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Enhancement or Recovery? The Scientific and Legal Paradox of Performance-Enhancing Substances

Robert M. Gallman*

I. INTRODUCTION

Scientific advancement has improved the human experience in nearly every area of life imaginable. Even in ancient times, man has sought to improve his existence through the use of tools and mechanisms for efficiency.¹ In fact, one may phrase this desire as a race to find the next level of human existence. The modern world provides many platforms for such a desire, and the sports world is no exception. Scientific advancement plays a major role in athletic performance. Discoveries in human anatomy and a careful study of human kinetics have led athletes to try new substances and methods in an attempt to gain a competitive edge over the competition. Recently, however, a question has arisen: Has science gone too far with performance-enhancing and performance-recovery substances? In the case of legislation, the United States has made sharp distinctions as to which substances are legal.² As we move forward into the new millennium, we are discovering more about how human anatomy functions. Thus, it is important that we reevaluate the proper role of substances that promote recovery and enhance performance in an ever-changing global society so the interests of athletes and others are best served by the law.

The history of substance use in athletics dates back to ancient Greek and Roman times. During the Olympic Games of 776 B.C. and gladiator competitions, participants would often make use of stimulants like strychnine to fight off fatigue and injury and to intensify their fights.³ In those times, such substances were not banned and were used in many different forms prior to

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1. Around 3500 B.C., the wheel was originally created to serve as potter's wheels in Mesopotamia. Megan Gambino, *A Salute to the Wheel*, SCIENCE & NATURE (June 18, 2009), <http://www.smithsonianmag.com/science-nature/A-Salute-to-the-Wheel.html>.
2. Office of National Drug Control Policy Reauthorization Act of 2006, Pub. L. No. 109-469, 120 Stat. 3502 (2006)[hereinafter Drug Control Act]; Crime Control Act of 1990, PL 101-647, 104 Stat. 4789 (1990)[hereinafter Crime Control Act].
3. *History of Performance Enhancing Drugs in Sports*, HISTORICAL TIMELINE (Sept. 14, 2011, 11:14 AM), [hereinafter *History of PE Drugs*] <http://sportsanddrugs.procon.org/view.resource.php?resourceID=002366>; see also Genevieve F.E. Birren & Jeremy C. Fransen, *The Body and the Law: How*

competitions.⁴ However, modern substance abuse law concerns itself with many substances derived from the human body's natural processes.⁵ The onset of high dollar winnings and earnings in competitive sports has incentivized both athletes and scientists to seek out substances and methods that allow for athletic improvement.

The discovery of new methods⁶ to introduce these substances into the body and an increased awareness of the currently used substances have produced a growing demand to differentiate whether they enhance athletic performance, assist athletes in recovery, or both. Furthermore, increased use of these substances has created questions as to what degree these methods should be regulated. Although recent use of anabolic steroids in professional sports has been met with substantial negativity, such as Mark McGwire's admission of steroid use during his professional baseball career, athletes appear reluctant to yield any ground to Congressional Acts.⁷ Despite the athletes' resistance to follow Congressional Acts, there are important scientific and bio-ethical arguments surrounding substance use in professional sports. This is particularly true with regard to performance enhancement and recovery, which must be considered if professional sports are to transition into the new millennium alongside scientific advancement.

An understanding of the biological effects of newly developed substances and methods is paramount to devising a proper legal standard for their use. Human Growth Hormone ("HGH"), Erythropoietin ("EPO"), testosterone, gene therapy, Androgenic Anabolic Steroids ("AAS"), and over-the-counter supplements are some of the most commonly used substances and methods in today's sports world. A detailed look at what each of these substances does for the human body will assist in determining whether they should be banned from athletic performance. Furthermore, substances and methods that interact with the human body differently than others may require different regulation.

Next, it is important to consider the current regulations regarding performance-enhancing substances and methods. Throughout the last half-century, different regulatory bodies and agencies, such as Congress and the

Physiological and Legal Obstacles Combine to Create Barriers to Accurate Drug Testing, 19 MARQ. SPORTS L. REV. 253 (2008).

4. *History of PE Drugs*, *supra* note 3.
5. *See generally* Drug Control Act, *supra* note 2.
6. By "new methods," I am referring generally to nanotechnology being used by pharmaceutical companies to formulate new drug delivery systems into the human body. *See, e.g.*, John C. Monica, Jr., NANOTECHNOLOGY LAW, § 5:28.
7. Mark McGwire continued the use of steroids in his professional baseball career despite Congress' passage of the Anti-Drug Abuse Act of 1988, which banned the use of steroids for non-medical purposes. *See, e.g.*, Drug Enforcement Agency Personnel Assignments, PL 100-690, § 9310, 102 Stat. 4181(1988) [hereinafter Anti-Drug Abuse Act].

World Anti-Doping Agency (“WADA”), have banned an ever-growing list of substances and methods in both the athletic and public context.⁸ It is these regulatory bodies and agencies that must pay close attention to advances in science and technology to properly decide whether the new substances or methods truly create an athletic advantage during competition. When a particular substance or method creates an advantage, regulators must decide how to regulate that substance or method. They must also consider whether the advantage to the athlete was born out of the attempt to rehabilitate an injury. These considerations stem from a new method of performance-recovery known as gene therapy.

Finally, the newly developed technique of gene therapy presents an interesting inside look at how the future of performance-enhancement substances may be regulated. In the analysis, gene therapy is contrasted with gene doping, which WADA defines as “[t]he non-therapeutic use of cells, genes, genetic elements, or of the modulation of gene expression, having the capacity to enhance athletic performance”⁹ Moreover, the case of Oscar Pistorius provides a guiding example of how regulatory agencies can procedurally handle scientific advancements in sports.¹⁰ Using the panel’s analysis from Pistorius’s case, future courts will be able to better handle any alleged violation of a substance regulation in athletics.¹¹

Overall, the rapid scientific advancements in substances and methods to assist athletes in recovery come with many considerations for the athlete and his or her team. Due to the lack of clarity on how performance-enhancing substances will be regulated procedurally in the future, it is difficult for an athlete, coach, parent, or agent to predict whether new developments or methods will preclude the athlete from participating in competition. Athletes should seriously consider whether they want to jeopardize their careers when they choose to use new methods or substances to aid in recovery. On the other hand, regulatory agencies must accept that scientific advancements and the use of those advancements by athletes is not likely to stop any time soon. Thus, in the future, the difference between what is considered performance-enhancement and performance-recovery may become extremely clouded or rendered moot.

8. Drug Control Act, *supra* note 2; Crime Control Act, *supra* note 2; World Anti-Doping Agency, The World Anti-Doping Code: The 2008 Prohibited List International Standard, 7 (2007), *available at* http://www.wada-ama.org/rtecontent/document/2008_List_En.pdf [hereinafter WADA Prohibited List].

9. WADA Prohibited List, *supra* note 8.

10. *See generally* Pistorius v. IAAF, Ct. of Arbitration for Sport, at 1–2, 6–7 Case No. CAS 2008/A/1480, Arbitral Award (May 16, 2008), *available at* <http://jurisprudence.tas-cas.org/sites/CaseLaw/Shared%20Documents/1480.pdf> [hereinafter CAS Arbitral Award].

11. *Id.*

II. HISTORY AND EVOLUTION OF PERFORMANCE-ENHANCING SUBSTANCES

A. The Origin of Performance-Enhancing Substances

Although performance-enhancing substances are currently a subject of much debate, such substances have been used for centuries without much controversy. Dating as far back as 776 BC, the ancient Greek athletes were using performance-enhancing substances when competing in the Olympic Games.¹² These substances were the most advanced for the era. Much like today, this ancient society was one governed by law.

New creations and variations of commonly consumed substances became more commonplace as athletes began searching for more creative ways to sustain their energy levels. In the 19th century, French cyclists and lacrosse players consumed a drink called *Vin Mariani*, which was a widely used mixture of alkaloids, wine, and coca leaf extract—a source of cocaine.¹³ The drink's ingredients made it quite popular because it staved off the sense of fatigue and hunger brought on by prolonged exertion.¹⁴

In the 20th century, athletes experimented with different combinations of substances known to fight fatigue. For example, in the 1904 Olympics, a marathon runner, Thomas Hicks, used a mixture of brandy and strychnine in his competitions.¹⁵ In fact, using a combination of strychnine, heroin, cocaine, and caffeine was a common practice among Olympic teams and coaches until the 1920s when cocaine and heroin became only available by prescription.¹⁶ However, in 1928, the first rule against the use of performance-enhancing substances was enacted by the International Association of Athletics Federation ("IAAF"), the governing body for track and field.¹⁷ The IAAF made an interesting statement explaining that "[d]oping is the use of any stimulant *not normally employed* to increase the power of action in athletic competition above the average."¹⁸ The implication was that as long as use of the substance was commonplace among the athletes, then its use was allowed and the athletes were on equal ground.¹⁹ Contrast this notion to today's idea that any use of a banned performance-enhancement substance or

12. *History of PE Drugs*, *supra* note 3.

13. *Id.*

14. *Id.*

15. *Id.*

16. *Id.*

17. International Association of Athletics Federation, *Drugs in Sport/Doping Control*, IAAF MEDICAL MANUAL, <http://www.iaaf.org/mm/Document/imported/42026.pdf>, (last visited Jan. 6, 2012).

18. *Id.* (emphasis added).

19. *See, id.*

method by an athlete, regardless of whether other athletes are also using it, is a violation.

Subsequently, in the 1950's, some of the first performance-enhancing substances, like amphetamines, widely used by soldiers in WWII, crossed over into sports.²⁰ Both Italian and Dutch cyclists used amphetamines to minimize fatigue during exercise.²¹ In 1958, Dr. John Bosley Ziegler created an anabolic steroid called Diaabol, subsequently released by Ciba Pharmaceuticals with the Federal Drug Administration ("FDA") approval, for sale in the United States.²² Dr. Ziegler's creation synthesized the strength-building properties of testosterone while minimizing the negative health effects of the hormone.²³ The use of amphetamines to combat a pre-race illness led to the death of British Cyclist Tommy Simpson while he was riding in the 13th stage of the Tour de France on July 13, 1967.²⁴ His death led the International Olympic Committee ("IOC") to establish its Medical Commission to fight against doping in sports.²⁵ The Commission has three guiding principles: protection of athletes' health, respect for medical and sport ethics, and equality for all competing athletes.²⁶ It is interesting to note that these principles do not provide any guidance to what substances can or cannot be used by the athletes despite the fact that they were enacted as a reaction to an athlete's use of amphetamines.²⁷

Eventually, in 1968, the IOC established its first compulsory drug testing at the Winter Olympic Games in Grenoble, France and then instituted it again at the Summer Olympic Games in Mexico City, Mexico that same year.²⁸ At the time, the list of banned substances included psychomotor stimulants, miscellaneous central nervous system stimulants, narcotic analgesics, and stimulants comprised of sympathomimetic amines and alcohol.²⁹ At this juncture, society began to view a commonplace and commercial substance, like alcohol, as a substance that could potentially "enhance" performance and thus should be banned for use in sporting events. However, this notion is in direct opposition to the cyclists and lacrosse players of the 19th century, who

20. *History of PE Drugs*, *supra* note 3.

21. *Id.*

22. *Id.*

23. *Id.*

24. *Id.*

25. *Id.*

26. *History of PE Drugs*, *supra* note 3.

27. *See id.*

28. *Id.*

29. *Id.*

legally consumed alcohol in the form of *Vin Mariani* in attempt to enhance their performances.³⁰

It is clear that society's notions of what is considered a performance-enhancing substance has changed quite drastically over the span of several centuries. Part of this change is due to advancements in science, biology, and human anatomy. As those scientists and biologists discover more about their respective fields, society's knowledge of the effects of certain substances or methods become more widely known. However, it seems this knowledge has created more complications for regulating agencies.

B. Early Resistance To Performance-Enhancement

In the past few decades there has been a clear resistance to scientific advancements in substances that not only assist an athlete in recovery but also may improve his or her performance as a result of the recovery. Some of the resistance has come in the form of legislation passed by Congress.³¹ As part of his War on Drugs program, President Ronald Reagan signed into law the Anti-Drug Abuse Act of 1988 banning the sale and distribution of steroids for non-medical purposes.³² It is this act that established the important distinction between a drug used for medical purposes and a drug used for any other purpose.³³ The importance of this distinction is that the drug's chemical composition was not seen as an important factor in determining its legality, but rather the purpose for which the drug was to be used.³⁴ This distinction between the purpose of the use of the substance or method and its actual biological effects in the body continues to play a key role in determining an athlete's eligibility for competition.

In 1990, Congress strengthened its resistance to the use of performance-enhancing drugs by passing the Anabolic Steroids Control Act, which added steroids to the same legal class (Schedule III) as amphetamines, methamphetamines, opium, and morphine.³⁵ In this Act, Congress amended Section 102 of the Controlled Substances Act and defined anabolic steroid to mean "any drug or hormonal substance, chemically and pharmacologically related to testosterone . . . that promotes muscle growth . . ."³⁶ That is to say, if a drug is chemically related to the body's natural hormone of testosterone and it promotes muscle growth, then such a drug is an anabolic steroid

30. *Id.*

31. Drug Control Act, *supra* note 2; Crime Control Act, *supra* note 2; Anti-Drug Abuse Act, *supra* note 7.

32. Anti-Drug Abuse Act, *supra* note 7.

33. *See id.*

34. *See id.*

35. Crime Control Act, *supra* note 2.

36. *Id.*, at Title XXI, § 1902 (amending Section 102 of the Controlled Substances Act 21 U.S.C. 802).

which may only be obtained by prescription.³⁷ Here, Congress established that drugs obtained via prescription are legal for use even though the drug itself is not chemically different when used for performance-recovery purposes.

In 1991, more resistance came in the form of the Major League Baseball ("MLB") Commissioner, Fay Vincent, who sent a seven page memo to all of the major league teams on June 7, stating, "[t]he possession, sale or use of any illegal drug or controlled substance by Major League players or personnel is strictly prohibited . . . This prohibition applies to all illegal drugs and controlled substances, including steroids."³⁸ This went unnoticed by a majority of the players and coaching staff involved in MLB.³⁹ In 1997, MLB's acting commissioner, Bud Selig, distributed a practically identical version of the Fay Vincent memo, in which he cited steroids, that directed clubs to post the policy in clubhouses and distribute copies of the memo to players.⁴⁰ Selig's memo also went largely ignored.⁴¹ This ignorance by MLB players in regard to steroid or testosterone use demonstrated an early disregard for any actions taken by regulating bodies to control the use of any substance that may be considered to enhance an athlete's performance. However, in the early 1990s, the range of substances available to athletes was not as large as it is today. The fact that there is a greater volume of performance-enhancing substances available complicates decision-making for both the athletes as well as the regulating agencies. It is important to look deeper into the type of effect substances have on human anatomy because it sheds light as to how regulatory agencies may seek to handle their use by athletes.

C. Performance-Enhancing Substances and Their Biological Effects

At present, there is an array of substances available to athletes as well as hospital patients recovering from an assortment of illnesses. Some of these substances include HGH, EPO, testosterone, AAS, over-the-counter substances, and gene therapy or gene injections.⁴² It is important to note how these substances affect human anatomy in order to pursue the ultimate goal of determining their legality in sports.

37. *Id.*

38. Fay Vincent, *Baseball's Drug Policy and Prevention Program*, at 1–2, OFFICE OF THE COMMISSIONER MAJOR LEAGUE BASEBALL (June 7, 1991) available at <http://sportsanddrugs.procon.org/sourcefiles/VincentMemo.pdf>; *History of PE Drugs*, *supra* note 3.

39. *History of PE Drugs*, *supra* note 3.

40. *History of PE Drugs*, *supra* note 3.

41. *Id.*

42. Brent S. Rushall & Guy Grant, *HGH, EPO, Anabolic Steroids, and Testosterone in Swimming*, AUSTRALIAN SWIMMING AND FITNESS, May–June 1998, at 42–44, <http://coachsci.sdsu.edu/csa/vol56/fourdrug.htm> [hereinafter PE Substances Article].

First, HGH is a hormone that affects general growth.⁴³ The most common HGH, Somatropin, acts on bones and muscles in a non-differential manner.⁴⁴ Through its best use, HGH may facilitate quicker overall recovery from general fatigue.⁴⁵ In triathlons and swimming, HGH is commonly used in conjunction with anabolic steroids.⁴⁶ The steroids provide specific adaptation effects, and HGH assists in recovery.⁴⁷ HGH affects growth rate and has beneficial medical uses and is used by athletes to “grow” larger but not necessarily to enhance their abilities.⁴⁸ The enhancement may be a result of growing larger depending on whether or not it is beneficial to grow larger for a particular sport. In professional tennis, in which I participated for two years, growing taller can significantly help a player improve his or her performance. This is because the extra height coupled with a longer reach allows the player to move less to cover the same distance as a shorter player. Over the time span of a match, the taller player would move significantly less than the shorter player, leading to more fatigue for the shorter player. The more fatigued player has a lower chance of winning the match. However, depending on the sport, growing taller is not always an advantage.

Second, EPO, a hormone naturally produced in the body, signals the bone marrow to begin the production of new red blood cells.⁴⁹ Natural production of EPO can be created by training at high altitudes.⁵⁰ However, synthetic EPO is a drug developed for the treatment of severe anemia, which may develop from cancer treatments or HIV infections.⁵¹ EPO only lasts in the body for a short time (as little as twenty-four hours), but its stimulus effect continues for as long as two weeks due to the rise in oxygen in the bloodstream.⁵² Its use is particularly attractive to individuals who participate in primarily aerobic, fatiguing sports, such as cycling or running.⁵³ The predecessor to EPO is known as blood doping—the transfusion of either donor blood or one’s own stored blood that enhances performance in endurance

43. *Id.*

44. *Id.*

45. *Id.*

46. *Id.*

47. *Id.*

48. PE Substances Article, *supra* note 42.

49. *Physiology of Altitude Training*, HIGHER PEAK ALTITUDE TRAINING (last visited Jan. 06, 2012), <http://www.higherpeak.com/faq-physiology.html> [hereinafter High Altitude Training Article].

50. *Id.*

51. *Id.*

52. PE Substances Article, *supra* note 42.

53. *Id.*

events by increasing the oxygen level in the bloodstream.⁵⁴ Interestingly, it doesn't seem to make a difference if an athlete uses high-altitude training or synthetic EPO because both methods have the same effect. That is to say, one can perform for longer periods of time with less fatigue because of the excess amount of oxygen flowing through the bloodstream. However, too much natural or synthetic EPO may "thicken" blood, which can cause additional circulatory strain and clotting in smaller blood vessels.⁵⁵

Third, testosterone is available in natural and synthetic forms; synthetic forms have different arrays of carbon-13 atoms than natural testosterone.⁵⁶ Expressed as a ratio (T/E), a normal balance of testosterone to epitestosterone is roughly 1:1 (slightly higher for males and lower for females).⁵⁷ Testosterone tends to increase strength and endurance levels in both males and females when the T/E ratio is near or above 6:1.⁵⁸ Recently, pharmaceutical companies, such as Abbott, have been using different dosage amounts of testosterone to treat low testosterone ("Low T") in males.⁵⁹ This is interesting because many times high-level athletes overtrain, causing them to experience chronic low-levels of testosterone.⁶⁰ Hence, the question arises: why is an overtrained, high-level athlete with chronic low testosterone not allowed testosterone supplementation, yet the Low T male can be prescribed an array of testosterone treatment options?⁶¹ The answer is anything but clear. Here, there is an interesting paradox. The average male with Low T can receive a prescription from a doctor for testosterone supplementation and use it to return his testosterone to normal levels. However, the overtrained athlete, who also has Low T, can obtain testosterone via prescription but runs the risk of not being able to compete in competition should he use it to return his testosterone levels to normal.

54. John W. Orchard, Peter A. Fricker, Susan L. White, Louise M. Burke & Deborah J Healey, *The Use and Misuse of Performance-Enhancing Substances in Sport*, 184 (3) MED. J. AUSTL. 132–36 (2006), available at http://www.mja.com.au/public/issues/184_03_060206/orc10359_fm.html#0_i1091800 [hereinafter Use & Misuse Article].

55. PE Substances Article, *supra* note 42.

56. *Id.*

57. *Id.*

58. *Id.*

59. When a man's testosterone falls below a level of around 300 ng/dL, it's generally considered to be low. Abbott Laboratories, *Is It Low T?*, <http://www.isitlowt.com/what-is-low-t/signs-and-symptoms.html> (last visited Jan. 08, 2012) [hereinafter Low T].

60. J. Jurimae, A. Nurmekivi & T. Jurimae, *Hormone Responses To Intensive Interval Training in Middle-Distance Runners*, 21 BIOLOGY OF SPORT 1 (2004).

61. Describing several treatment options for men diagnosed with Low T: gels, patches, injections, buccal tablets, and pellets. Low T, *supra* note 58, at <http://www.isitlowt.com/what-you-can-do/treatment-options.html>.

Fourth, "AASs are specialized derivatives of the male hormone testosterone."⁶² "They increase protein synthesis and when coupled with training and proper nutrition increase lean muscle mass."⁶³ There are many types of AASs for different medical uses and not all AASs are performance-enhancing.⁶⁴ However, some AASs enhance strength, tolerance for anaerobic work, and shorten the body's recovery time.⁶⁵ They respond differently to specific bodily stresses, and thus, produce augmentations in the functioning of locally stressed body parts.⁶⁶ This is the substance rumored to have been circulating throughout MLB players for the past couple decades.

Fifth, over-the-counter supplements are considered "legal" under anti-doping codes; however, there are some controversies due to the notion that they may enhance athletic performance.⁶⁷ Though there is no specific scientific evidence to support the benefits claimed for many of these over-the-counter products, there is substantial proof that some can enhance performance when used according to particular procedures.⁶⁸ For instance, athletes taking caffeine, creatine, or bicarbonate/citrate can exercise at a more intense level for a greater time before they begin to experience fatigue.⁶⁹ In response to attempts to regulate such products, WADA has contemplated that such ingredients occur naturally in food and that manufactured over-the-counter products merely represent a practical way for athletes to consume a certain dosage of those ingredients.⁷⁰ Contrarily, the WADA Code has banned prohormones, including Androstenedione, Dehydroepiandrosterone, and 19-Norandrostenedione, which all can be converted in the body to testosterone or the anabolic steroid Nandrolone.⁷¹ Nevertheless, the Dietary Supplement Health and Education Act of 1994 allowed products containing prohormones to be marketed as over-the-counter dietary supplements due to the amino acid content present in the prohormones.⁷² It seems as though WADA and Congress disagree as to whether products containing prohormones are worth banning.

62. PE Substances Article, *supra* note 42.

63. *Id.*

64. *Id.*

65. *Id.*

66. *Id.*

67. Use & Misuse Article, *supra* note 53.

68. *Id.*

69. *Id.*

70. *Id.*

71. *Id.*

72. Dietary Supplement Health and Education Act of 1994, Pub. L. No. 103-417, § 201, 108 Stat. 4325 (1994) [hereinafter Supplement Act].

Sixth, gene therapy, also known as gene injections, is a relatively new development and is on the cutting edge of performance-enhancement. Gene injections are performed when one injects into muscles a manipulated virus that carries a gene for insulin-like growth factor 1, also known as IGF1, which has caused target muscles in rats to grow in size and strength by fifteen to thirty percent.⁷³ The inserted gene causes formation of extra IGF1, which causes the growth of muscle cells.⁷⁴ When the technique was used on rats that were put through an exercise program, the rats doubled their muscle strength.⁷⁵ Lee Sweeney, who conducted a study regarding gene injections at the University of Pennsylvania, stated:

If a normal person would inject this, their muscles would get stronger without them doing anything . . . If they are athletes in training, the rat study indicates that their training would be much more effective, injury would be overcome more easily and the effect of the training would last a much longer time.⁷⁶

The effects appeared to last throughout the entirety of the rats' life.⁷⁷ The technique was designed so that the IGF1 gene stays in the target muscle and does not move into the bloodstream where it could cause damage to other organs.⁷⁸ Bio-nanotechnology, such as these performance-enhancing gene injections, presents a new frontier in both science and law as both fields will eventually need to grapple with this new advancement. As of now, there is no precedent regarding gene therapy that would assist regulatory agencies on how to approach a situation where an athlete is receiving gene therapy for recovery purposes. It is advancements like gene therapy that require regulatory agencies to constantly evaluate where to draw the line between performance enhancement and performance recovery.

III. CURRENT LEGAL STATE OF PERFORMANCE-ENHANCING SUBSTANCES

A. The Fight Against Performance-Enhancing Substances

The prevailing view of athletes using any substance deemed to enhance athletic performance has continued to move more toward the negative. That is to say, these substances and their use by athletes in competition have become progressively more regulated. For instance, in February 1999, the

73. Paul Recer, *Gene Therapy Creates Super-muscles*, GENETICS ON MSNBC.COM (Feb. 16, 2004, 11:39 PM), <http://www.msnbc.msn.com/id/4282866/ns/health-genetics/t/gene-therapy-creates-super-muscles/#.Tw8VAvlliZQ> [hereinafter *Super-Muscles Article*].

74. *Id.*

75. *Id.*

76. *Id.*

77. *Id.*

78. *Id.*

World Conference on Doping in Sport, held in Lausanne, produced the Lausanne Declaration on Doping in Sport.⁷⁹ This declaration created an independent, international anti-doping agency, which was to be fully operational for the XXVII Olympic Games in Sydney in 2000.⁸⁰ Pursuant to the document's terms, WADA was established in 1999 to promote and coordinate the fight against doping in sports worldwide.⁸¹ WADA was created as a foundation under the initiative of the IOC with the support and participation of governments, intergovernmental organizations, public authorities, and other public and private bodies who opposed doping in sports.⁸² WADA consists of several equal representatives from the Olympic Movement as well as public authorities.⁸³

Moreover, the United States Anti-Doping Agency ("USADA"), the independent anti-doping agency for Olympic sports in the United States, was created as a result of recommendations set forth by the United States Olympic Committee's Select Task Force on Externalization.⁸⁴ The USADA initiated operations on Oct. 1, 2000, and maintained full authority for testing, education, research, and adjudication for U.S. Olympic, Pan Am, and Paralympic athletes.⁸⁵ The USADA's responsibility was to develop a comprehensive United States anti-doping program for the Olympic Movement.⁸⁶ The creation of many different national and international regulatory bodies over recent years demonstrates the seriousness with which society treats performance-enhancing substances. This seriousness is a far cry from the unregulated sports world of the 19th century. Clearly, the new millennium has brought about a more strict view of the use of performance-enhancing substances via the creation of WADA and the USADA.

On Dec. 29, 2006, in furtherance of this strict view, President Bush signed into law HR 6344, the Office of National Drug Control Policy Reauthorization Act of 2006, which prohibits the use of gene-doping and bans the use of genetic modification for performance enhancement in amateur athletic competition recognized by the U.S. Olympic Committee.⁸⁷ Notice that this act only prohibits "gene doping" and not "gene therapy."⁸⁸ The Reauthorization Act may see more action in years to come due to the ad-

79. *History of PE Drugs*, *supra* note 3.

80. *Id.*

81. *Id.*

82. *Id.*

83. *Id.*

84. *Id.*

85. *History of PE Drugs*, *supra* note 3.

86. *Id.*

87. Drug Control Act, *supra* note 2.

88. *Id.*

vancements in bio-nanotechnology. Advancements may eventually make it easier for athletes to make genetic changes to their bodies for either performance-enhancing or recovery purposes. Should athletes begin using advanced bio-technology on a large scale, a different type of regulation or an amendment to the Reauthorization Act may be necessary to clearly establish whether any form of gene therapy is banned from use in sports.

In contrast, in 2004, WADA removed caffeine from its list of banned substances.⁸⁹ Interestingly enough, some doctors believe WADA legalized caffeine because research demonstrated that caffeine exceeding the amount allowed under the WADA rules may actually decrease performance.⁹⁰ Furthermore, doctors believed WADA wanted to avoid undue punishment for athletes whose bodies metabolize caffeine at different rates.⁹¹ The removal of caffeine from WADA's banned substances list demonstrates an interest by governing authorities in looking deeper into whether these different substances actually improve athletic performance. This type of in-depth analysis is a beneficial practice that should continue for each substance in order to truly determine whether some substances are in fact both performance-enhancement and performance-recovery drugs.

B. Crossing the Line Leads to Litigation and Settlements

The recent onslaught of regulation overseeing performance-enhancing substances in athletics did not deter some athletes from their use. In the recent decades some athletes have been in the spotlight of the performance-enhancement substance debate. Both Barry Bonds and Lance Armstrong have found themselves involved in either litigation or allegations regarding using these substances while competing in professional athletics.⁹² It is important to understand the basics of each athlete's situation in order to further analyze the performance-enhancing substances debate.

Barry Bonds is a former MLB outfielder, who played from 1986 to 2007, for the Pittsburgh Pirates and San Francisco Giants.⁹³ He debuted in 1986 with the Pittsburgh Pirates and joined the San Francisco Giants in 1993, where he remained through the 2007 season. He has had a controversial

89. Anna Salleh, *Athletes' Caffeine Use Reignites Scientific Debate*, ABC SCIENCE ONLINE (Aug. 01, 2008, 11:15 AM), <http://www.abc.net.au/news/stories/2008/08/02/2322263.htm?site=olympics/2008>.

90. *Id.*

91. *Id.*

92. *United States v. Bonds*, No. CR 07-00732 SI, 2009 WL 416445 (N.D. Cal. Feb. 19, 2009), *aff'd*, 608 F.3d 495 (9th Cir. 2010); *see also* Tom Goldman, *Ex-Friends Say Armstrong Admitted Drug Use*, NPR.ORG (June 24, 2006), <http://www.npr.org/templates/story/story.php?storyId=5508863> [hereinafter NPR Armstrong Article].

93. Barry Bonds Statistics and History, BASEBALL-REFERENCE.COM, <http://www.baseball-reference.com/players/b/bondsba01.shtml> (last visited Sept. 1, 2012).

career, notably as a central figure in baseball's steroids scandal. In 2008, he was indicted on charges of perjury under 18 U.S.C. § 1623(a) and obstruction of justice under 18 U.S.C. § 1503 for allegedly lying to the grand jury during the government's investigation of Bay Area Laboratory Co-operative ("BALCO").⁹⁴ Bonds testified that he never knowingly took illegal steroids.⁹⁵ Specifically, he was accused of lying when he said he did not knowingly take the steroids given to him by his former trainer Greg Anderson and that Anderson never injected him with steroids.⁹⁶ The trial began March 21, 2011, and he was convicted on April 13, 2011, on the obstruction of justice charge.⁹⁷

Even though the charges against Bonds centered on perjury and obstruction of justice, the true reason Bonds was in this position was his involvement with BALCO, which was in the business of selling what many considered performance-enhancing substances.⁹⁸ Bonds initially became involved in the scandal through his trainer, Greg Anderson, who was indicted by a federal grand jury in the United States District Court for the Northern District of California and charged with supplying anabolic steroids to athletes.⁹⁹ Since Anderson had been Bonds's trainer circa 2000, there was speculation about whether Bonds had used any performance-enhancing substances while playing in the Major Leagues.¹⁰⁰ The speculation centered on his possible use of anabolic steroids.¹⁰¹ Bonds denied having ever knowingly used anabolic steroids at any point, either for recovery or performance-enhancement purposes.¹⁰²

However, even if Bonds had admitted to using anabolic steroids, the larger questions become: to what extent is the use of anabolic steroids banned in sports and should there be a new "limit" on their use if they are so prevalent that testing for them becomes too high a cost to the professional sports leagues? The answer to the first question is clear because anabolic steroids are banned in sports.¹⁰³ However, the answer to the second question is not clear. Regulating agencies, especially the MLB, need to take an in-

94. United States v. Bonds, 608 F.3d 495, 499 (9th Cir. 2010).

95. *Id.*

96. *Id.*; Lester Munson, *Last, Best Hope in Convicting Bonds*, ESPN.COM (Apr. 6, 2011), <http://sports.espn.go.com/espn/otl/columns/story?id=6301745>.

97. Juliet Macur, *Bonds Guilty of Obstruction, but Not of Perjury*, N.Y. TIMES, Apr. 13, 2011, at A1, <http://www.nytimes.com/2011/04/14/sports/baseball/14bonds.html>.

98. Bonds, WL 416445, at *1.

99. United States v. Bonds, 608 F.3d 495, 497–99 (9th Cir. 2010).

100. *See id.*

101. *See, id.*

102. *See, id.*

103. Crime Control Act, *supra* note 2.

depth look into whether banning anabolic steroid use altogether is cost effective for the sport. Furthermore, they need to consider balancing between high testing costs and what consequences¹⁰⁴ may occur should they allow a limited use of anabolic steroids.

Another athlete recognized worldwide, Lance Armstrong, faced allegations from across the globe regarding use of performance-enhancing substances. Specifically, in 2006, French newspaper *Le Monde* reported claims by Betsy and Frankie Andreu during a deposition that Armstrong had admitted using performance-enhancing drugs to his physician just after brain surgery in 1996.¹⁰⁵ The Andreus' testimony related to litigation between Armstrong and SCA Promotions, a Texas company attempting to withhold a \$5 million bonus. This case was settled out of court with SCA paying Armstrong and Tailwind Sports \$7.5 million, to cover the \$5 million bonus plus interest and lawyers' fees.¹⁰⁶ Relevant testimony was as follows: "And so the doctor asked him a few questions, not many, and then one of the questions he asked was . . . have you ever used any performance-enhancing drugs? And Lance said yes. And the doctor asked, what were they? And Lance said, growth hormone, cortisone, EPO, steroids and testosterone."¹⁰⁷ Armstrong suggested Betsy Andreu may have been confused by questions about his post-operative treatment, which included steroids and EPO, taken to counteract wasting and red-blood-cell-destroying effects of intensive chemotherapy.¹⁰⁸

As this instance demonstrates, much of what has been claimed regarding Armstrong's use of performance-enhancing substances has centered on possible use of EPO and testosterone.¹⁰⁹ Yet, many may not consider the possibility that Armstrong's use of these substances were for chemotherapy treatment recovery only and not to enhance his athletic performance.¹¹⁰ These allegations and the ensuing answers from Armstrong bring about an interesting legal paradox regarding steroids, testosterone, and EPO use among athletes. The paradox is that the use of steroids and EPO are not considered illegal when used in a recovery context, such as treating patients with anemia.¹¹¹ However, the use of these substances to recover from ex-

104. By "consequences," I am referring to what unintended effects allowing a limited use of anabolic steroids may have on younger aspiring baseball players.

105. NPR Armstrong Article, *supra* note 91.

106. *Id.*

107. *Id.*

108. *Id.*

109. *See id.*

110. *See id.*

111. "Although the Olympic Committee bans EPO from competition, the drug is safe in humans and is already approved by the FDA to treat anemia, especially in patients with cancer or kidney failure." Laurie Barclay, *Blood Builder Of-*

hausting endurance-based sports, which at a professional level often puts athletes' bodies in an overstrained state, is banned even though the substances are chemically equivalent to those used in recovery.¹¹²

It is unclear what the intention of the regulating bodies is when such a paradox exists. The paradox calls for a more structured procedure on how to determine what exactly is considered a performance-enhancing substance or method versus what is determined to be a performance-recovery substance or method. Alternatively, there may not be a difference between performance-enhancement and performance-recovery in some instances such as the use of gene therapy.

IV. ANALYSIS

A. Flawed Concept of a Difference Between Enhancement and Recovery

Due to advancements such as biotechnology as well as high profiled allegations of performance-enhancing substance use, the question arises: where should Congress or other regulatory agencies draw the line between a performance-enhancement substance and a recovery substance? Lance Armstrong's answer to allegations of performance-enhancing substance use brings about that dispute.¹¹³ Doctors questioned Armstrong as to whether he had ever used performance-enhancing substances.¹¹⁴ His answer was "Yes."¹¹⁵ However, according to Armstrong, he had used them in an attempt to recover from chemotherapy.¹¹⁶ Thus, the answer to the aforementioned question depends on whether one considers the context in which the substances are used. Say, for example, a professional athlete is severely fatigued after a sporting event (hours, days, even weeks long) and that athlete uses EPO as a recovery method, which in turn enhances his or her performance for the next event because they are closer to being fully recuperated. In this instance, is EPO being used as recovery, enhancement, or both? Regardless, EPO is banned by WADA, which precludes international athletes from using it.¹¹⁷ On the other hand, in a hospital context, the use of EPO would likely be considered only a recovery substance for anemia patients.¹¹⁸ In that context,

fers New Hope for Brain Diseases, WEBMD HEALTH NEWS (Aug. 10, 2001), <http://www.webmd.com/brain/news/20010810/blood-builder-offers-new-hope-for-brain-diseases> [hereinafter EPO Article].

112. *See, id.*

113. *See* NPR Armstrong Article, *supra* note 91.

114. *Id.*

115. *Id.*

116. *Id.*

117. WADA Prohibited List, *supra* note 8.

118. EPO Article, *supra* note 110.

use of EPO is not criminalized or banned.¹¹⁹ Interestingly, EPO does not have to be adjusted much chemically in order for it to be used for performance-enhancement or anemia patient recovery.¹²⁰ Hence, the only variable in those two situations is how one chooses to view EPO's use. Ultimately, the legal line is drawn based on the user's purpose for the use of the substance or method.

A consensus exists in professional sports that an athlete using performance-enhancing substances creates an unfair advantage for that athlete because other competitors are not using such substances. Thus, WADA and Congress have banned certain substances so as to level the playing field and prevent deteriorating health.¹²¹ However, many items could possibly be considered "performance-enhancing" as well as recovery products. For example, drinking a sports-drink like Gatorade after a workout enhances performance in a subsequent workout because it replenishes the body with lost electrolytes the body needs to function properly.¹²² Lactic acid build-up creates soreness that may hinder an athlete in the next event. Thus, drinking a Gatorade after a workout or practice enhances one's athletic performance by assisting the body in recovery and allowing that athlete to perform closer to one hundred percent.

There are many substances that purport to assist one's body in recovery that could also be considered both recovery and enhancement products.¹²³ This fact raises the question, why ban other substances, such as EPO, testosterone, and HGH if all these substances do is assist the body in recovery? The banned substances are, in theory, merely an advanced version of what Gatorade and a plethora of other over-the-counter products purport to be: a workout recovery product. EPO, HGH, and testosterone not only assist in physical recovery, but also allow the body to function properly; as evidenced by the use of EPO in treating anemic patients and testosterone used to treat older males diagnosed with "Low T."¹²⁴ Furthermore, many drugs used to assist sick patients in recovery are chemically equivalent to the "banned sub-

119. *See id.*

120. *See generally id.*

121. Drug Control Act, *supra* note 2; Anti-Drug Abuse Act, *supra* note 7; WADA Prohibited List, *supra* note 8.

122. *See* Ronald Maughan, John B. Leiper & Susan M. Shirrefs, *Rehydration and Recovery After Exercise*, 9 SPORTS SCI. EXCH. No. 3 (1996), available at http://www.gssiweb.com/Article_Detail.aspx?articleid=35&level=2&topic=2 [hereinafter *Rehydration & Recovery*].

123. *See generally* Rehydration & Recovery, *supra* note 121; *see e.g.*, AdvoCare International, L.P., *Rehydrate*, available at <http://www.advocare.com/products/active/A2412.aspx>; *see also* Optimum Nutrition, Inc., *2:1:1 Recovery*, available at <http://www.optimumnutrition.com/products/211-recovery-p-252.html>.

124. EPO Article, *supra* note 110; Low T, *supra* note 59.

stances” athletes are using to recover from competitions.¹²⁵ Therefore, there may not be a bright line between what really is a performance-enhancing substance and a performance-recovery substance. A specific bright-line must be drawn to determine what exactly is unjust about substances that increase performance by assisting the athletes in recovery.

Where is that bright-line drawn? The answer to this question may be simple in theory, but difficult to implement. For instance, EPO and high-altitude training produce a similar effect for an athlete in that the athlete is able to perform for longer periods of time due to the increased amount of oxygen in his or her bloodstream.¹²⁶ It assists both in recovery and performance-enhancement because the more oxygen present in the bloodstream, the faster an athlete can recover. The athlete in turn performs better for the next event. The result from using EPO creates an unclear reason as to why substances are lumped into either a performance-enhancing category or a performance-recovery category. Ultimately, these substances are really assisting in both functions. Substances such as EPO and testosterone assist in recovery, which in turn allows one to enhance their performance as a by-product of the recovery purpose for which those substances were originally taken.

For EPO in particular, the bright-line to be drawn is exacted by determining how much EPO use produces a result equal to the average, and recommended, time spent in high-altitude training.¹²⁷ Once that amount is determined, then it is safe to say there is no difference between which method the athlete uses to increase endurance (provided the athlete does not over-do either method and cause harm to their bodies). However, it is at this point where implementing such exact measurements becomes difficult. For example, female and male athletes each have individual body types and sizes, which creates complications for determining a “one-size fits all” amount of EPO to be allowed by regulatory bodies such as Congress or WADA. The amount of EPO that a cyclist may require could differ drastically from the amount a National Football League player could require due to many factors such as size, metabolism, weight or length of play. The same difficulties would apply to finding a bright-line rule for testosterone use as well.

There are no easy answers, but since performance enhancement and recovery are really just a matter of degree, perhaps a solution can be proposed. First, more specifically defining why substances are banned or outlawed will assist rule-making agencies in determining which substances should be banned. For example, if Congress, WADA, or the IOC were to define a banned substance by specifying the level of dosage allowed in the body, then substances like EPO, HGH, and testosterone could be legalized and regulated by WADA, IOC, or other professional sport organizations. This is similar to

125. *See id.*

126. High Altitude Training Article, *supra* note 48.

127. *See id.*

the method used for bloodstream alcohol levels pertaining to drinking and driving as well as to pharmaceutical drugs. Pharmaceutical drugs are bought, sold, and used every day to recover/enhance people's bodies. If sport governing bodies were to set a dosage level for products such as EPO, HGH, and testosterone, as has already been done in the medical field, then these substances may be legalized and used as part of recovery for athletes. This method, of course, would require testing of every athlete prior to every competition, which would be costly. Here, sports organizations grapple with the cost of such a solution versus banning the substances all together. Ultimately, the question the organizations must ask themselves is "which solution costs us less and still maintains a high reputation with potential players in our leagues"?

The law could regulate such a method in sports much like regulation of the pharmaceutical industry, for which there is already a system in place.¹²⁸ In fact, the regulations or body of law for this type of solution may be easier than using the current testing methods since efficient dosage calculations are already being performed by pharmaceutical companies.¹²⁹ Hence, the transition of dosage amounts and its accounting method would merely be transferred to governing bodies such as WADA or the IOC and that transition would be relatively seamless.

There is not a significant difference between substances that enhance performance and ones that assist in recovery. This is important because even though legislation has already been passed banning certain substances known to enhance or assist in recovery for humans in the sporting context, biotechnological advancements may force Congress to regulate such use beyond sports. For example, the passage of the Drug Control Act of 2006, which prohibits the use of gene doping and bans from athletic competition anyone who uses genetic modification for performance-enhancement, is not currently the center of any litigation.¹³⁰ It is important to take note, however, that this lack of litigation may not be the case for much longer. The advancement of biotechnology worldwide is moving at a fast pace and will inevitably make its way into the field of athletics as athletes seek to compete at a higher level. The situation then will become more complicated. Will Congress or regulatory agencies allow biotechnology to be used in sports, the medical field, agriculture, or even technology? And, if Congress and regulatory agencies do allow such biotechnology to be used in those different fields, how does that affect the future of professional sports, medicine, food supply, and technology?

The answer to that question can only partly be answered with regard to professional sports. Already, in 2008, WADA banned the use of biotechnol-

128. 1 Food and Drug Admin. § 13:2 (2012).

129. See *Drug Dose Calculations Made Easier*, http://www.davesems.com/files/drug_dose_calculations.pdf (last visited Sept. 9, 2012).

130. Drug Control Act, *supra* note 2.

ogy in the form of gene doping from competition and sports.¹³¹ However, judging from the past use of banned substances, athletes will probably find a way to effectively use biotechnology, such as gene doping, in competition. Interestingly, The Office of National Drug Control Policy Reauthorization Act of 2006, which bans gene doping, may be ahead of its time because it may address a large portion of soon-to-be claims against athletes attempting to gene dope.¹³² On the other hand, gene doping may advance beyond the detection abilities of the overseeing bodies in sports. These scientific advances may create an arms-race between substance use and detection. Such an arms race calls for legal clarification on how to handle biotechnology, and more specifically, how to handle gene doping. Another issue is the need to closely examine whether there is truly a difference between gene doping and a new form of recovery from injury known as gene therapy.

B. Gene Doping Versus Gene Therapy: Case In Point

Gene doping, which WADA defines as “[t]he non-therapeutic use of genes, genetic elements and/or cells that have the capacity to enhance athletic performance” has been banned by both WADA and The Office of National Drug Control Policy Reauthorization Act of 2006.¹³³ There is a difficult distinction between gene therapy, which is the use of genetic material for recovery purposes, and prohibited gene doping in athletes.¹³⁴ For instance, gene therapy is performed in order to correct genetic abnormalities and to repair sports injuries, but such therapy may also genetically enhance the athlete, which renders moot the distinction between gene therapy and gene doping.¹³⁵ This presents an athlete, who must receive gene therapy for recovery purposes, with a dilemma due to the potential genetic and performance enhancements that may be a result of such gene therapy. Such a distinction exemplifies the difficulty of determining whether such methods are considered to be a recovery or enhancement mechanism for athletes.

First, explanation and examples of both gene therapy and gene doping are important to explore prior to discussing whether such methods are truly distinct. Gene Therapy is a technique for correcting defective genes responsible for disease development.¹³⁶ Numerous diseases are a result of unusual DNA variations, which are caused by an abnormality in protein production

131. WADA Prohibited List, *supra* note 8.

132. Drug Control Act, *supra* note 2.

133. WADA Prohibited List, *supra* note 8; *see also* Drug Control Act, *supra* note 2.

134. Kristin Jo Custer, *From Mice to Men: Genetic Doping in International Sports*, 30 HASTINGS INT’L & COMP. L. REV. 181, 206 (2007).

135. *See id.*

136. Human Genome Project (HGP) Information, Gene Therapy, http://www.ornl.gov/sci/techresources/Human_Genome/medicine/genetherapy.shtml (last visited Sept. 9, 2012).

and function within the cells.¹³⁷ Gene therapy occurs when genetic scientists are able to determine the specific genes involved in diseases, relate the specific genes to certain diseases, and ultimately insert a “normal” gene into human cells to substitute for or supplement a defective gene.¹³⁸ This method has been used to treat both disease and, more recently, sports injuries.¹³⁹ In many sports injuries, there is a major concern with tissue trauma, which usually occurs in the form of torn ligaments, tendons, cartilage, and muscle.¹⁴⁰ Since these types of injuries heal slowly, there is an increasing interest in utilizing gene therapy for faster recovery.¹⁴¹ Gene therapy, however, becomes enhancement “(1) when it is undertaken for the purpose of improving a characteristic or capability that, but for the enhancement, would lie within what is generally accepted as a ‘normal’ range for humans; or (2) when it installs a characteristic or capability that is not normally present in humans.”¹⁴² For example, gene doping can occur when an athlete attempts to enhance muscle strength through use of IGF-I gene therapy, which can create “genetically inflated musculature” allowing for increases in muscle endurance for aerobic exercise and increase fast-twitch muscle fibers in anaerobic exercise.¹⁴³ This would allow athletes to enhance a specific muscle group based on what their particular sport requires of them, such as a cyclist’s quadriceps, a swimmer’s shoulders, or a sprinter’s hamstrings.

Naturally, the question becomes: what is the difference between gene therapy and gene doping? Differentiation between gene therapy and gene doping can be difficult because both encompass the same genes, employ the same techniques, and yield similar outcomes. The purpose behind the two ideas is what separates them in society’s mind. Gene therapy involves repairing or recovering, while gene doping is considered to “enhance” human ability beyond that of what is considered “normal.” Paradoxically, when gene therapy is used to assist an athlete in recovery or repair, that athlete has in essence received an enhancement. Thus, there is a potential for ambiguity between the two and athletes receiving gene therapy treatment for disease or injury may have reason for concern regarding their eligibility to compete.

137. Human Genome Project (HGP) Information, Gene Disease Information, http://www.ornl.gov/sci/techresources/Human_Genome/medicine/assist.shtml (last visited Feb. 01, 2012) [hereinafter HGP Gene Therapy].

138. Human Genome Project (HGP) Information, Gene Therapy, *supra* note 135.

139. Vladimir Martinek et al., *Gene Therapy and Tissue Engineering in Sports Medicine*, 28 THE PHYSICIAN AND SPORTSMED 34, 34–41 (2000), available at <http://www.sportgen.narod.ru/genter.htm>.

140. *See generally id.*

141. *See generally id.*

142. Maxwell J. Mehlman, *The Law of Above Averages: Leveling the New Genetic Enhancement Playing Field*, 85 IOWA L. REV. 517, 523 (2000).

143. H. Lee Sweeney, *Gene Doping*, SCI. AM., July 2004, at 69.

Regulations currently in place need further scrutiny in order to properly deal with this problem.

The regulations and their application to gene therapy are important to understand in order to discern a true difference between gene therapy and gene doping. The two leading regulatory authorities overseeing gene doping are the IOC and WADA. By mid-year in 2001, the IOC Medical Commission began including gene doping in their discussions and on January 1, 2003, the IOC became the first institution to ban gene doping by adding it to its list of prohibited substances and methods for international competition.¹⁴⁴ The next year, WADA took responsibility for updating the list of prohibited substances even though the IOC still maintains representation within WADA committees through the IOC Medical Commission.¹⁴⁵ The IOC created a tribunal, the Court of Arbitration for Sport ("CAS"), to handle and resolve legal issues in international sports through the use of arbitration and mediation.¹⁴⁶ Even though the IOC created the CAS, this arbitral body is used by nearly all Olympic International Sports Federations and their statutes mandate that disputes be directed toward the CAS for arbitration.¹⁴⁷ In the United States 21 U.S.C. § 2001 mandates the United States Anti-Doping Agency work with the United States Olympic Committee to help ensure athletes in amateur athletics are "prevented from using . . . performance-enhancing genetic modification accomplished through gene doping."¹⁴⁸ Additionally, the statute dictates that the Agency is to "permanently include 'gene doping' among any list of prohibited substances adopted by the Agency."¹⁴⁹ Furthermore, a landmark in anti-doping took place when the WADA Prohibited List included a prohibition against gene doping, even though gene doping was not yet in use.¹⁵⁰ The 2008 WADA Prohibited List explicitly prohibits gene doping, which is defined as "[t]he non-therapeutic use of cells, genes, genetic elements and/or cells that have the capacity to enhance athletic performance"¹⁵¹ A major concern with these regulations is that because gene therapy and gene doping use the same methods,

144. O. De Hon, P. Sollie, & J. Vorstenbosch, *Gene Doping*, NECEDO NETHERLANDS CENTRE FOR DOPING AFFAIRS, February 2004, <http://www.dopingautoriteit.nl/media/files/documenten/2009/Gene%20Doping.pdf>.

145. See Custer, *supra* note 134, at 190.

146. The International Council Of Arbitration for Sport and the Court of Arbitration for Sport (CAS), Statutes of the Bodies Working for the Settlement of Sports-related Disputes 1, 4, 5, 12 (2004), available at <http://www.tas-cas.org/d2w/files/document/281/5048/0/3.1%20CodeEngnov2004.pdf>.

147. Custer, *supra* note 134, at 191.

148. 21 U.S.C. § 2001(b)(2) (2006).

149. 21 U.S.C. § 2001(b)(5) (2006).

150. WADA Prohibited List, *supra* note 8.

151. *Id.*

there is no clear bright line separating the two outside of an athlete's own description of the purpose behind the gene therapy. It is unclear as to how these current regulations can be applied.

Two problems anchor the debate between what is performance recovery and what is performance-enhancement with regard to gene therapy and gene doping. First, future testing for gene doping is unlikely to be able to distinguish between the protein expressions in gene doping and those in gene therapy. Thus, some athletes may be wrongly sanctioned if the tests come back positive. This problem leads to the second concern, which is that gene therapy may enhance certain muscles or tissues even though that may not have been the intention of the treatment. Gene therapy as a treatment is unlike other methods or substances, with which the regulatory bodies are familiar, and may pose complications in testing in the near future.

The second problem demonstrates the heart of the debate between performance-enhancing and performance-recovery substances. The concern with current gene doping regulations is how the phrase "enhance athletic performance" will be evaluated or interpreted going forward.¹⁵² Both the WADA Prohibited List as well as 21 U.S.C. § 2001 indicate that athletic performance-enhancement is not prohibited as long as gene therapy is the purpose for such manipulation.¹⁵³ Nevertheless, it is likely that whenever a person receives gene therapy, whether for disease treatment or sports injury repair, there will be some type of "performance-enhancing genetic modification."¹⁵⁴ Thus, an athlete receiving gene therapy as a treatment for a condition will obtain enhancements in their ability to perform. Unfortunately, the current regulations do not explain how gene therapy is to be settled with any sort of enhancement by-product of the gene therapy.¹⁵⁵ Moreover, agencies such as IOC and WADA have not specifically addressed how they intend to determine whether it is gene therapy or gene doping that is the cause of any performance-enhancement.¹⁵⁶ Additionally, the Therapeutic Use Exemption in the WADA World Anti-Doping Code may or may not apply to gene therapy, creating more confusion.¹⁵⁷

Such confusion may complicate how different regulatory agencies decide what is performance-enhancement and what is performance-recovery.

152. See WADA Prohibited List, *supra* note 8.

153. See 21 U.S.C. § 2001(b)(2) (2006); see also WADA Prohibited List, *supra* note 8.

154. 21 U.S.C. § 2001(b)(2) (2006).

155. Custer, *supra* note 134, at 206–07.

156. See Custer, *supra* note 134 at 209.

157. Therapeutic Use Exemption will allow an athlete with a documented medical condition to use one of the prohibited drugs or methods. World Anti-Doping Agency (WADA), 2009 World Anti-Doping Code 12, at 34–36 (2007), available at http://www.wada-ama.org/rtecontent/document/code_v2009_En.pdf; Custer, *supra* note 25, at 206–07.

For example, one agency may allow an athlete to compete with genetically enhanced performance as long as the athlete used gene manipulation for “therapeutic” purposes.¹⁵⁸ In contrast, a different agency may decide that such an athlete is ineligible because such gene manipulation has enhanced “athletic performance.”¹⁵⁹ In the latter case, an athlete may be banned from competition by the agency.¹⁶⁰ Without a specific stance from either the IOC or WADA, it is difficult to draw a line between gene therapy and gene doping as a performance-enhancement or a performance-recovery method. However, there may be one instance that helps shed light on how to evaluate gene therapy use by athletes.

**C. The Future of Performance-Enhancement via Gene Therapy:
Oscar Pistorius**

The case of Oscar Pistorius gives us a guiding example of how gene doping may be handled in the future. Pistorius was born in Johannesburg, South Africa, in 1986 and was missing the fibula in both legs.¹⁶¹ His parents made the decision to amputate his legs halfway between his knees and ankles when he was only eleven months old.¹⁶² When he began to walk, Pistorius used prosthetic legs to become mobile on his own.¹⁶³ Pistorius began running competitively in 2004 using special running prosthetics called Cheetahs.¹⁶⁴ In the 2006 Paralympic Athletics World Championships, he won three gold medals in the 100, 200, and 400 meter events, setting a world record in each event.¹⁶⁵ In 2008, Pistorius earned a spot on the 2008 Olympic 4x400 meter South African relay team that was expected to compete in that year’s Olympics.¹⁶⁶ Since he qualified for such an event, Pistorius requested permission from the IAAF, the International Sports Federation serving as the world governing body for track and field, to run against “able-bodied” runners using the Cheetah prosthetics.¹⁶⁷

158. See generally WADA Prohibited List, *supra* note 8.

159. See generally *id.*

160. See Custer, *supra* note 134, at 207.

161. Josh McHugh, *Blade Runner*, WIRED, Mar. 2007, at 136, 138, available at http://www.wired.com/wired/archive/15.03/blade_pr.html.

162. *Id.* at 138–39.

163. *Id.* at 139.

164. *Id.* at 138.

165. Gregor Wolbring, *Oscar Pistorius and the Future Nature of the Olympic, Paralympic, and Other Sports*, 5 Script Ed., 139, 155 available at <http://www.law.ed.ac.uk/ahrc/scripted/vol5/wolbringasp>.

166. Jere Longman, *An Amputee Sprinter: Is He Disabled or Too-Abled?*, N.Y. Times, May 15, 2007, at A1, available at <http://www.nytimes.com/2007/05/15/sports/othersports/15runner.html>.

167. Wolbring, *supra* note 165, at 141.

In 2007, shortly before Pistorius earned his position on the South African Olympic team, the IAAF amended Rule 144.2 of its competition rules.¹⁶⁸ It stated, “[T]he following shall be considered assistance, and . . . therefore not allowed: (e) use of any technical device that incorporates springs, wheels, or any other element that provides the user with an advantage over another athlete not using such a device.”¹⁶⁹ Since this amendment was new, the IAAF granted Pistorius temporary permission to compete as it investigated further as to whether his prosthetic legs would fall under the amendment’s definition of “technical device.”¹⁷⁰ The IAAF commissioned an independent scientific study to compare the biomechanical and physiological aspects of using the Cheetah “legs” to able-bodied runners of a similar level.¹⁷¹ Many allege the study was flawed because elite athletes competing at higher levels should have been used as a comparison to Pistorius.¹⁷² However, the study concluded that Pistorius received an advantage by using his prosthetics, and the IAAF ruled that he was ineligible to compete in competitions organized under IAAF Rules.¹⁷³

Pistorius commissioned another study that reached a different conclusion; he was not at an advantage using the prosthetic legs in comparison to able-bodied runners.¹⁷⁴ With this knowledge, Pistorius submitted an appeal to the CAS in 2008, and requested a stay on the ban and an annulment of IAAF’s decision.¹⁷⁵ The CAS arbitrates international sports disputes and is used by both the IOC and WADA.¹⁷⁶ Ultimately, the CAS determined that the IAAF had not satisfied its burden of proof that the prosthetic legs violated Rule 144.2(e) because there was no direct proof that Pistorius’ use of the Cheetah prosthetics gave him a metabolic or biomechanical advantage over athletes not using prosthetics.¹⁷⁷ Thus, the CAS reinstated Pistorius’ eligibil-

168. Peter Charlish & Stephen Riley, *Should Oscar Run?*, 18 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 929, 930 (2008).

169. INTERNATIONAL ASSOCIATION OF ATHLETICS FEDERATIONS (IAAF), COMPETITION RULES 2008 100 (2008), available at <http://www.iaaf.org/mm/Document/imported/42192.pdf>.

170. Charlish & Riley, *supra* note 168, at 930–31.

171. Charlish & Riley, *supra* note 168 at 936–37.

172. *Id.* at 936–37.

173. Press Release, Int’l Ass’n of Athletics Fed’n (IAAF), Oscar Pistorius—Indep. Scientific Study Concludes That Cheetah Prosthetics Offer Clear Mech. Advantages (Jan. 14, 2008), available at <http://www.iaaf.org/news/printer,news?id=42896.htm> [hereinafter IAAF Study].

174. Wolbring, *supra* note 165, at 151.

175. CAS Arbitral Award, *supra* note 10, at 3.

176. Wolbring, *supra* note 165, at 149.

177. CAS Arbitral Award, *supra* note 10, at 15.

ity and allowed him to compete against able-bodied athletes internationally.¹⁷⁸

Such a ruling is important to the debate between performance-enhancement and performance-recovery methods, such as gene therapy. This CAS ruling provides future courts direction on how to handle such methods or substances. The elements from this decision that are useful in analyzing future performance-enhancing methods include: (1) eligibility review should be on a case-by-case basis, with each case considered on its own merits; (2) both advantages and disadvantages of the method must be weighed to determine whether the athlete has an overall advantage over other athletes; (3) the difficulty in determining whether improved athletic ability is due to recovery (gene therapy) or enhancement (gene doping) must be considered; and (4) up-to-date scientific knowledge must be used for review.¹⁷⁹

Of these elements, the most determinative is the third element.¹⁸⁰ Due to the similar methods used for both gene therapy and gene doping, it may prove quite difficult to make an exact determination on whether a substance is solely for recovering or solely for enhancing athletic abilities. Furthermore, there are currently no tests to determine whether an athlete has used gene therapy or gene doping techniques. One solution may be to look to the purpose behind the gene manipulation. For instance, gene therapy seeks to bring an injured or diseased person back to normal functioning.¹⁸¹ If an athlete, who had been at a normal status prior to such manipulation, were to use gene manipulation, then the athlete would be seen as trying to enhance his athletic ability. This type of gene manipulation would render an athlete ineligible for competition. On the other hand, if the athlete were to use gene therapy and the specific area treated did not advance beyond its normal functioning condition, then the athlete would remain eligible.

However, there are those that believe an athlete using gene therapy, and who receives performance enhancement due to such therapy, should be viewed as an athlete "recovering" and thus the athlete would have no advantage over another.¹⁸² Suppose that gene therapy was the treatment prescribed to an athlete, but it was not the athlete's choice. In that instance, the athlete who received performance enhancement via the gene therapy recovery treatment would be eligible for competition. Nevertheless, it is concerning that if a regulatory body or court followed this reasoning, then gene therapy may never be viewed as an illegal method even if the athlete were to obtain a performance-enhancing advantage over other athletes. There is also the possibility that some athletes may ask their doctors to continue the gene therapy

178. *Id.* at 18.

179. *See* CAS Arbitral Award, *supra* note 10, at 15–16, 18.

180. *See id.*

181. Wolbring, *supra* note 165, at 155.

182. *Id.* at 154–55.

beyond what is deemed necessary for injury treatment. This, of course, could be seen as an abuse of gene therapy and may render the athlete ineligible.

The fourth element plays a secondary role to the third element, but it is no less significant because it allows for an in-depth look into scientific advancement when considering new substances or methods.¹⁸³ Without this element, the procedural analysis would create difficulties for future courts attempting to determine whether a new scientific advancement creates ineligibility for an athlete. Furthermore, it works in tandem with the third element in that it allows a court to make a true distinction between performance enhancement and performance recovery by looking at all available material on the substance or method.¹⁸⁴

Next, the second element could be considered a prong of the third and is only slightly less influential.¹⁸⁵ Essentially, the second element is a balancing test that asks the court to weigh the “advantages and disadvantages of the method” in order to determine if the athlete’s use of that method creates an advantage over other athletes.¹⁸⁶ The reason the second element could be a prong of the third element is that the two elements play off each other. To determine whether the athlete has achieved an advantage over another athlete through the use of a certain method, the court must decide whether that method has truly enhanced the athlete’s performance beyond that which was normal before use of the method. However, without the second element included in the court’s analysis, the third element would not have as much merit standing alone.¹⁸⁷

Lastly, the first element is a complementary addition to elements two, three and four.¹⁸⁸ The analysis would be incomplete and unfair to the athlete without “each case [being] considered on its own merits”¹⁸⁹ The more specific or detailed a certain scientific advancement is, then the more need there is to consider each athlete’s situation on its own. Furthermore, there may be circumstances surrounding the athlete’s use of a new substance or method that are only directly related to his or her personal situation. It would be unfair to compare an athlete’s use of one method to another athlete’s use of the same method, but in a different sporting contest, because that is similar to comparing apples to oranges. Moreover, this element helps create a broader analysis for future courts because no one set of circumstances or personal situations are equal.¹⁹⁰ Clearly, the court was looking to create an

183. See CAS Arbitral Award, *supra* note 10, at 16, 18.

184. See *id.* at 15–16, 18.

185. See *id.*

186. *Id.* at 14.

187. See *id.* at 15–16, 18.

188. See *id.*

189. CAS Arbitral Award, *supra* note 10, at 16.

190. See *id.*

element that would treat athletes fairly and uniquely, which is of utmost importance when court decisions could determine the future of an athlete's livelihood.

In conclusion, the case of Oscar Pistorius provides an important procedural map for determining whether a method or substance is truly enhancing an athlete's performance or simply assisting that athlete in recovery.¹⁹¹ Due to the similarity between Pistorius' prosthetic Cheetah legs enhancement and gene therapy patients receiving genetic enhancements, the CAS ruling provides a procedural map for regulating bodies such as the IOC, WADA, and IAAF to follow.¹⁹² Even though the CAS ruling does not directly deal with gene therapy, it does offer four elements for regulatory agencies worldwide to use in fairly assessing whether a technological or biological advancement used by athletes is truly assisting them in recovery or enhancing athletic performance.¹⁹³ It may not be much guidance, but at this point there is at least some guidance to future courts on the issue. As more scientific and biological advances are made, the Pistorius analysis should provide the base from which other courts can expand.¹⁹⁴ Under the CAS Panel's analysis, the future of performance-enhancement may change drastically from what we recognize today.

V. CONCLUSION

If regulatory agencies and Congress are to truly make a stand and establish bright-line rules regarding performance-enhancing and performance-recovery methods and substances, then changes such as those exhibited by the CAS ruling need to be followed consistently.¹⁹⁵ However, unlike past legislation that bans specific methods or substances, future decisions regarding performance enhancement should allow for the consideration that the substance or method may be used for recovery or even medical purposes only.¹⁹⁶ The CAS Panel's decision indicates that consideration will need to be on a case-by-case basis, as evidenced by the first element in the CAS decision.¹⁹⁷ However, that element alone will not suffice for handling future performance enhancement and eligibility disputes in international sports.

In a pattern we see in nearly every sport, athletes are going to find the most innovative ways to recover from grueling competition, even if that recovery method crosses the line into possible athletic enhancement.¹⁹⁸ Cur-

191. *See id.* at 16, 18.

192. *See id.*

193. *See id.* at 15–16, 18.

194. *See id.* at 15–16, 18.

195. *See* CAS Arbitral Award, *supra* note 10, at 15–16, 18.

196. *See* Drug Control Act, *supra* note 2.

197. CAS Arbitral Award, *supra* note 10, at 16.

198. *See Bonds*, WL 618911, at *1; *see also* NPR Armstrong Article, *supra* note 91.

rent legislation attempts to ban all types of methods and substances, even though some of these may, in fact, benefit athletes in the form of performance recovery.¹⁹⁹ Several new substances and methods are already being used by doctors and physicians to treat specific diseases and illnesses. This practice of experimenting in the medical field directly affects performance recovery and, inevitably, enhancement in athletics. Thus, one important step in distinguishing between performance enhancement and performance recovery is to strictly adhere to the procedural requirements outlined in the CAS Panel's ruling for Pistorius until further analysis is created by future court decisions.²⁰⁰ At the very least, some consistency will be established within the realm of international sports despite the rapid advancements that occur with performance-enhancement or performance-recovery use by athletes.

Although using the CAS decision's procedural requirements is important to future decisions regarding performance enhancement, it is also vital that athletes be aware of what is motivating them to try such substances or methods.²⁰¹ Early athletes, as far back as the first Olympians, were already testing substances that could possibly enhance their performance in competition.²⁰² Such use was not necessarily frowned upon centuries ago, but it has recently become the center of heated debate and litigation.²⁰³ The present-day athlete must be aware of every possible repercussion from choosing to try new methods of recovery because it is not yet completely clear how that method will be treated by regulatory bodies. At this point, the only clarity is that any substance already known to either damage the health of an athlete when used in excess or greatly enhance the athlete's abilities beyond that of a normal level will be considered banned. Consequently, the athlete will be deemed ineligible for competition. Due to the lack of clarity and the few decisions rendered on cutting-edge performance-enhancing substances and drugs, it is difficult for an athlete, coach, trainer, parent, or agent to predict whether new developments or methods will preclude the athlete from participating in competition. Therefore, athletes should take the time to educate themselves and their team and consider whether they want to risk jeopardizing their careers or futures when attempting to use new methods or substances to aid in recovery.

Technological and scientific advancement is moving forward at an exponential rate while regulations governing these new advancements are attempting to keep pace. In other words, new methods and substances are advancing, just as they have been for centuries. These facts, and the changes that will come about in the coming decades, may make the current procedure for dealing with performance-enhancing substances and methods unrealistic

199. See Drug Control Act, *supra* note 2.

200. See CAS Arbitral Award, *supra* note 10, at 18.

201. See *id.* at 15–16, 18.

202. *History of PE Drugs*, *supra* note 3.

203. See *Bonds*, WL 618911, at *1; see also NPR Armstrong Article, *supra* note 91.

and perhaps irrelevant.²⁰⁴ Furthermore, the current all-encompassing banning of nearly every substance that could possibly enhance athletic performance, even if it also helps with sports injury, is without deep thought. Considering their reasonableness, it is necessary and justifiable to follow procedures like those given in the CAS ruling for Pistorius.²⁰⁵

Looking forward into the future of sports performance, it is inevitable that scientific progress will be made and that athletes will attempt to use the advancements to assist in them. Thus, it is vital that we consistently apply reasonable procedural requirements in order to do justice to the athletes, their competitors, and the scientific advancements in both performance enhancement and recovery methods.²⁰⁶ In the future, we may even discover that there really is no difference between a method or substance that assists in recovery and enhances athletic abilities, rendering the legal and scientific paradox altogether moot.

204. See CAS Arbitral Award, *supra* note 10, at 15–16, 18.

205. See *id.* at 18.

206. See *id.* at 15–16, 18.