consequences.

Numerous scientists internationally have issued concerns regarding GM food. Even the *Lancet*, a prestigious medical journal, issued a warning that GM foods should have never been allowed into the food chain. A report was also released by the National Academy of Science specifying that "GM products introduce new allergens, toxins, disruptive chemicals, soil-polluting ingredients, mutated species and unknown protein combinations into our bodies and into the whole environment. This may also raise existing allergens to new heights as well as reduce nutritional content."

Dr. George Wald a Nobel Laureate in Medicine in 1967 and a Higgins Professor of Biology at Harvard University said:

"Recombinant DNA technology faces our society with problems unprecedented not only in the history of science, but of life on Earth. It places in human hands the capacity to redesign living organisms, the products of three billion years of evolution. Such intervention must not be confused with previous intrusions upon the natural order of living organisms: animal and plant breeding…All the earlier procedures worked within single or closely related species…Our morality up to now has been to go ahead without restriction to learn all that we can about nature. Restructuring nature was not part of the bargain…this direction may be not only unwise, but dangerous. Potentially, it could breed new animal and plant diseases, new sources of cancer, novel epidemics."

Medical analysis involving genetically engineered organisms is also being questioned as well due to the prevalence of academic research scientists having industry affiliations with financial interests that could taint scientific integrity. Not to mention serious ethical, socioeconimical, political issues that are of grave concern is the fact big business is trumping public health for the monopoly of agribusiness at all costs!

Cultural Heritage of Indigenous Medicinal Knowledge

The implications and use of indigenous medicinal herbs is being affected from a cultural heritage standpoint due to biopiracy and cross-pollination of the local flora with GM crops. Dr. Vandana Shiva is in the forefront of battling biopiracy in India. The term biopiracy refers to the use of intellectual property systems to legitimize the exclusive ownership and control over biological resources and biological products and processes that have been used over centuries in non-industrialized cultures – basically, theft of indigenous knowledge!

According to Dr. Shiva: "Patent claims over biodiversity and indigenous knowledge that are based

on the innovation, creativity and genius of the people of the Third World are acts of biopiracy. Since a patent is given for invention, a biopiracy patent denies the innovation embodied in indigenous knowledge. The rush to grant patents and reward invention has led corporations and governments in the industrialized world to ignore the centuries of cumulative, collective innovation of generations of rural communities."

The significance is that a patent gives exclusive rights to make, sell and distribute that product. Biodiversity patents establish monopolies in medicine, livestock and seeds because corporations that own these exclusive rights can control the production and distribution.

Cross-pollination into the local ecology affects the property and energy of the plants because they have changed suddenly without any evolutionary process involved to allow plants, insects, animals, and/or humans to adapt to their environment. This is called genetic pollution, which can affect the entire ecosystem through the transportation of GM pollen by fungus, bacteria, birds, wind, bees, insects and the rain. Another factor to be considered, is the crossing of nature's boundaries between species that normally would not cross in natural evolution. For example: crossing different species as human genes with pigs, plants and animals, and beans with fungi, bacteria and viruses, fish and strawberries among many others. Although we consider ourselves technologically advanced, in reality we really have no idea of the long-term ramifications. What research has recently identified through epigenetics in 2005, is our food plays a vital role in how DNA gets switched on or off. The outcome of those particular switches expressing or inhibiting DNA can be passed on through multiple generations.

Global Effect

Global implications: Many scientists internationally have identified that indigenous regions are adversely being affected by advanced biotechnology industries which affects long term sustainability of the world's food supply. Some examples: In 1991, Argentina was exploited for profits by GMO conglomerates with the first "secret experimental" GM crop at the expense of its indigenous people and seed diversity. The Institute of Traditional Thai Medicine identified 16 specific plants (cotton family) used by traditional healers that were genetically polluted with Monsanto's Bt cotton. So, the government stopped the field tests.

In 1993 in India, a protest was staged against GATT trade regulations by 500,000 farmers opposing GM seeds. It seems that the new regulations established by the WTO, the World Bank, GATT, and NAFTA created dependency and the autonomy of local economies could be vastly overridden, suggesting that foreign interests are interested in buying up all the water, seed, and land as well as other agricultural resources for the purpose of exported profits rather than sustainable local crops.

In many Third World countries this issue is in the forefront more than the United States because it is deadly to its people and cultural heritage. Peru is a country that globally is significant because it only has a few small regions remaining with diverse seed stocks left. This will hopefully ensure long standing sustainable resilience of the world's staple of food. Bolivia took a bold stand and passed a "Law of Mother Earth" in April of this year that gives the same rights to Earth as it does to humans. The indigenous perspective identifies that this law follows indigenous beliefs and values, which view Pachamama (Mother Earth) as a living being. According to the *Guardian*, the new law grants eleven rights to "Mother Earth," which include: "the right to life and to exist; the right to continue vital cycles and processes free from human alteration; the right to pure water and clean air; the right to balance; the right not to be polluted; and the right to not have cellular structure modified or genetically altered." It will also grant nature "the right to not be affected by mega-infrastructure and development projects that affect the balance of ecosystems and the local inhabitant communities."

Another country with a powerful indigenous presence is Ecuador that changed its constitution to give nature "the right to exist, persist, maintain and regenerate its vital cycles, structure, functions and its processes in evolution."

Food for thought

The implications and significance are not just individual, but global, in making these interconnections between epigenetics, GMO and Chinese Medicine. This changes the perspective of how medicine views chronic injury mechanisms and prevention. Now we begin to bridge science and indigenous knowledge synergistically in understanding the dynamic relationship with our environment. In Chinese Medicine, the diagnostic methodology articulates diagnostic patterns of differentiation addressing dynamic relationships associated with our environment. This is true for many indigenous medical systems. Science is now supporting this dynamic relationship with our environment through epigenetics because our environment has the ability to turn genes on or off, which means certain genes can be expressed or inhibited and passed through multiple generations.

Genetically modified foods are engineered genes, which are artificially inserted into animals and/or agricultural crops. Genetically modified organisms (GMO) are the end product of this process. The promotion and justification of GE, according to Rutgers University professor Dr. David Ehrenfield, was based on the prediction that human technology can feed more people with better food. However, the reality behind GE bio-engineered products is a desire to increase the sales of chemicals to dependent farmers. The promotion of GM Food is big business oriented with the pulse on dominating global agribusiness with the promotion of GM crops over organic sustainable crops.

The consequences of genetic pollution are even more staggering with regard to Chinese Medicine, as well as many indigenous medical systems, because once this cross-pollination occurs in the indigenous regions local flora it will forever change the plant's property and medicinal use. This has been seen in India, Thailand, Europe, the United States and so on. The implications with regard to performance enhancement is that research is substantiating that genetically altered foods can create new viral strains, decrease nutritional values, increase allergies, impair immune systems and create horizontal transfer of transgenic DNA between bacteria. Research indicates that transgenic DNA can be taken up in the mouth, throat and GI tract of animals that can then be transmitted to humans, potentially causing various unknown mutations that can be passed on through multiple generations with conceivably severe consequences.

The bottom line is that performance at any level is based upon what we eat. Physiologically, fuel (ATP) is the basic means by which all cells function. The quality of that fuel is a precursor to chronic disease and the longevity of athletes. Globally, the implications for the "quality of our food" necessitates being brought to the forefront. These mechanisms are not just from the physiological and biochemical standpoint anymore, but from a synergistic perspective with the environment. Food is used as medicine in multiple indigenous medical systems specifically in the prevention of chronic diseases. Now that science validates there is a dynamic relationship between the human and its environment, we must demand a higher quality of food and support those trying to preserve their cultural heritage and indigenous knowledge. We have much to learn from Boliva, Ecuador, India and other cultures and their indigenous wisdom. This is performance enhancement not only for our generation, but future generations.

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