

AHA/ACC SCIENTIFIC STATEMENT

# Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 11: Drugs and Performance-Enhancing Substances



A Scientific Statement From the American Heart Association and American College of Cardiology

N.A. Mark Estes III, MD, FACC, *Chair\**

Richard J. Kovacs, MD, FAHA, FACC\*  
Aaron L. Baggish, MD, FACC\*  
Robert J. Myerburg, MD, FACC\*

The use of performance-enhancing drugs and substances, or doping, is one of the most important and difficult challenges in contemporary sports. Doping occurs when a prohibited substance or its metabolite is documented in a bodily specimen or when a prohibited method is used to increase athletic performance (1). Most commonly, the substances or methods used for doping have not been evaluated for therapeutic use. The abuse of counterfeit or designer drugs that are not regulated is a particular threat to the athlete's health. Doping also threatens the

integrity of sport. The use of artificial enhancements to gain an advantage over others in competition is fundamentally unfair to athletes who train and compete by the rules.

Athletic governing organizations maintain updated lists of prohibited substances (2). The prohibition of these agents is based on preventing an unfair athletic advantage and eliminating the health risks of doping. Generally, these drugs fall into categories that include anabolic agents, hormones and related substances,  $\beta_2$ -adrenergic agonists, stimulants, and

\*On behalf of the American Heart Association Electrocardiography and Arrhythmias Committee of the Council on Clinical Cardiology, Council on Cardiovascular Disease in the Young, Council on Cardiovascular and Stroke Nursing, Council on Functional Genomics and Translational Biology, and the American College of Cardiology.

The American Heart Association and the American College of Cardiology make every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest. The Preamble and other Task Force reports for these proceedings are available online at [www.onlinejacc.org](http://www.onlinejacc.org) (J Am Coll Cardiol 2015;66:2343-9; 2350-5; 2356-61; 2362-71; 2372-84; 2385-92; 2393-7; 2398-405; 2406-11; 2412-23; 2424-8; 2434-8; 2439-43; 2444-6; and 2447-50).

This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on June 24, 2015, and the American Heart Association Executive Committee on July 22, 2015, and by the American College of Cardiology Board of Trustees and Executive Committee on June 3, 2015.

The American College of Cardiology requests that this document be cited as follows: Estes NAM 3rd, Kovacs RJ, Baggish AL, Myerburg RJ; on behalf of the American Heart Association Electrocardiography and Arrhythmias Committee of the Council on Clinical Cardiology, Council on Cardiovascular Disease in the Young, Council on Cardiovascular and Stroke Nursing, Council on Functional Genomics and Translational Biology, and the American College of Cardiology. Eligibility and disqualification recommendations for competitive athletes with cardiovascular abnormalities: Task Force 11: drugs and performance-enhancing substances: a scientific statement from the American Heart Association and American College of Cardiology. J Am Coll Cardiol 2015;66:2429-33.

This article has been copublished in *Circulation*.

Copies: This document is available on the World Wide Web sites of the American Heart Association (<http://my.americanheart.org>) and the American College of Cardiology ([www.acc.org](http://www.acc.org)). For copies of this document, please contact Elsevier Inc. Reprint Department via fax (212-633-3820) or e-mail ([reprints@elsevier.com](mailto:reprints@elsevier.com)).

Permissions: Multiple copies, modification, alteration, enhancement, and/or distribution of this document are not permitted without the express permission of the American College of Cardiology. Requests may be completed online via the Elsevier site (<http://www.elsevier.com/about/policies/author-agreement/obtaining-permission>).

diuretic agents (1,2). Multiple masking agents are also prohibited because they are used to hide or prevent detection of a banned substance (1,2). Drugs used for enhancement of oxygen transfer, such as erythropoietin, or techniques of autotransfusion are also prohibited (1,2). Many drugs and substances considered “recreational” rather than performance enhancing, including narcotics, cannabinoids, and alcohol, are also prohibited (1,2).

Of the many adverse effects of performance-enhancing substances, those that affect the cardiovascular system are among the most serious and will be the focus of this document (3). This section also summarizes the best available, albeit limited, data on the adverse cardiovascular effects of prohibited substances in athletes. In addition, strategies for effective implementation of anti-doping programs will be discussed, and specific recommendations for healthcare professionals will be made. To ensure harmonized, coordinated, and effective antidoping programs at the international and national level with regard to detection, deterrence, and prevention of doping, a World Anti-Doping Code has been accepted by almost all international athletic organizations (4). Ultimately, all stakeholders, including athletic governing organizations, athletes, trainers, and physicians, have a shared responsibility to discourage the use of doping in sports.

The evidence base for performance-enhancing drugs and substances is subject to limitations not usually encountered in the assessment of risk and benefit for cardiovascular drugs approved by the U.S. Food and Drug Administration (FDA). Scientifically designed studies of efficacy are lacking, and many reports or opinions are subjective and often specific to an individual sport. The application of randomized clinical trials has not been feasible and in many cases may be considered unethical because of the listing of the drug or substance on lists of banned substances (5). Searches of the medical literature for randomized trials demonstrate very few clinical trials that evaluated the efficacy and safety of performance-enhancing drugs or substances. One prospective randomized trial of supraphysiological doses of testosterone combined with strength training demonstrated an increased fat-free mass and muscle size and strength in normal men with this steroid (6). The [ClinicalTrials.gov](http://ClinicalTrials.gov) Web site does not list any currently enrolling trials when searched under the terms of *sports* or *performance* (7). Because many of the substances in question are regulated by the FDA as food supplements, claims of efficacy are not substantiated by randomized clinical trials.

The evidence base for safety is somewhat more extensive but is also limited by its observational nature and the absence of randomized trials with placebo controls in most cases. Excellent summaries of the

detrimental cardiovascular effects of performance-enhancing substances have been published (5,8). FDA efforts are largely directed at individual product recalls and warning letters for unwarranted claims rather than published trial data. However, in its ban of ephedra-containing dietary supplements in the United States in 2004, the FDA based its decision on the principle of “unreasonable risk,” a risk-benefit analytical method based on even a small potential for harm in the absence of any scientifically reliable support for benefit (9). The FDA avoided the principle of “significant risk,” which would have required a higher level of scientific reliability of specific risk than was available (9). Gaps in the evidence base may continue to expand. The number of performance-enhancing substances available to athletes continues to increase, and the substances are readily available via the Internet. Large numbers of youth are being prescribed stimulant drugs to treat attention-deficit hyperactivity disorder, with a prevalence estimated to be as high as 10% of the relevant age group (10). Participation of these patients in competitive sports will require assessment of the risk and benefit. Finally, athletes will continue to explore new substances to enhance performance, without the benefit of adequate trials of efficacy or measures of safety published in the medical literature.

The term *antidoping program* refers to any organized system designed to prevent the use of banned substances in sport. Such programs have been designed and implemented with the dual objectives of ensuring fair sport competition and protecting the health of athletes. There are numerous key stakeholders in an effective antidoping program, including athletic governing bodies, athletic league directors and administrators, healthcare professionals, athletic trainers, coaches, and athletes themselves. Collectively, this group should work to promote awareness about the consequences of the use of performance-enhancing drugs and substances (education), design and implement transparent and evidence-based drug testing protocols (detection), impart and uphold fair sanctions for athletes who abuse performance-enhancing drugs and substances (enforcement), and provide resources for athletes who develop medical or psychiatric complications (treatment).

Athletic governing organizations play a crucial role in the effort to curb abuse of performance-enhancing drugs and substances among athletes. Historically, these organizations were created to generate and maintain lists of prohibited substances and to develop policies for the detection and punishment of users (1,2). These fundamental objectives remain their primary focus. The antidoping organization community now includes members at the international, regional, national, and local levels. Over the past decade, their role has expanded to include development of widespread

educational campaigns, support of scientific research focused on abuse, certification of clinical laboratories for testing, arbitration of complex cases with disputed athlete culpability, oversight of therapeutic use exemptions, and the creation of novel abuse detection strategies, including biological passports. Athletic governing bodies should continue to revise and update lists of banned substances as new agents become available. These lists should be published in easily accessible places, should be constructed in language that can be interpreted by stakeholders from all backgrounds, and should include known medical and psychological complications of use.

Athletes of all ages and across all competition levels should be educated with guidance from physicians and relevant athletic organizations regarding the risks of illicit drugs. This includes life-threatening consequences such as sudden death with cocaine use (11). The use of performance-enhancing drugs and substances such as anabolic-androgenic steroids, growth hormone, and red cell boosting agents, as well as medications such as diuretic agents,  $\beta_2$ -adrenergic agonists, and glucocorticoids, may jeopardize athletic eligibility. Use of these drugs and substances, including many commercially available nutritional supplements, can be harmful and result in athletic disqualification. Athletes should disclose all prescription medication and supplement use to healthcare providers and governing organizations such that therapeutic use exemptions can be arranged when and if necessary.

A therapeutic use exemption is an official authorization from a governing agency that indicates that an athlete may take a prescription medication that is otherwise considered a banned substance without jeopardizing athletic eligibility. The international standard for the therapeutic exemption process was created in 2004 by the World Anti-Doping Agency and is updated on a regular basis (12). At the present time, national governing agencies are responsible for all aspects of the therapeutic drug exemption application and granting process. This is contingent on 3 key criteria: 1) The athlete would experience significant health problems without taking the prohibited substance or method; 2) the therapeutic use of the substance would not produce significant enhancement of performance; and 3) there is no reasonable therapeutic alternative to the use of the otherwise prohibited substance or method. The US Anti-Doping Agency provides an algorithm for determining an individual athlete's need for a therapeutic drug exemption based on the competition level and the medication in question (12). All U.S. athletes are required to submit applications through the U.S. Anti-Doping Agency. Medications in routine clinical practice that most frequently prompt the need for therapeutic drug exemption include

$\beta_2$ -adrenergic agonists, glucocorticoids, stimulants (including methylphenidate), and  $\beta_2$ -adrenergic blockers. Appropriate therapeutic drug exemption use requires a collaborative approach between the athlete, clinician, and appropriate governing body. It is the athlete's responsibility to file an application for a therapeutic drug exemption if he or she is taking a banned medication. Clinicians play a crucial role in this process, because they must justify the necessity of the medication in question and the absence of comparable alternatives.

Athletes considering the use of banned or unregulated substances should be aware that the efficacy and safety of most agents have not been assessed in rigorous scientific fashion. Athletes should not ingest any substances in an attempt to improve performance or expedite recovery from injury or training unless prescribed by a healthcare professional who abides by governing organization recommendations.

Healthcare providers should recognize that performance-enhancing drug and substance abuse is a potential issue with each athlete encountered. This applies to asymptomatic athletes evaluated during health screening visits and those presenting with symptoms that suggest occult performance-enhancing drug and substance use. An essential element of the comprehensive clinical encounter with an athlete includes careful and direct questioning about performance-enhancing drug and substance use. Providers are encouraged to ask about access to and use of common agents by name and to counsel patients about the known and uncertain medical consequences of abuse. It is the responsibility of all clinicians who care for athletes to know which prescribed medications have been included on banned substance lists and to support an athlete's therapeutic exemption application when appropriate. Clinicians who discover performance-enhancing drug and substance abuse should counsel patients about the necessity of abstinence, treat all attendant medical complications, and refer the patient to specialists, including addiction counselors, sport psychologists, and medical subspecialists as deemed appropriate on a case-by-case basis.

### Recommendations

- 1. Athletes should have their nutritional needs met through a healthy, balanced diet without dietary supplements (Class I; Level of Evidence C).**
- 2. As a matter of general policy, the use of performance-enhancing drugs and supplements should be prohibited by schools, universities, and other sponsoring/participating organizations as a condition for continued participation in athletic activities (Class I; Level of Evidence C).**
- 3. The principle of "unreasonable risk" (the potential for risk in the absence of defined benefit) should be the**

standard for banning or recommending avoidance of substances being evaluated for use by athletes (*Class I; Level of Evidence C*).

4. Prohibited stimulants and other medications should be subject to exceptions based on a specific medical benefit, such as a  $\beta_2$ -adrenergic blocker or a bronchodilator. Medical need should be determined by a treating physician on a case-by-case basis and

authorized by the procedures defined by the US Anti-Doping Agency (*Class I; Level of Evidence B*).

5. Athletes should receive formal education and counseling by physicians and athletic department staff on the potential dangers of recreational drugs and performance-enhancing substances, including the risk of sudden death and myocardial infarction (*Class I; Level of Evidence C*).

## DISCLOSURES

### Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
N.A. Mark Estes III	Tufts University	None	None	None	None	None	Medtronic*; St. Jude Medical†; Boston Scientific†	None
Aaron Baggish	Massachusetts General Hospital, Harvard Medical School	None	None	None	None	None	None	None
Richard J. Kovacs	Indiana University	None	None	None	None	None	None	None
Robert J. Myerburg	University of Miami	None	None	None	None	None	None	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives \$10,000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns \$10,000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

\*Modest.

†Significant.

### Reviewer Disclosures

Reviewer	Employment	Research Grant	Other Research Support	Speakers Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
Michael S. Emery	Greenville Health System	None	None	None	None	None	None	None
Michelle E. Grenier	University of Mississippi	None	None	None	None	None	None	None
Carolyn A. Hempel	University at Buffalo School of Pharmacy & Pharmaceutical Sciences	None	None	None	None	None	None	None
James E. Tisdale	Purdue University	American Heart Association Grant in Aid†; Indiana Clinical Translational Sciences Institute†	None	None	None	None	None	None

This table represents the relationships of reviewers that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all reviewers are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives \$10,000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns \$10,000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

†Significant.

## REFERENCES

1. World Anti-Doping Agency (WADA) Code Web site. <https://www.wada-ama.org/en/>. Accessed August 24, 2015.
2. List of prohibited substances and methods. World Anti-Doping Agency (WADA) Web site. Available at: <https://www.wada-ama.org/en/what-we-do/prohibited-list>. Accessed December 24, 2014.
3. Estes NAM 3rd, Kloner R, Olshansky B, Virmani R. Task Force 9: drugs and performance-enhancing substances. *J Am Coll Cardiol*. 2005;45:1368-9.
4. World Anti-Doping Code. World Anti-Doping Agency (WADA) Web site. <https://www.wada-ama.org/en/what-we-do/the-code>. Accessed March 3, 2013.
5. Deligiannis A, Björnstad H, Carre F, Heidbüchel H, Kouidi E, Panhuyzen-Goedkoop NM, Pigozzi F, Schänzer W, Vanhees L, ESC Study Group of Sports Cardiology. ESC Study Group of Sports Cardiology position paper on adverse cardiovascular effects of doping in athletes. *Eur J Cardiovasc Prev Rehabil*. 2006;13:687-94. <http://dx.doi.org/10.1097/01.hjr.0000224482.95597.7a>.
6. Bhasin S, Storer TW, Berman N, Callegari C, Clevenger B, Phillips J, Bunnell TJ, Tricker R, Shirazi A, Casaburi R. The effects of supraphysiologic doses of testosterone on muscle size and strength in normal men. *N Engl J Med*. 1996;335:1-7. <http://dx.doi.org/10.1056/NEJM199607043350101>.
7. *ClinicalTrials.gov* registry and results database. <http://clinicaltrials.gov/>. Accessed March 3, 2013.
8. Dhar R, Stout CW, Link MS, Homoud MK, Weinstock J, Estes NA 3rd. Cardiovascular toxicities of performance-enhancing substances in sports [published correction appears in *Mayo Clin Proc*. 2006;81:133]. *Mayo Clin Proc*. 2005;80:1307-15. <http://dx.doi.org/10.4065/80.10.1307>.
9. FDA acts to remove ephedra-containing dietary supplements from market [news release]. Silver Spring, MD: US Food and Drug Administration, November 23, 2004. <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/2004/ucm108379.htm>. Accessed August 26, 2014.
10. Kratochvil CJ, Vaughan BS, Barker A, Corr L, Wheeler A, Madaan V. Review of pediatric attention deficit/hyperactivity disorder for the general psychiatrist. *Psychiatr Clin North Am*. 2009;32:39-56. <http://dx.doi.org/10.1016/j.psc.2008.10.001>.
11. Isner JM, Estes NA 3rd, Thompson PD, Costanzo-Nordin MR, Subramanian R, Miller G, Katsas G, Sweeney K, Stumer WQ. Acute cardiac events temporally related to cocaine abuse. *N Engl J Med*. 1986;315:1438-43. <http://dx.doi.org/10.1056/NEJM198612043152302>.
12. International Standard for Therapeutic Use Exemptions (ISTUE). World Anti-Doping Agency (WADA) Web site. <https://www.wada-ama.org/en/resources/therapeutic-use-exemption-tue/international-standard-for-therapeutic-use-exemptions-istue>. Accessed August 24, 2015.

---

**KEY WORDS** ACC/AHA Scientific Statements, athletes, cardiovascular abnormalities, drugs, performance-enhancing substances