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Critical Legal Reading of World Anti-Doping Agency's Gene Doping Guidance

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Abstract: The genetic barrier negatively affected competitive athletic performance until the advent of gene therapy and genetic manipulation, which cast doubt on and impacted the legitimacy of sporting events. At that a critical point, the World Anti-Doping Agency (WADA) interfered in such experimentation and application with a serious attempt to curb the problem and set things back on track with the healthiest standards in light of bioethics. However, the major problem that the agency has encountered and which this legal study wants to raise, and address is the legal consequences that result from the lack of a reliable method that provides sufficient evidence and definitive answers to confirm whether cellular and gene doping are occurring or not. This is study aims to demonstrate that the procedures for accusing players of using genetic modification and genetic change techniques are incorrect and insufficient and may be harmful. The suspicion must be interpreted in favour of the accused (i.e., the athlete) in accordance with the general principles of penal codification. However, some of the Agency's procedures are not compatible with the provisions of international treaties, not to mention they conflict with the Punitive legislation of numerous countries.

Keywords: Elite Athlete; Gene Doping; Legal Consequences; Non-manageable Competition; Sport

1. Introduction

Doping is the utilization of a subterfuge (element or technique) that is possibly deleterious to sports-persons' health and/or efficient in promoting their achievement or the existence in the players' body of a prevented item or proof of the consumption thereof or evidence of the banned way usage.[1] A thousand years ago, mankind has utilized different types of elements for the improvement of their lives.[2] Over and above that … Individuals have used legal, illegal, healthy, and unhealthy practices in an effort to build their physique in a false way.[3] Mushrooms have been consumed by the early Greeks, ginseng origin and the Opium to increase their sporty potential. Incas were munching coca leaves to restrain their agony.[4] As for the current era, unprecedented forms of

[1] Alan D. Rogol and Lindsay Parks Pieper, "Genes, Gender, Hormones, and Doping in Sport: A Convoluted Tale," *Frontiers in Endocrinology* 8 (2017): 251, https://doi.org/10.3389/fendo.2017.00251.

[2] Evrim Celebi, Cemal Gundogdu, and Sakir Tufekci, "Determination of Attitudes and Opinions of Triathlon Athletes Regarding Doping As a Moral Issue," *Studies on Ethno-Medicine* 12, no. 02 (2018), https://doi.org/10.31901/24566772.2018/12.02.495.

[3] Ahmad Saad Ahmad AL-Dafrawi, "WADA Prohibited List: The Benefits of Combining Pharmacology, Medicine, and Law," *ASM Science Journal* 17 (2022): 1–9, https://doi.org/10.32802/asmscj.2022.1291.

[4] Jennifer L Minigh, *Sports Medicine*, 1st ed. (Westport, Connecticut. London: Greenwood Publishing Group, Inc, 2007), 57.

gaining enhanced performance have arisen, peaked by the chance of modifying human genetic materiality and modulating gene transcription.[5] Genetic modification has emerged as a result of gene therapy, which is utilized to treat major human diseases.[6] Basically, gene curative tactics are being employed in fighting again sicknesses, such as carcinoma, HIV, contagious illnesses, Parkinson's and Alzheimer's.[7]

Vaccinations have recently emerged through the employment of gene treatment to face (COVID-19), corona virus induced by severe acute respiratory syndrome (SARS-CoV-2), via adenoviral vectors or the mRNA.[8] Howbeit, what about the moral aspect for adopting these technologies in sports?[9]

In the "***Sport, gene doping and ethics***," Prof. Dr. Gunnar Breivik, the famous Norwegian sociologist answered this question by saying: "*the problem will be to uphold a sharp demarcation between what is a repair of disease, injuries and defects, and what is performance enhancement.*"[10]

It is still unclear exactly how genetic variants affect a person's ability to compete in sports.[11] Notwithstanding the ability to manufacture a "perfect athlete" through gene doping comes at the price of violating sporting morality and compromising the values of equitable play in sports. Additionally, there is a great potential of hazard to the players' health.[12] The use of physical steroids, performance-enhancing drugs, or even other illegal means and methods such as genetic engineering and modification technologies in sports competitions by a few athletes or their supporting teams has apparent effects on the ability to exert physical effort. However, this employment is catastrophic since it has almost irreversible bad effects, which force those who depend on them to pay a hefty health expenditure and possibly risk their lives.[13] As an attempt to preserve players' health and guarantee equal competitive statuses, the International Olympic Committee (IOC), (WADA), and International Sports Federations have considered performance-enhancing agents and methods as doping and banned them. However, the inclination to prevail makes competitors abuse these medications and techniques.[14]

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[5] Rebeca Araujo Cantelmo et al., "Gene Doping: Present and Future," *European Journal of Sport Science* 20, no. 8 (2020): 1093–1101, https://doi.org/10.1080/17461391.2019.1695952.

[6] Cantelmo et al.

[7] I. M. Verma et al., "Gene Therapy: Promises, Problems and Prospects," *Genes and Resistance to Disease*, 2000, 147–57, https://doi.org/10.1007/978-3-642-56947-0_13.

[8] Takehito Sugasawa et al., "Proof of Gene Doping in a Mouse Model with a Human Erythropoietin Gene Transferred Using an Adenoviral Vector," *Genes* 12, no. 8 (2021): 1249, https://doi.org/10.3390/genes12081249.

[9] Ahmad Saad Ahmad AL-Dafrawi, "Taking Physical Steroids in Sport Competitions: (From an Ethical-Legal Perspective)," *Journal of Political Science and Law* 2, no. 9 (2018): 188–206.

[10] Gunnar Breivik, "Sport, Gene Doping and Ethics," in *Genetic Technology and Sport: Ethical Questions*, ed. Claudio Tamburrini and Torbjörn Tännsjö, 1st ed. (London and New York: Routledge, 2005), 172.

[11] Seema Patel and Ian Varley, "Exploring the Regulation of Genetic Testing in Sport," *Entertainment and Sports Law Journal* 17, no. 5 (2019): 1–13, https://doi.org/10.16997/eslj.223.

[12] E Brzeziańska, D Domańska, and A Jegier, "GENE DOPING IN SPORT – PERSPECTIVES AND RISKS," *Biology of Sport* 31, no. 4 (2014): 251–59, https://doi.org/10.5604/20831862.1120931.

[13] Ahmad Saad Ahmad AL-Dafrawi, "The Dual Nature of Physical Steroids: Normative Concepts between Civil Jurisprudence and Shari'ah," *Journal of College of Sharia & Islamic Studies* 40, no. 2 (2022): 115-141, https://doi.org/10.29117/jcsis.2022.0335.

[14] Mehmet Unal and Durisehvar Ozer Unal, "Gene Doping in Sports," *Sports Medicine* 34, no. 6 (2004): 357–62, https://doi.org/10.2165/00007256-200434060-00002.

The mechanisms for accusing players of employing genetic alteration and genetic change techniques are wrong, inadequate, and potentially hazardous. The reason is that the Agency based its doctrine on testing methods that cannot confirm or deny the occurrence that these technologies were employed. Thus, suspicion of such cases must be interpreted in the interest of the accused (athlete), and the judge, whether he/she is in the (Tribunal Arbitral du Sport/ Court of Arbitration for Sport), or a national judge, has no other right more than to utter the innocence of that athlete.

From a legal point of view, the basic pitfall of gene abuse through the use of gene therapy technologies is the lack of standardized testing methods. That is because genes are not transmitted to the bloodstream and there is no evidence of them in the urine.[15] This *legal* study addresses the examination of the procedures for detecting inaccurate gene-doping used by the World Anti-Doping Agency in proving violations of the World Anti-Doping Code.

2. The Genomic Era: From Fantasy to Reality

2.1. Gene therapy

Gene treatment is said to be the introduction of a genetic component into human cells for the purpose of treating or preventing a disease or disorder. The genetic elements could be cells with genetic modifications, RNA, or DNA.[16] The discovery of the full human genome, which contains almost 30.000 different genes, opened up new avenues for the diagnosis and prevention of a wide range of diseases. Furthermore, based on the DNA sequence data, this knowledge could be used to build a new therapeutic usage, including genetic treatment.[17]

Indeed, the discovery of the hereditary map of humankind was the beginning of an era promising many answers. Not only that, but this discovery also opened a wide door to many ethical and legal questions, some of which remain unanswered to this day. It should be noted that … Genetic treatment is meaningful for sports medicine since it allows the relocation of specific genes to the recipient's tissues. This technological progress is also substantial for recovery. Experts have evolved a factitious gene that, when inserted inside the muscle cells of mice, prevents, and even inverses naturalistic muscle degeneration. Not just does the gene fix futile or wounded muscles, but it reinforces the vigorous ones too. Due to the characteristic of gene treatment, iatrogenic components are steadily generated by domestic cells in the defect or infection place.[18]

According to the European Medicines Agency (EMA), a gene treatment medical product is a biological curative that meets the following two criteria: (a) it consists of an effective element that has or holds a recombinant nucleic acid that is employed or given to people,

[15] Ahmad Saad Ahmad Al-Dafrawi et al., "Performance-Enhancing Medicines In Sports: Legal Discussion," *International Journal of Law, Government and Communication* 4, no. 17 (2019): 48–60, https://doi.org/10.35631/ijlgc.417005.

[16] H. J. Haisma and O. de Hon, "Gene Doping," *International Journal of Sports Medicine* 27, no. 4 (2006): 257–66, https://doi.org/10.1055/s-2006-923986.

[17] Stefania Santamaria et al., "Gene Doping: Biomedical And Laws Aspects Of Genetic Modification Of Athletes.," *Medicina Sportiva: Journal of Romanian Sports Medicine Society* 17, no. 4 (2013): 193–99.

[18] Minigh, *Sports Medicine*.

with the aim of controlling, rehabilitation, substitute, adding, or removing the genetic sequence; and (b) its curative, preventative, or diagnostic impact is directly connected to the recombinant nucleic acid sequence or the result of gene code of this sequence.[19]

Genetic illnesses, which are cases brought on by one or more gene mutations, are prime candidates for gene treatment or gene editing, which aim to restore the normal function of the variant gene.[20] This genetic change results in better healthcare provisions, ameliorates the illness, and may increase research and therapeutic options for illnesses in the future.[21] Gene therapy is like other types of medical care, but human gene treatment involves numerous significant moral, legal, and social challenges.[22]

2.2. Ethical and legal obstacles

Research in the topics of genetic modification and gene therapy collides with basic ethical and legal considerations and questions, the most important of which must be considered, and answers must be provided, such as: Is there a limit to the authority of medicine when it comes to gene therapy and genetic modification? Is gene therapy used for treatment or for enhancement?

Theodore Friedmann, somatic gene treatment pioneer mentioned that it has been proposed that the necessity to dominate the disease or the need to disable harm early in developmental time or in unattainable cells may justify germ line treatment.[23]

By going back, a little bit into the past … In the XIVTH International Congress of Penal Law which was held in (Vienna, 2 – 7 October 1989), the International Criminal Law Association issued a decision not to allow the transfer of genes for non-therapeutic purposes. This decision states that:

> (6.8) – 'Gene transfer to germ line cells for other than therapeutic purposes is unacceptable without exception. Moreover, gene transfer into the human germ line must be forbidden until the reliability and the safety of the germ line therapy have been proved by prior somatic cell therapy and animal tests. This research moratorium must at least be ensured by professional guidelines and/or administrative approval restrictions.'[24]

The Congress did well by issuing this important decision as the strands connecting the parts of the genetic theme had not yet been disentangled.

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[19] Thomas Wirth, Nigel Parker, and Seppo Ylä-Herttuala, "History of Gene Therapy," *Gene*, 50 years of gene therapy - a contribution of Waclaw Szybalski to science and humanity, 525, no. 2 (2013): 162–69, https://doi.org/10.1016/j.gene.2013.03.137.

[20] Juliette Delhove et al., "Public Acceptability of Gene Therapy and Gene Editing for Human Use: A Systematic Review," *Human Gene Therapy* 31, no. 1–2 (2020): 20–46, https://doi.org/10.1089/hum.2019.197.

[21] Patel and Varley, "Exploring the Regulation of Genetic Testing in Sport."

[22] David B Resnik, "Bioethics of Gene Therapy," in *Encyclopedia of Life Sciences* (John Wiley & Sons, Ltd, 2001), https://doi.org/10.1038/npg.els.0003480.

[23] John H. Evans, "Setting Ethical Limits on Human Gene Editing after the Fall of the Somatic/Germline Barrier," *Proceedings of the National Academy of Sciences* 118, no. 22 (2021): e2004837117, https://doi.org/10.1073/pnas.2004837117.

[24] "Resolutions of the Congresses of the International Association of Penal Law," December 1, 2007, http://www.penal.org/sites/default/files/files/RICPL.pdf.

After about a decade … the importance of congenital characteristics as a universal dilemma was admitted by UNESCO's (1997) declaration about the human genome and human rights. Likewise, the international nature of genetics raises a question on whether a universal moral strategy is accomplishable (or even desirable) concerning science.[25]

The previous prohibition contained in Resolution n° (8.6) issued by the International Criminal Law Association in Vienna in 1989 must be understood in the context of the precautionary principle emphasized by UNESCO. Although the principle was originally developed in connection with the preservation of the environment, nevertheless we can extend its umbrella to restrict the topics of gene therapy and genetic modification, which states:

> 'When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. Morally unacceptable harm refers to harm to humans or the environment that is threatening to human life or health, serious and effectively irreversible, inequitable to present or future generations, or imposed without adequate consideration of the human rights of those affected. The judgment of plausibility should be grounded in scientific analysis. Analysis should be ongoing so that chosen actions are subject to review.'[26]

It has been written before: Once all of the genes are known, we could understand the human being, both generally and specifically. Our genes are the code that decides our identities. However, how could people ethically be judged and legally be accountable for their impulses, decisions, and actions if they are really just a product of their genes?[27]

Gene therapy technologies and gene doping are no longer seen as a dream strongly move only inside the heads of scientists in the genetic engineering field. There will probably be no true legal obstacles mention for modifying some embryos especially if their genetic maps showed a high possibility for affliction with deadly genetic diseases showed on the one hand of one of the parents in the future.[28] Not only that, perhaps the official governmental institutions of countries may understand the idea of genetic change and modification, and the genetically improved babes may be accepted as well.[29]

2.3. Gene doping: An endless exam

Specialists in gene treatment pointed to the possible approaches of gene modification and genetic transmission techniques with the aim of performance enhancement for the first time in 2001. After that, it has been conjectured that manipulating genes across all Olympics might propel the performance of humankind to new levels of genetically

[25] Andy Miah, "Genetics, Cyberspace and Bioethics: Why Not a Public Engagement with Ethics?," *Public Understanding of Science* 14, no. 4 (2005): 409–21, https://doi.org/10.1177/0963662505056616.

[26] "The Precautionary Principle - UNESCO Digital Library," accessed May 25, 2023, https://unesdoc.unesco.org/ark:/48223/pf0000139578.

[27] T H Murray and E Livny, "The Human Genome Project: Ethical and Social Implications.," *Bulletin of the Medical Library Association* 83, no. 1 (1995): 14–21.

[28] AL-Dafrawi, "Taking Physical Steroids in Sport Competitions: (From an Ethical-Legal Perspective)."

[29] AL-Dafrawi.

changed "superhumans".[30] Gene Doping was included on WADA's earliest Banned List, despite the lack of a tangible possibility of detecting a gene change in an actual sample.[31]

But how is the process of gene doping carried out?

The procedure with the highest likelihood would include inserting viral constructs encoding transgenes into the skeletal muscle, thereafter the cell's biochemical machinery would be activated to express the designed gene. Muscle biopsies would be necessary for the most accurate method to identify this type of gene doping, nevertheless, an invasive technique is unsuitable.[32]

The non-curative utilization of genes, cells, genetic components, or alteration of gene expression and having the capability to enhance performance in physical activities all are forms of gene doping. Specifically, gene doping is the deliberate use of gene treatment to improve performances of the sportsperson. The genes are put or adjusted not to inhibit or cure sickness, but to impact sports achievement.[33] The dissimilarity between genetic treatment and gene doping is that the latter is not used to replace a missing or non-working protein in a sick person, simply to unnaturally permute the code of a gene in a non-sick individual.[34]

From a simplistic point of view … 'Gene doping' can be described as the transmission of genetic matter in purpose to enhance sportive performance.[35] For my part, I am inclined to the opinion reached in this definition as this definition summarises motivations behind the non-therapeutic use of gene therapy technologies in sports.

3. Materials and Methods

In this legal study, the researcher tries to determine the legal situation that must be taken in the event of the failure of reliable laboratory examination methods while attempting to detect or prove the occurrence of gene modifications and gene doping that are applied to healthy athletes. To accomplish this task, various sources were checked carefully to collect data related to the subject of the study. Among the most important sources is Resolution n° (6, 8) issued by the International Criminal Law Association at the XIVTH International Congress of Penal Law which was held in (Vienna, 2 – 7 October 1989). The best international publishing houses with wide interests in medicine, genetic modification, ethics' Genetics and sports, and medical law are also among the sources of

[30] Elmo W. I. Neuberger and Perikles Simon, "Gene and Cell Doping: The New Frontier - Beyond Myth or Reality," in *Acute Topics in Anti-Doping*, ed. O Rabin and Y Pitsiladis, vol. 62 (2017 S. Karger AG, Basel: Karger Publishers, 2017), 91–106, https://www.karger.com/Article/FullText/465456.

[31] Sheila López et al., "Gene Doping and Genomic Science in Sports: Where Are We?," *Bioanalysis* 12, no. 11 (2020): 801–11, https://doi.org/10.4155/bio-2020-0093.

[32] Eddy N. de Boer et al., "A Next-Generation Sequencing Method for Gene Doping Detection That Distinguishes Low Levels of Plasmid DNA against a Background of Genomic DNA," *Gene Therapy* 26, no. 7 (2019): 338–46, https://doi.org/10.1038/s41434-019-0091-6.

[33] Harshad O. Malve, "Sports Pharmacology: A Medical Pharmacologist's Perspective," *Journal of Pharmacy & Bioallied Sciences* 10, no. 3 (2018): 126–36, https://doi.org/10.4103/jpbs.JPBS_229_17.

[34] Kris Dierickx, Seppe Deckx, and Kristien Hens, "The Ethics of Gene Doping: A Survey of Elite Athletes and Academic Professionals," *Journal of Clinical Research and Bioethics* 3, no. 2 (2012): 1–5, https://doi.org/10.4172/2155-9627.1000136.

[35] V. Birzniece, "Doping in Sport: Effects, Harm and Misconceptions," *Internal Medicine Journal* 45, no. 3 (2015): 239–48, https://doi.org/10.1111/imj.12629.

the study. In this regard, I should not forget to mention that popular academic websites like (google scholar and Researchgate.net) are important sources of gathering materials of this study. As an illustration, these websites have been used for searching suggested titles such as 'Gene Doping, Ethics of testing for Gene Doping, gene doping ethics of sport, Gene doping tests, gene doping detection, benefit of the doubt and so forth'. Additionally, one important part of collecting data information had been done by depending on non-English language published articles and journals. It remains for me to say that this study, according to its academic nature does not need to make any survey, statistical analysis, or tables.

4. Confrontation for the Control of Doping and Gene Doping

The second half of the twentieth century witnessed a rise in doping cases in sport competitions. As an illustration, Knut Jensen, the Danish bicyclist, dropped and died in the 175-kilometres team time-trials after he abused Amphetamines and nicotine acid, at the 'Rome summer Olympic games in 1960'.[36] The employment of performance-enhancing factors amidst players has taken place and has not ceased in every part of diverse sports. New agents are being refined with effects similar to PEFs that are cannot discover by dope investigating.[37] Specialists have explained that the uselessness of testing is not just a research-based problem, it is also political: Administration of anti-doping regulations is gruelling and costly and numerous international bodies and governments are unenthusiastic to put forth the effort. In addition to the thoughtlessness of detection and indifference of officials, players are faced with growing financial and competitive inducements to dope.[38] The number of cases increased more and more in the 1980s and mid-1990s. These numbers have been used by governments and governmental bodies such as the Council of Europe as evidence proving that doping in a lot of Olympic sports has not been controlled.[39]

This fact was eloquently echoed by Gardiner and his colleagues when they wrote: "*The milestone in policy development that takes place in the late 1980s was consequent in part to the admit by governments and sports bodies that doping was a much more perplexing phenomenon and uncontrollable as they had at first thought*".[40] If there was another possibility, would it be anything but the formation of a new international body? Indeed, an independent international body other than the International Olympic Committee was required to take on the anti-doping mission.

Following a string of heavily covered dope incidents "the Ben Johnson case, Summer Olympics Seoul 1988; Festina case, Tour de France 1998", a pivotal resolution to establish

[36] Verner Møller, *The Ethics of Doping and Anti-Doping. Redeeming the Soul of Sport?*, Ethics and Sport (London; New York: Routledge, 2010).

[37] Shamila Shadmanfaat et al., "Performance Enhancing Drug Use Among Professional Athletes: Testing the Applicability of Key Theoretical Concepts Derived From Situational Action Theory," *Journal of Sport and Social Issues* 44, no. 4 (2020): 336–55, https://doi.org/10.1177/0193723520919812.

[38] Shadmanfaat et al.

[39] Barrie Houlihan et al., "The World Anti-Doping Agency at 20: Progress and Challenges," *International Journal of Sport Policy and Politics* 11, no. 2 (2019): 193–201, https://doi.org/10.1080/19406940.2019.1617765.

[40] Simon Gardiner et al., *Sports Law*, 2nd ed. (London: Cavendish Publishing Limited, 2001).

WADA was founded in 1999.[41] WADA is funded and financially supported by sport organizations and the governments, and therefore it is considered to be a composite public-private entity".[42] WADA is an official Swiss organization, but its administrative structures are evenly set of delegates of (SGBs) Sports Governing Bodies and public authorities.[43]

Functionally speaking, WADA represented an independent authority that could systematize and coordinate anti-doping precepts onto sports, covering testing procedures, the prohibited materials catalogue, and penalties for anti-doping contraventions.[44] In addition, WADA is also in charge of releasing an updated list of the drugs and steps which categorize doping yearly.[45] WADA has three criteria for putting a product on the List: threat to health, improving athletic performance, and counteracting sports ethos. Two of the three norms or requirements must be met to include a component or technique in the List.[46] The list is a living document that is subject to constant updating and modification. Following discussions, stakeholders and specialists contribute to the List's inclusions and removals.[47] Furthermore, the WADA Code includes specific 'core' articles, and it has mandated the adherence to the code and made it mandatory for various sports federations. These core articles comprise the determinations of what is considered as a doping offense, what burdens and standards of proof must be selected and what punishments have to be enforced.[48]

WADA, cooperatively with sports-proficient scholars of genetics and sports delegates organized a workshop in the Banbury Centre in New York to talk about the probability of gene passing in sport, in place that skill and genetic changing collide, in March 2002.[49] Additionally, the phrase 'Gene doping' was included in the formal list of prohibited factors and means in the year of 2003. From that time, considerable care and funds have been presented by WADA to investigate and find out about gene doping.[50] On the agency's site, there are twenty-three funded study projects that try to identify effectual methods of testing genetic doping; between those selected are some of their recombinant protein

[41] Jules A. A. C. Heuberger et al., "Dealing with Doping. A Plea for Better Science, Governance and Education," *British Journal of Clinical Pharmacology* 88, no. 2 (2022): 566–78, https://doi.org/10.1111/bcp.14998.

[42] Marina Nehme and Catherine Ordway, "Governance and Anti-Doping: Beyond the Fox and the Hen House," in *Doping in Sport and the Law*, ed. Ulrich Haas and Deborah Healey, 1st ed. (Oregon: Bloomsbury Publishing Plc, 2016), 207–31.

[43] Antoine Duval et al., "The World Anti-Doping Code 2015: ASSER International Sports Law Blog Symposium," *The International Sports Law Journal* 16, no. 1 (2016): 99–117, https://doi.org/10.1007/s40318-016-0097-9.

[44] John Gleaves and Ask Vest Christiansen, "Athletes' Perspectives on WADA and the Code: A Review and Analysis," *International Journal of Sport Policy and Politics* 11, no. 2 (2019): 341–53, https://doi.org/10.1080/19406940.2019.1577901.

[45] Rodrigo Gonçalves Dias, "Genética, performance física humana e doping genético: o senso comum versus a realidade científica," *Revista Brasileira de Medicina do Esporte* 17, no. 1 (2011): 62–70, https://doi.org/10.1590/S1517-86922011000100012.

[46] AL-Dafrawi, "WADA Prohibited List."

[47] AL-Dafrawi.

[48] Vincent Geeraets, "Ideology, Doping and the Spirit of Sport," *Sport, Ethics and Philosophy* 12, no. 3 (2018): 255–71, https://doi.org/10.1080/17511321.2017.1351483.

[49] Giuseppe Fischetto and Stéphane Bermon, "From Gene Engineering to Gene Modulation and Manipulation: Can We Prevent or Detect Gene Doping in Sports?," *Sports Medicine* 43, no. 10 (2013): 965–77, https://doi.org/10.1007/s40279-013-0075-4.

[50] T. Beiter et al., "Direct and Long-Term Detection of Gene Doping in Conventional Blood Samples," *Gene Therapy* 18, no. 3 (2011): 225–31, https://doi.org/10.1038/gt.2010.122.

products (rEPO, rhGH), also, MSTN, PCK1, HIFs, VEGFA, PPARD, GH, IGF1, and EPO.[51] Anti-doping labs apply approaches that rely on the direct recognition of novel chemicals or metabolites as well as the indirect assessment of genetic or protein alterations or metabolic alterations caused by doping.[52]

Now, if the World Anti-Doping Agency Code is the sole arbiter and reference in determining gene doping violations, and the appropriate penalties for those acts, don't we have the right to ask and question the legal nature of such a Code? Perhaps we will find a convincing answer in what Paul Marriott-Lloyd wrote:

> Governments cannot be direct parties to the Code because of its legal status and that of WADA under whose authority it was elaborated. The Code is a non-governmental document that operates in the realm of private or contractual law and WADA, despite equal governmental involvement in its funding and management, was established as a private foundation. Therefore, governments could only give a moral commitment to the Code by signing the Copenhagen Declaration on Anti-Doping and Sport. Only an international convention can create binding obligations on governments.[53]

Concerning the legal issue, WADA's Code section 1 (Doping Control) - INTRODUCTION, states:

> Anti-doping rules, like competition rules, are sport rules governing the conditions under which sport is played. Athletes, Athlete Support Personnel or other Persons (including board members, directors, officers, and specified employees and Delegated Third Parties and their employees) accept these rules as a condition of participation or involvement in sport and shall be bound by these rules. These sport-specific rules and procedures, aimed at enforcing anti-doping rules in a global and harmonized way, are distinct in nature from criminal and civil proceedings. They are not intended to be subject to or limited by any national requirements and legal standards applicable to such proceedings.[54]

Countries' Penal codes provide legal protection of the right to life and the right to bodily integrity.[55] Since the abuse of performance-enhancing drugs negatively affects both of them, neglecting this protection or agreeing on its contrary is invalid and incorrect.[56] Therefore, the text at the introduction of WADC is a text that is not consistent with penal legal standards and contradicts the sovereign legislation of countries.[57]

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[51] Mihaela Oraviţan, "Current Threats on Gene Doping - a Systematic Review," *Timisoara Physical Education and Rehabilitation Journal* 11, no. 21 (2018): 28–35, https://doi.org/10.2478/tperj-2018-0013.

[52] Oraviţan.

[53] Paul Marriott-Lloyd, "International Convention against Doping in Sport - SHS/2010/PI/H/2," UNESDOC Digital Library, 2010, https://unesdoc.unesco.org/ark:/48223/pf0000188405.

[54] "World Anti-Doping Code 2021," www.wada-ama.org, January 1, 2021, https://www.wada-ama.org/sites/default/files/resources/files/2021_code.pdf.

[55] Ahmad Saad Ahmad AL-Dafrawi et al., "Consuming Prohibited Substances in Sport Activities: A Legal and Shariah Perspective," *International Journal of Fiqh and Usul al-Fiqh Studies* 2, no. Spcl (2018): 23–37, https://doi.org/10.31436/ijfus.v2iSpcl.77.

[56] AL-Dafrawi et al.

[57] AL-Dafrawi et al.

5. Proving Gene Doping: Will the Doubt Be Translated into the Athlete's Benefit?

Gene doping testing is a highly sensitive complicated topic, and its unclear results often violate the rights of the athletes in addition to infringing some provisions of the WADA Code itself. This has an effect on the application of the idea of justice in its broad concept. If you wish more specification, it is related to applying the concept of Justice on all parties.

Legally speaking, the concept of beyond a reasonable doubt that will confirm the concept of 'benefit of the doubt', it is noticeable in paragraphs 2 and 3 of Article 66, of the Rome Statute of the International Criminal Court which states:

> Article 66: ***Presumption of innocence***
> 1. Everyone shall be presumed innocent until proved guilty before the Court in accordance with the applicable law.
> 2. The onus is on the Prosecutor to prove the guilt of the accused.
> 3. In order to convict the accused, the Court must be convinced of the guilt of the accused beyond reasonable doubt.[58]

As a comment on this, if the principle 'benefit of the doubt' applies to War criminals' cases, there should be no surprise when one argues for applying it to Gene Doping cases. In other words, applying this principle to athletes who have been accused of Doping should be considered as a priority when applying it to someone accused of war-crimes.

That is why it was said previously, it must also be recognized that even felonious criterion of proof by itself does not ensure pertinent civilian freedoms. In addition to proof's standard, forms and other sides of criminal justice must be kept in mind, e.g., the crime-fighting prototypical inclined to be more restricted and, therefore, risks indicting the innocent other than the model of the due procedures.[59]

The 'benefit of the doubt' is a basic principle in each structure of common law. It is used in its daily meaning, to assume something favourable about someone instead of negative if there is no solid or unambiguous proof in either direction. Nevertheless, the concept must be understood in relation to three additional extraordinary specific legal meanings: criterion of verification, the onus of evidence, and believability. In penal circumstances, the "presumption of innocence" is connected to the idea of "reasonable suspicion" via the reciprocal contradiction.[60] For example, the definition of "reasonable suspicion" proposed by the Federal Judicial Center and described by the US Supreme Court as "clear," direct and accurate reads as follows: "Evidence that leaves no room for doubt is evidence that makes you entirely persuaded with the defendant's plaintiff. ... If ... believe there is a true probability that he is not sinful, you should grant him the benefit of the

[58] "Rome Statute of the International Criminal Court," Pub. L. No. A/CONF.183/9, § PART 6. THE TRIAL: "Article 66: Presumption of innocence"., 2187 1 (2011), https://www.icc-cpi.int/NR/rdonlyres/ADD16852-AEE9-4757-ABE7-9CDC7CF02886/283503/RomeStatutEng1.pdf.

[59] Salomeja Zaksaite and Hubert Radke, "The Interaction of Criminal and Disciplinary Law in Doping-Related Cases," *The International Sports Law Journal* 14, no. 1 (2014): 115–27, https://doi.org/10.1007/s40318-014-0045-5.

[60] Ahmad Saad Ahmad AL-Dafrawi, "Absence of Reliable Screening Methods That Prove the Use of Gene Doping in Sports," *MHSalud: Revista En Ciencias Del Movimiento Humano y Salud* 20, no. 1 (2023): 1–3, https://doi.org/10.15359/mhs.20-1.14.

doubt and announce that he is blameless'.[61] In the same manner, 'the benefit of the doubt' in civil cases predominantly rests with the accused, though due to lower criteria of proof this represents less of an impediment to the plaintiff than one faced via a criminal prosecutor.[62]

Realistically speaking, WADA has espoused a comparatively permissive standard of proof, i.e. 'comfy satisfaction' being enough, which is a criterion less rigorous than 'without reasonable doubt'.[63] In the most recent version of the WADA code, the article n°. (3.1) deals with the Burdens and Standards of Proof by saying:

> 'The Anti-Doping Organization shall have the burden of establishing that an anti-doping rule violation has occurred. The standard of proof shall be whether the Anti-Doping Organization has established an anti-doping rule violation to the comfortable satisfaction of the hearing panel, bearing in mind the seriousness of the allegation which is made. This standard of proof in all cases is greater than a mere balance of probability but less than proof beyond a reasonable doubt. Where the Code places the burden of proof upon the Athlete or other Person alleged to have committed an anti-doping rule violation to rebut a presumption or establish specified facts or circumstances, except as provided in Articles 3.2.2 and 3.2.3, the standard of proof shall be by a balance of probability'.[64]

Before I begin to analyse the content of the quotation above, I must admit that this article was formulated in a legal professional style. Now, let me try to give a legal explanation of the text of WADC Article (3.1) in more detail to fully be understood. In systems with an accusatory procedure, a distinction is made between degrees of probability that a criminal judgment must attain, according to the one who has the burden of proof. As a result, when the burden of proof rests with the defence, the court must be convinced on the basis of a balance of probabilities, i.e., with a probability of 50% or more. If the burden of proof is borne by the follow-up body, the court's conviction must be without reasonable doubt. (Meaning to say that it must be convinced with a high degree of probability that excludes any reasonable doubt. This does not mean that conviction must be proven without any doubt such as in the case where the probability is more than 95%. It is not necessary for the probability of condemnation to reach a one way only, but there are possibilities for error).

The confirmation tests of gene doping, which WADA is currently implementing, produce inaccurate results. In other words, the results of these tests can only give a small and limited probability index. Consequently, the results of these tests can in no way exclude reasonable doubt. This shows that the measures put forth by WADA to prove genetic doping go against Article (3.1) of its own code.

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[61] Anthony Good, "'The Benefit of the Doubt' in British Asylum Claims and International Cricket," in *Of Doubt and Proof: Ritual and Legal Practices of Judgment*, ed. Daniela Berti, Anthony Good, and Gilles Tarabout, 1st ed. (London and New York: Routledge, 2016), 119–40.

[62] Good.

[63] Geeraets, "Ideology, Doping and the Spirit of Sport."

[64] "World Anti-Doping Code 2021."

Experts in Biomedical Ethics and Law confirm that there are no declared stories of gene doping tried from players, though some suspects have already employed. Despite the advancement of science, and procedures for detecting genetic doping being developed, the discovery remains difficult.[65] It is almost unattainable to differentiate between two proteins of the same task and design, which are manufactured in the identical place through the same cellular mechanism.[66]

A second team of researchers confirmed the same meaning by saying: presently, there is no proof that gene doping has been applied to improve sportive performance. Yet, then progress might make therapeutic genes a more glamorous method for doping purposes. Thus, it is necessary that anti-doping authorities continue to respond in a proactive rather than as a reactive manner.[67]

Now, if my argument had any strength and logic, then I would say that it is not sufficient at all to state the name of the material or the prohibited method in the Prohibited List. But what really matters is to have accurate and reliable technical methods to disclose it. This reminds us of the first rule issued by the International Amateur Athletic Federation (IAAF), regarding the ban on the use of any stimulant elements in sports in 1928. Unfortunately, this rule remained mere ink on paper because there were no precise reliable methods that can reveal the substance abuse in Track and Field sport at that time.

The inaccurate results that genetic testing produces, which was used to detect gene doping in sport, were supposed to improve gradually in the mid-2020s. Unfortunately, corona virus, the global pandemic, has invaded the whole world and caused the lockdown of many sporting events, such as the Summer Olympic Games in Tokyo in 2020, where DBS blood test was assumed to be launched. This announced by IOC President Mr. Thomas Bach, during the fifth World Conference on Doping in Sport organised by the World Anti-Doping Agency (WADA). This conference held in Katowice, the Republic of Poland in November 2019.

In his study, Pitsiladis, the commissioner of the Medical and Scientific Commission of IOC proved the existence of around 21,000 genes in man and that a few hundred will switch on after a sportsperson has abused EPO or experience the blood components' adding.[68] It has been announced that this replacement in the player's genetic footprint will not be impossibly verifiable along weeks - even for months probably - after doping happening has completed.[69] On top of that, the IOC made its allegation to save samples so they can investigate them once it is prepared, even if the new technology is not confirmed in the schedule for Tokyo 2020.[70] In terms of my personal opinion on the matter, I feel that things will not remain as they are.

The elite generation of genetically modified individuals will have bodies that will never age and genetically designed muscles that are four times or more larger in size and ability

[65] Dierickx, Deckx, and Hens, "The Ethics of Gene Doping."
[66] Dierickx, Deckx, and Hens.
[67] Neuberger and Simon, "Gene and Cell Doping."
[68] "Inside the Games," insidethegames.biz, November 5, 2019, https://www.insidethegames.biz/articles/1086687/gene-testing-could-be-used-at-tokyo-2020.
[69] "Inside the Games."
[70] "Inside the Games."

to execute exertion than the current generation. The current type of muscle is that found in humans today. In terms of education, their minds will be equipped to understand and accept the most difficult physics and mathematics theories, as well as the rest of the complicated cosmic ideas, and the world's leading corporations will compete to hire them.

The means for taking performance-enhancing drugs are no longer traditional, even in some of their most common forms, laws governing the use of performance-enhancing drugs, if such legislation exists, must be reviewed. Traditional methods have become incompatible with the novel and extremely sophisticated images of some treatments that have become used in the sports field in the hope of achieving their spectacular stimulating effects and outcomes.

6. Conclusion

The results of this study support the idea that some of the procedures put forth by WADA lack credibility, or in a more accurate legal expression, its credibility is flawed and not suitable as a standard to judge the integrity and sincerity of the players when it comes to gene doping. Suppose we want to advance research on doping detection in general, and gene doping in particular, to benefit from their results in combating doping. In that case, the procedures we use must be compatible with the guarantees provided by national constitutions and criminal legal legislation for those accused in cases. In the end, to ensure maintaining the sustainability of fair sporting competition, it is necessary to confront the abuse of doping and the acts of gene doping with strict measures. Yet, if the results of those procedures are doubtful, then that doubt must be interpreted in favour of the athlete in question.

Legal status

This is a legal study in the first place, addressing the examination of the procedures for detecting inaccurate gene-doping used by WADA in proving violations of the World Anti-Doping Code. The researcher emphasizes that he has not conducted or participated in any tests on humans, plants, or animals.

Declaration

The author asserts that he did not violate the privacy of any patient/athlete, nor did he use or promote the name of any hospital, or genetic lab.

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Abbreviations

Some specialist words from the fields of medicine and sports are used in this legal study and are listed below alphabetically:

(DBS): Dried Blood Spot testing.

(EPO): Erythropoietin, a hormone that your kidneys naturally make to stimulate the production of red blood cells.

(GH): A peptide hormone that stimulates growth.

(HIFs): Hypoxia-Inducible Factors.

(IGF1): Insulin-like growth factor 1.

(IOC): International Olympic Committee.

(MSTN): MSTN gene.

(PCK1): Phosphoenolpyruvate carboxykinase 1 (soluble).

(PESs): Performance-Enhancing Substances.

(PPARD): Peroxisome proliferator-activated receptor delta.

(rEPO): Recombinant Erythropoietin.

(rhGH): Recombinant human growth hormone.

(SGBs): Sports Governing Bodies.

(VEGF-A): Vascular endothelial growth factor A.

(WADA): World Anti-Doping Agency.

(WADC): World Anti-Doping Agency Code.

References

AL-Dafrawi, A. S. A. "Absence of Reliable Screening Methods That Prove the Use of Gene Doping in Sports." *MHSalud: Revista En Ciencias Del Movimiento Humano y Salud* 20 no. 1 (2023): 1–3, https://doi.org/10.15359/mhs.20-1.14.

———. "Taking Physical Steroids in Sport Competitions: (From an Ethical-Legal Perspective)." *Journal of Political Science and Law* 2 no. 9 (2018): 188–206.

———. "WADA Prohibited List: The Benefits of Combining Pharmacology, Medicine, and Law." *ASM Science Journal* 17 (2022): 1–9, https://doi.org/10.32802/asmscj.2022.1291.

AL-Dafrawi, A. S. A, Mohamad Asmadi bin Abdullah, Majdah Zawawi, and Zainudin bin Ismail. "Consuming Prohibited Substances in Sport Activities: A Legal and Shariah Perspective." *International Journal of Fiqh and Usul al-Fiqh Studies* 2 no. Spcl (2018): 23–37, https://doi.org/10.31436/ijfus.v2iSpcl.77.

Al-Dafrawi, A. S. A, Mohamad Asmadi Abdullah, Majdah Zawawi, and Zainudin Ismail. "PERFORMANCE-ENHANCING MEDICINES IN SPORTS: LEGAL DISCUSSION." *International Journal of Law, Government and Communication* 4 no. 17 (2019): 48–60, https://doi.org/10.35631/ijlgc.417005.

Beiter, T., M. Zimmermann, A. Fragasso, J. Hudemann, A. M. Niess, M. Bitzer, U. M. Lauer, and P. Simon. "Direct and Long-Term Detection of Gene Doping in Conventional Blood Samples." *Gene Therapy* 18 no. 3 (2011): 225–31, https://doi.org/10.1038/gt.2010.122.

Birzniece, V. "Doping in Sport: Effects, Harm and Misconceptions." *Internal Medicine Journal* 45 no. 3 (2015): 239–48, https://doi.org/10.1111/imj.12629.

Boer, Eddy N. de, Petra E. van der Wouden, Lennart F. Johansson, Cleo C. van Diemen, and Hidde J. Haisma. "A Next-Generation Sequencing Method for Gene Doping Detection That Distinguishes Low Levels of Plasmid DNA against a Background of Genomic DNA." *Gene Therapy* 26 no. 7 (2019): 338–46, https://doi.org/10.1038/s41434-019-0091-6.

Breivik, Gunnar. "Sport, Gene Doping and Ethics." In *Genetic Technology and Sport: Ethical Questions*, edited by Claudio Tamburrini and Torbjörn Tännsjö, 1st ed., 172. London and New York: Routledge, 2005.

Brzeziańska, E, D Domańska, and A Jegier. "GENE DOPING IN SPORT – PERSPECTIVES AND RISKS." *Biology of Sport* 31 no. 4 (2014): 251–59, https://doi.org/10.5604/20831862.1120931.

Cantelmo, Rebeca Araujo, Alessandra Pereira da Silva, Celso Teixeira Mendes-Junior, and Daniel Junqueira Dorta. "Gene Doping: Present and Future." *European Journal of Sport Science* 20 no. 8 (2020): 1093–1101, https://doi.org/10.1080/17461391.2019.1695952.

Celebi, Evrim, Cemal Gundogdu, and Sakir Tufekci. "Determination of Attitudes and Opinions of Triathlon Athletes Regarding Doping As a Moral Issue." *STUDIES ON ETHNO-MEDICINE* 12 no. 02 (2018). https://doi.org/10.31901/24566772.2018/12.02.495.

Delhove, Juliette, Ivana Osenk, Ivanka Prichard, and Martin Donnelley. "Public Acceptability of Gene Therapy and Gene Editing for Human Use: A Systematic Review." *Human Gene Therapy* 31 no. 1–2 (2020): 20–46, https://doi.org/10.1089/hum.2019.197.

Dias, Rodrigo Gonçalves. "Genética, performance física humana e doping genético: o senso comum versus a realidade científica." *Revista Brasileira de Medicina do Esporte* 17 no. 1 (2011): 62–70, https://doi.org/10.1590/S1517-86922011000100012.

Dierickx, Kris, Seppe Deckx, and Kristien Hens. "The Ethics of Gene Doping: A Survey of Elite Athletes and Academic Professionals." *Journal of Clinical Research and Bioethics* 3 no. 2 (2012): 1–5, https://doi.org/10.4172/2155-9627.1000136.

Duval, Antoine, Herman Ram, Marjolaine Viret, Emily Wisnosky, Howard L. Jacobs, and Mike Morgan. "The World Anti-Doping Code 2015: ASSER International Sports Law Blog Symposium." *The International Sports Law Journal* 16 no. 1 (2016): 99–117, https://doi.org/10.1007/s40318-016-0097-9.

Evans, John H. "Setting Ethical Limits on Human Gene Editing after the Fall of the Somatic/Germline Barrier." *Proceedings of the National Academy of Sciences* 118 no. 22 (2021): e2004837117. https://doi.org/10.1073/pnas.2004837117.

Fischetto, Giuseppe, and Stéphane Bermon. "From Gene Engineering to Gene Modulation and Manipulation: Can We Prevent or Detect Gene Doping in Sports?" *Sports Medicine* 43 no. 10 (2013): 965–77, https://doi.org/10.1007/s40279-013-0075-4.

Gardiner, Simon, Mark James, John O'Leary, Roger Welch, Ian Blackshaw, Simon Boyes, and Andrew Caiger. *Sports Law*. 2nd ed. London: Cavendish Publishing Limited, 2001.

Geeraets, Vincent. "Ideology, Doping and the Spirit of Sport." *Sport, Ethics and Philosophy* 12 no. 3 (2018): 255–71, https://doi.org/10.1080/17511321.2017.1351483.

Gleaves, John, and Ask Vest Christiansen. "Athletes' Perspectives on WADA and the Code: A Review and Analysis." *International Journal of Sport Policy and Politics* 11 no. 2 (2019): 341–53, https://doi.org/10.1080/19406940.2019.1577901.

Good, Anthony. "'The Benefit of the Doubt' in British Asylum Claims and International Cricket." In *Of Doubt and Proof: Ritual and Legal Practices of Judgment*, edited by Daniela Berti, Anthony Good, and Gilles Tarabout, 1st ed., 119–40. London and New York: Routledge, 2016.

Haisma, H. J., and O. de Hon. "Gene Doping." *International Journal of Sports Medicine* 27 no. 4 (2006): 257–66, https://doi.org/10.1055/s-2006-923986.

Heuberger, Jules A. A. C., April Henning, Adam F. Cohen, and Bengt Kayser. "Dealing with Doping. A Plea for Better Science, Governance and Education." *British Journal of Clinical Pharmacology* 88 no. 2 (2022): 566–78, https://doi.org/10.1111/bcp.14998.

Houlihan, Barrie, Dag Vidar Hanstad, Sigmund Loland, and Ivan Waddington. "The World Anti-Doping Agency at 20: Progress and Challenges." *International Journal of Sport Policy and Politics* 11 no. 2 (2019): 193–201, https://doi.org/10.1080/19406940.2019.1617765.

insidethegames.biz. "Inside the Games," Accessed 5 November 2019. https://www.insidethegames.biz/articles/1086687/gene-testing-could-be-used-at-tokyo-2020.

López, Sheila, João Meirelles, Vanessa Rayol, Gabriella Poralla, Nicole Woldmar, Bruna Fadel, Mariana Figueiredo, et al. "Gene Doping and Genomic Science in Sports: Where Are We?" *Bioanalysis* 12 no. 11 (2020): 801–11, https://doi.org/10.4155/bio-2020-0093.

Malve, Harshad O. "Sports Pharmacology: A Medical Pharmacologist's Perspective." *Journal of Pharmacy & Bioallied Sciences* 10 no. 3 (2018): 126–36, https://doi.org/10.4103/jpbs.JPBS_229_17.

Marriott-Lloyd, Paul. "International Convention against Doping in Sport - SHS/2010/PI/H/2." UNESDOC Digital Library, 2010. Accessed 19 June 2023. https://unesdoc.unesco.org/ark:/48223/pf0000188405.

Miah, Andy. "Genetics, Cyberspace and Bioethics: Why Not a Public Engagement with Ethics?" *Public Understanding of Science* 14 no. 4 (2005): 409–21, https://doi.org/10.1177/0963662505056616.

Minigh, Jennifer L. *Sports Medicine*. 1st ed. Westport, Connecticut. London: Greenwood Publishing Group, Inc, 2007.

Møller, Verner. *The Ethics of Doping and Anti-Doping. Redeeming the Soul of Sport?* Ethics and Sport. London; New York: Routledge, 2010.

Murray, T H, and E Livny. "The Human Genome Project: Ethical and Social Implications." *Bulletin of the Medical Library Association* 83 no. 1 (1995): 14–21.

Nehme, Marina, and Catherine Ordway. "Governance and Anti-Doping: Beyond the Fox and the Hen House." In *Doping in Sport and the Law*, edited by Ulrich Haas and Deborah Healey, 1st ed., 207–31. Oregon: Bloomsbury Publishing Plc, 2016.

Neuberger, Elmo W. I., and Perikles Simon. "Gene and Cell Doping: The New Frontier - Beyond Myth or Reality." In *Acute Topics in Anti-Doping*, edited by O Rabin and Y Pitsiladis, 62:91–106. 2017 S. Karger AG, Basel: Karger Publishers, 2017. https://www.karger.com/Article/FullText/465456.

Oraviţan, Mihaela. "Current Threats on Gene Doping - a Systematic Review." *Timisoara Physical Education and Rehabilitation Journal* 11 no. 21 (2018): 28–35, https://doi.org/10.2478/tperj-2018-0013.

Patel, Seema, and Ian Varley. "Exploring the Regulation of Genetic Testing in Sport." *Entertainment and Sports Law Journal* 17 no. 5 (2019): 1–13, https://doi.org/10.16997/eslj.223.

Resnik, David B. "Bioethics of Gene Therapy." In *Encyclopedia of Life Sciences*. John Wiley & Sons, Ltd, 2001. https://doi.org/10.1038/npg.els.0003480.

"Resolutions of the Congresses of the International Association of Penal Law," December 1, 2007. http://www.penal.org/sites/default/files/files/RICPL.pdf.

Rogol, Alan D., and Lindsay Parks Pieper. "Genes, Gender, Hormones, and Doping in Sport: A Convoluted Tale." *Frontiers in Endocrinology* 8 (2017): 251, https://doi.org/10.3389/fendo.2017.00251.

Rome Statute of the International Criminal Court, Pub. L. No. A/CONF.183/9, § PART 6. THE TRIAL: "Article 66: Presumption of innocence"., 2187 1 (2011). Accessed 19 May 2023. https://www.icc-cpi.int/NR/rdonlyres/ADD16852-AEE9-4757-ABE7-9CDC7CF02886/283503/RomeStatutEng1.pdf.

Santamaria, Stefania, Antonio Ascione, Domenico Tafuri, and Filomena Mazzeo. "GENE DOPING: BIOMEDICAL AND LAWS ASPECTS OF GENETIC MODIFICATION OF ATHLETES." *Medicina Sportiva: Journal of Romanian Sports Medicine Society* 17 no. 4 (2013): 193–99.

Shadmanfaat, Shamila, Saeed Kabiri, Lauren N. Miley, C. Jordan Howell, Caitlyn N. Muniz, and John K. Cochran. "Performance Enhancing Drug Use Among Professional Athletes: Testing the Applicability of Key Theoretical Concepts Derived From Situational Action Theory." *Journal of Sport and Social Issues* 44 no. 4 (2020): 336–55, https://doi.org/10.1177/0193723520919812.

Sugasawa, Takehito, Takuro Nakano, Shin-ichiro Fujita, Yuki Matsumoto, Genki Ishihara, Kai Aoki, Koki Yanazawa, et al. "Proof of Gene Doping in a Mouse Model with a Human Erythropoietin Gene Transferred Using an Adenoviral Vector." *Genes* 12 no. 8 (2021): 1249, https://doi.org/10.3390/genes12081249.

"The Precautionary Principle - UNESCO Digital Library." Accessed 25 May 2023. https://unesdoc.unesco.org/ark:/48223/pf0000139578.

Unal, Mehmet, and Durisehvar Ozer Unal. “Gene Doping in Sports.” *Sports Medicine* 34 no. 6 (2004): 357–62, https://doi.org/10.2165/00007256-200434060-00002.

Verma, I. M., L. Naldini, T. Kafri, H. Miyoshi, M. Takahashi, U. Blömer, N. Somia, L. Wang, and F. H. Gage. “Gene Therapy: Promises, Problems and Prospects.” *Genes and Resistance to Disease*, 2000, 147–57, https://doi.org/10.1007/978-3-642-56947-0_13.

Wirth, Thomas, Nigel Parker, and Seppo Ylä-Herttuala. “History of Gene Therapy.” *Gene*, 50 years of gene therapy - a contribution of Waclaw Szybalski to science and humanity, 525 no. 2 (2013): 162–69, https://doi.org/10.1016/j.gene.2013.03.137.

www.wada-ama.org. “World Anti-Doping Code 2021,” January 1, 2021. Accessed 17 June 2023. https://www.wada-ama.org/sites/default/files/resources/files/2021_code.pdf.

Zaksaite, Salomeja, and Hubert Radke. “The Interaction of Criminal and Disciplinary Law in Doping-Related Cases.” *The International Sports Law Journal* 14 no. 1 (2014): 115–27, https://doi.org/10.1007/s40318-014-0045-5.

الدفراوي, أحمد سعد أحمد. “الطبيعة الثنائية للمنشِّطات الجسدية: المفاهيم المعياريّة بين فقه التشريع الوضعي والشريعة.” *Journal of College of Sharia & Islamic Studies* 40 no. 2 (2022). https://doi.org/10.29117/jcsis.2022.0335.

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