Whereas, Gene therapy is defined as "an experimental technique that uses genes to treat or prevent disease";¹ and

Whereas, Gene therapies in both human clinical trials and murine models have been shown to be effective in promoting endogenous production of various proteins such as erythropoietin, insulin-like growth factor-1, and vascular endothelial growth factor;²,³,⁴,⁵,⁶ and

Whereas, While the therapeutic benefits of such technology is promising, many are also considering the potential for misuse of such technology, including "gene doping"; and

Whereas, In 2008, the World Anti-Doping Agency (WADA) defined gene doping as the "nontherapeutic use of cells, genes, genetic elements, or modulation of gene expression, having the capacity to enhance performance.";⁷,⁸ and

Whereas, Although to date there have been no confirmed instances of gene doping, the potential societal and health related consequences of gene doping have prompted a prophylactic investigation into detection techniques and the denouncement of such activity by many of the major governing bodies in this arena, including the International Olympic Committee (IOC), WADA, and various International Sports Federations;⁹,¹⁰,¹¹ and

Whereas, While the major institutional bodies relevant to doping in sports have condemned the use of gene doping, public opinion may diverge, as recent evidence suggests that the general

population may be in greater support of gene doping without consideration for ethical and medical repercussions;\textsuperscript{12,13} and

Whereas, Though the major sequelae of gene doping are still uncertain, potential long term effects have manifested as cancers, heart failure, and stroke;\textsuperscript{6,14} and

Whereas, While there is speculation that the technology to adequately detect gene doping in athletes already exists, no standardized protocol has yet to be developed for the detection or regulation of any type of gene doping in athletes;\textsuperscript{14,15,16,17} and

Whereas, While our AMA has recognized and supported the potential therapeutic effects of genomic editing (AMA Policy H-480.945) and denounced the use of pharmacologic substances for non-therapeutic purposes (H-470.994, H-470.972, H-470.978), it has not yet established a position regarding the various non-therapeutic applications and genetic manipulation of such technology; therefore be it

RESOLVED, That our American Medical Association partner with relevant institutions to encourage the development of safety guidelines, regulations, and permissible uses of performance enhancing, non-therapeutic gene therapies. (Directive to Take Action)

Fiscal Note: not yet determined

Received: 04/26/18

RELEVANT AMA POLICY:

Non-Therapeutic Use of Pharmacological Agents by Athletes H-470.994
Our AMA: (1) opposes the use of drugs for the purpose of enhancing athletic performance or sustaining athletic achievement. This action in no way should be construed as limiting a physician's proper use of drugs in indicated treatment of athletic injuries or clinical symptoms of individual athletes; and (2) endorses efforts by state level high school athletic associations to establish programs which include enforceable guidelines concerning weight and body fat changes on a precompetition basis for those sports in which weight management is a concern.

Citation: (Res. 89 part 2, A-72; Reaffirmed: CLRPD Rep. C, A-88; Modified by Res. 401, I-96; Reaffirmed: CSA Rep. 8, A-05; Reaffirmed: CSAPH Rep. 1, A-15)

Medical and Nonmedical Uses of Anabolic-Androgenic Steroids H-470.972
Our AMA (1) reaffirms its concern over the nonmedical use of drugs among athletes, its belief that drug use to enhance or sustain athletic performance is inappropriate, its commitment to cooperate with various other concerned organizations, and its support of appropriate education and rehabilitation programs; (2) actively encourages further research on short- and long-term health effects, and encourages reporting of suspected adverse effects to the FDA; and (3) supports continued efforts to work with sports organizations to increase understanding of health effects and to discourage use of steroids on this basis.


See also: Blood Doping H-470.978; Genome Editing and its Potential Clinical Use H-480.945


\textsuperscript{14}Salamin, O. et al. Erythropoietin as a performance-enhancing drug: Its mechanistic basis, detection, and potential adverse effects. Molecular and Cellular Endocrinology. 2017 Jan.;50303-7207(17);30046-X

