

Theory of Supremacy in Sports: A Genetic Innovative Revolution

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Abstract: Recent biotechnological advances have permitted the manipulation of genetic sequences to treat several diseases in a process called **gene therapy**. However, the advance of gene therapy has opened the door to the possibility of using genetic manipulation (GM) to **enhance athletic performance**. In such 'gene doping', exogenous genetic sequences are inserted into a specific tissue, altering cellular gene activity or leading to the expression of a protein product. The exogenous genes most likely to be utilized for gene doping include erythropoietin (EPO), vascular endothelial growth factor (VEGF), insulin-like growth factor type 1 (IGF-1), myostatin antagonists, and endorphin. However, many other genes could also be used, such as those involved in glucose metabolic pathways. Because gene doping would be very difficult to detect, it is inherently very attractive for those involved in sports that are prepared to cheat. Moreover, the field of gene therapy is constantly and rapidly progressing, and this is likely to generate many new possibilities for gene doping. Thus, as part of the general fight against all forms of doping, it will be necessary to develop and continually improve means of detecting exogenous gene sequences (or their products) in athletes. Nevertheless, some bioethicists have argued for a liberal approach to gene doping.

Sports achievements are a deciding criterion for developed country. The new innovations to exploit the human potential to its maximum extent through drugs and doping are taking the future in its girth. In future there is chance to scientific research of genetic makeup in human being to excel in sports as an enduring endurance as that of Siberian Crain or the unmatched speed of that of the fastest running creature on earth, 'the cheetah'.

What makes a Siberian Crain to travel 6000 K.M. for survival and progeny or the muscular structure of the cheetah to chase it's pray at an unmatched speed of 95 K.M. / Hour. Performance of Sports skill is based on the five motor components which are prerequisites. The basic motor components are Strength, Speed, Endurance, Flexibility and Coordinative Abilities. Is there a cheetah seen with slow twitch muscles fibers which is not able to catch its fast running prey? Then why a human being does is with distinct percentage of composition of the muscle fiber content, the slow twitch and the fast twitch. Why only certain human being made to run fast whereas only few can run for longer? Such questions are imponderables which require sound justification.

Future sports research in this field has to be with these unmatched qualities of some of the astonishing creatures on earth. The genetic makeup of animals which can swim thousands of kilometers like dolphins, survive depths of ocean like whales, run as fast as a cheetah, survive the hottest weathers of desert and Africa like sliding viper and Hippopotamus; coldest weathers like penguins on earth, unmatched quality of jumping like impala, strength of the biggest animal on land, the mighty elephants, etc.

Human body is also said to be the most adaptable thing in the world, it can survive $\pm 50^{\circ}\text{C}$, gap of nearly 100°C . The genetic engineering in future may make the things adaptable to such an extent that even the human beings are at par to every animal possessing extraordinary quality in motor abilities.

Latest developments in Gene doping: Candidate genes for use in gene doping

Erythropoietin: increase in energy production by aerobic metabolism

Vascular endothelial growth factor: increase in Oxygen Supply

Insulin-like growth factor type 1: increase in muscle growth and differentiation

Myostatin antagonists: increase in muscle hypertrophy and hyperplasia

Endorphin and enkephalin: increase in pain endurance

Bioethics of gene doping: In the ancient Olympic Games, athletes competed for recognition, eternal fame and an olive branch. Today, such motives continue to serve as important reasons for participation in international competitions; however, they have been joined by an additional factor: money. For an athlete, to win a medal is a guarantee of lucrative contracts in the future. Thus, multiple factors conspire to place pressure upon athletes to a hitherto unprecedented degree, generating temptations to resort to extreme measures, including conventional doping and, potentially, gene doping.

The main arguments used by the WADA to justify the prohibition of gene doping are 2-fold. Uppermost are concerns over potential health risks from the insertion of genes or the use of substances that interfere in gene expression. Such alterations of gene expression can bring unknown risks to the athlete's health and, should exogenous sequences reach the germ line cells, some changes might be transmitted to future generations. A second argument of the WADA centers on the issue of fairness. The use of GM to increase sports performance is seen as a violation of the sporting spirit, giving unfair physical advantages to those who have access to the requisite technology.

Arguably, there are two ways to analyze the ethical status of gene doping. The first holds that sports ethics is subservient to medical ethics. So, if the use of gene therapy for medicine is permitted, any performance increase should be acceptable, essentially as a form of 'side effect'. In this way, a sports physician could prescribe potentially performance-enhancing substances - or gene therapy - to athletes in order to alleviate a medical condition. However, this matter is not straightforward and it is not an easy task for a physician to answer the question: how best to treat the athlete-patient - more as an athlete or more as a patient? Furthermore, some patients might have more interest in receiving a treatment that makes them well for sports performance, rather than well for life.

The second way to approach sports doping as an ethical issue is to consider sports ethics as representing a separate entity from medical ethics. In other words, sport is seen as a moral practice which, while not requiring a rejection of the concepts of medical ethics, depends more on the sporting context than on the medical context.

Viewpoints favorable towards liberalizing the use of performance-enhancing agents in sport have been expressed by some ethicists, albeit a minority thereof. The essential argument here is that since athletes legitimately strive to improve their performance (for example, by use of training methods, nutrition, and psychological conditioning), there are no obvious reasons to exclude performance-enhancing agents (e.g., anabolic steroids) from the set of methods that may be used to enhance athletic performance. While it may seem that this would give an unfair advantage to athletes able to access these agents, it can be argued that specialist gym apparatus, advanced nutrition, and psychological coaching are also expensive and thus - like performance-enhancing drugs - not available to all athletes. So, it can be argued that performance-enhancing drugs should not be singled out for prohibition on the basis of a lack of fairness. Similarly, health risks are inherent in many forms of sports training; thus, banning performance-enhancing agents on grounds of safety is arguably inconsistent, as the basis for prohibition implies a similar ban on forms of training, such as lifting heavy weights, or practicing gymnastic moves, that might conceivably endanger the health of the athlete. Logically, any prohibition should be based

on an objective assessment of risk, which would evaluate drugs and training methods on an equal basis, as opposed to prohibiting simply on the basis of categorizations.

Such pro-enhancement arguments, if accepted with respect to conventional performance-enhancing drugs, would logically also apply to gene doping. At present, the risks of human gene therapy are inadequately understood in the context of application to healthy individuals, but if a GM method could be shown to carry an acceptably low health risk (including any risk of inter-generational transmission of introduced gene sequences), then there would be no logical grounds for prohibition. Because gene therapy is at the cutting edge of medical science, its use for **performance enhancement** would be expensive and thus restricted to well-funded athletes, again raising the issue of fairness. However, it is an economic rule that technologies (e.g., computers, medical devices, etc.) drop steeply in price as they come to be used more widely, and this rule is very likely to apply to human GM technology. Thus, it may be that inexpensive commercial gene therapy 'kits' will become available in the future. If so, gene doping could become widely accessible to athletes regardless of their financial situation.

Those who reject conventional doping on ethical grounds will also reject gene doping. However, an acceptance of conventional doping, as advocated by a minority of bioethicists, would rationally permit the full use of GM technology in sports. If this were to happen, then there can be little doubt that world sporting records (many of which have reached a plateau) would tumble, and athletic performance would reach hitherto unprecedented levels. As GM technology advances, athletes, regulatory bodies and society in general will need to decide whether to open the door to the 'brave new world' of gene doping.

Conclusions: Recent developments in molecular biotechnology have provided new approaches to the treatment of several diseases, but have also generated new opportunities for cheating in sports. Most recently, these discoveries have enabled the potential use of gene doping, a strategy that promises (or threatens) to radically enhance athletic performance using GM approaches that will be hard to detect. Sport-regulatory organizations will need to remain vigilant for signs that gene doping starts to be used by athletes; if this does happen, scientists will need to rise to the challenge of entering an 'arms race' to develop effective means to detect such abuse. Meanwhile, bioethicists need to promote an active debate on an important emerging question: should gene doping be banned, controlled or liberalized?

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