

Drugs and Sports

Objectives:

1. Coaches will understand the concept of performance enhancement drug.
2. Coaches will have access to a list of performance enhancement drugs, and the effects they have on health.
3. Coaches will understand the ethical issues of using illegal performance enhancing drugs.
4. Coaches will be given prompts to use when discussing drugs with their players.

Coaches watch Video on Two Olympic Athletes who used Performance Enhancing Drugs:

1. Marion Jones Videos:
 - a. <http://www.youtube.com/watch?v=lldGbP1ujgo>
 - b. <http://www.youtube.com/watch?v=97vdguGp7qg>
2. Ben Johnson:
 - a. <http://www.youtube.com/watch?v=cCh5QswxQ6k>
 - b. <http://www.youtube.com/watch?v=Kq4KrymPtXY>

Discussion Questions:

1. Why do you think that Marion Jones and Ben Johnson used performance enhancement drugs? (pressure that everyone is doing it; financial rewards associated with winning; rigorous training and need for their bodies to rebuild)
2. Do you think that the small edge it may have given them was worth the consequences of being stripped of their medals and being publicly disgraced?
3. In what ways may their lives be different today if they had not used illegal performance enhancing drugs?
4. What other prominent athletes have been disgraced for using performance enhancing drugs? (Mark McGuire; Barry Bonds, etc.).
5. Do you know any athletes who take performance enhancing drugs? If so, what do they take? How do you think it helps their performance? Do you think that it may affect their personalities (e.g., are they less patient, more aggressive, doing poorly in school)?
6. As coaches of young children, what do you think they should know about using drugs to enhance their sport's performance?

What do Performance Enhancing Drugs Actually Do?

1. Break-up into 3 Groups and be ready to report back to the larger groups.
 - a. Group 1: Look at the list of steroids and be prepared to explain how they may help an athlete such as Marion Jones? Also explain the negative side-effects of taking steroids.
 - b. Group 2: Look at an hormone like EPO and be prepared to explain how it may help an athlete such as Ben Johnson? Also explain the negative side-effects of taking EPO.
 - c. Group 3: Look at Human Growth Hormone and be prepared to explain how it may help an athlete such as Mark McGuire? Also explain the negative side-effects of taking Human Growth Hormone.
2. Come back together and discuss the pros and cons of using these substances. Given all the cons, why do athletes risk even death, to enhance their performance?

Beyond the Biological Aspects of Using Performance Enhancing Drugs, do you think it is fair to use them?


1. Break-up into groups again and discuss the following:
 - a. Do you think that Ben Johnson's observation that because everyone is using performance enhancing drugs that justifies their use by all athletes (i.e., if you do not do it, you can not be competitive).
 - b. Do you think that performance enhancing drugs should be legalized?
 - c. How does the process of training relate to winning and losing? (i.e., what meaning/benefits does w/l have when one trains with or without drugs?)
2. Come back together and discuss how coaches can teach sportsmanship and fairness to their athletes (i.e., what should sports be about – process is critical; outcome means little when achieved through unfair means – like running 100m starting at 90m).

What might be some ways to talk to your athletes about using performance enhancing drugs?

1. Brainstorm as a group on ways to talk about performance enhancing drugs with athletes.
 - a. Pressures from friends: What might they tell you, and how might you respond (“If you use steroids you will become bigger, stronger, faster and more successful.” How could you counter this? Illegal, health (acne, hair growth on face for females, depression, tumors)
 - b. Sportsmanship issues: How would you counter: Everyone is doing it, and if you do not, you are stupid? Rules are what make games interesting. Using a ladder to put the ball in the basket is not fun; learning how to dribble, pass, and shoot from the outside is what makes basketball fun. Also, how people achieve goals is as important as whether or not they do so (explain).
2. Brainstorm as a group on other drug issues that youth may see in their neighborhood.

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192 Banned Performance Enhancing Substances and Methods with Pros & Cons of Their Health Effects

The International Olympic Committee and the US Olympic Committee are among [625 sports organizations worldwide](#) (106 KB)  (as of Dec. 19, 2008) that have adopted the World Anti-Doping Agency's (WADA) "Code" banning 192 performance enhancing substances and methods. Drugs are added and removed from this list by WADA annually.

Each sports organization that adopts the "Code" is also responsible for enforcing it through drug testing and non-compliance penalties. Several sports leagues, including the National Football League (NFL), Major League Baseball (MLB), and the National Basketball Association (NBA), have **not** adopted WADA's "Code."

The chart below lists all 192 banned substances and methods along with their pro and con health effects. **[Note: Do not rely on this chart for legal or medical advice.]**

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|---------------------------------------------------------------|----------------------------------------------|
| I. Anabolic Agents (56) | VIII. Cannabinoids (1) |
| II. Hormones & Related Substances (7) | IX. Glucocorticosteroids (1) |
| III. Beta-2 Agonists (1) | X. Alcohol (1) |
| IV. Hormone Antagonists & Modulators (13) | XI. Beta-Blockers (20) |
| V. Diuretics & Other Masking Agents (16) | XII. Banned Methods (3) |
| VI. Stimulants (62) | XIII. Notes & Sources |
| VII. Narcotics (11) | |

Substance <small>* method(s) of consumption *</small>	Health Effects	
I. ANABOLIC AGENTS (56) <small>* oral or intramuscular injection *</small>	Pro	Con
A. Exogenous Anabolic Androgenic Steroids (AAS): 1. 1-androstendiol 2. 1-androstendione 3. bolandiol 4. bolasterone 5. boldenone 6. boldione 7. calusterone 8. clostebol 9. danazol 10. dehydrochloromethyltestosterone 11. desoxymethyltestosterone 12. drostanolone 13. ethylestrenol 14. fluoxymesterone 15. formebolone 16. furazabol 17. gestrinone 18. 4-hydroxytestosterone 19. mestanolone 20. mesterolone 21. metenolone 22. methandienone 23. methandriol 24. methasterone 25. methyldienolone 26. methyl-1-testosterone 27. methylnor-testosterone 28. methyltrienolone 29. methyltestosterone	Enhances athletic performance in the following ways: 1. endurance increase 2. fat loss 3. muscle recovery increase 4. muscular size and strength increase in combination with exercise Used medically to treat the following symptoms and diseases: 1. anemia 2. asthma 3. bone pain from osteoporosis 4. gonadal function decrease or absence (males) 5. hereditary angiodema metastatic breast cancer (females) 6. muscle loss (i.e. burn injury, HIV-infection, muscular dystrophy) 7. postmenopausal symptoms such as hot flashes and sweating (postmenopausal females) 8. puberty delay (males)	1. abnormal menstrual cycles (females) 2. acne 3. aggressiveness 4. asthenia 5. baldness 6. brain tissue damage 7. breast enlargement (males) 8. clitoris enlargement (females) 9. depression 10. dizzy spells 11. fever 12. hair growth on the face and body (females) 13. HIV and other disease contraction due to contaminated needles used for injection of steroid 14. hypertension 15. impotence (males) 16. kidney tumours 17. liver dysfunction 18. mania 19. masculinization (females) 20. muscle strains or ruptures 21. myalgia 22. nausea 23. periorbital pain 24. prostate gland enlargement (males)

30. mibolerone
31. nandrolone
32. 19-norandrostedione
33. norboletone
34. norclostebol
35. norethandrolone
36. oxabolone
37. oxandrolone
38. oxymesterone
39. oxymetholone
40. prostanazol
41. quinbolone
42. stanozolol
43. stenbolone
44. 1-testosterone
45. tetrahydrogestrinone
46. trenbolone

B. Endogenous Anabolic Androgenic Steroids (AAS):

47. androstenediol
48. androstenedione
49. dihydrotestosterone
50. prasterone
51. testosterone

C. Other Anabolic Agents:

52. clenbuterol
53. selective androgen receptor modulators (SARMs)
54. tibolone
55. zeranol
56. zilpaterol

25. psychiatric dysfunction
26. sexual appetite increase
27. sperm production reduction (males)
28. stunted growth (in adolescents)
29. tearing of tendons
30. testicular shrinkage or atrophy (males)
31. voice deepening (females)
32. vomiting

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II. HORMONES & RELATED SUBSTANCES (7)		Health Effects	
		Pro	Con
<p>57. Erythropoietin (EPO) • <i>oral</i> •</p>	<p>Enhances athletic performance in the following ways:</p> <ol style="list-style-type: none"> 1. endurance capabilities enhancement during exercise 2. muscle recovery increase <p>Used medically to treat the following symptoms and diseases:</p> <ol style="list-style-type: none"> 1. anemia due to kidney failure, HIV, and some cancers 	<ol style="list-style-type: none"> 1. death 2. deep vein thrombosis 3. heart attack 4. hyperviscosity of the blood 5. myocardial infarction 6. pulmonary embolism 7. stroke 8. thrombosis 	
<p>58. Growth Hormone (hGH), • <i>oral or intramuscular injection</i> •</p> <p>59. Insulin-like Growth Factors (e.g. IGF-1), • <i>intramuscular injection</i> •</p> <p>60. Mechano Growth Factors (MGFs) • <i>intramuscular injection</i> •</p>	<p>Enhances athletic performance in the following ways:</p> <ol style="list-style-type: none"> 1. body fat percentage decrease 2. growth stimulation 3. muscle definition enhancement 4. muscle size and strength increase 5. muscle tissue repair 6. protein synthesis increase <p>Used medically to treat the following symptom and diseases:</p> <ol style="list-style-type: none"> 1. cosmetic symptoms of 	<ol style="list-style-type: none"> 1. abnormal body changes 2. acromegaly 3. antibody formation 4. arthritis 5. brain swelling 6. cardiomyopathy 7. congestive heart failure 8. coronary artery disease 9. Cruetefeldt-Jakob disease development when drug is produced from cadaveric specimens 10. diabetes mellitus 11. diabetic (hypoglycemic) coma 12. facial nerve paralysis 13. forehead and jaw shape 	

	<ul style="list-style-type: none"> aging 2. growth hormone deficiency in children 3. growth retardation in children 4. Turner's syndrome 	<ul style="list-style-type: none"> change 14. hand enlargement 15. heart enlargement 16. hypercholesterolemia 17. hypoglycemia 18. hypothyroidism 19. impotence 20. menstrual irregularities 21. metabolic dysfunction 22. myopathies 23. osteoporosis
<p>61. Gonadotrophins (e.g. LH, hCG) - prohibited in males</p> <ul style="list-style-type: none"> • intramuscular injection • 	<p>Enhances athletic performance in the following ways:</p> <ul style="list-style-type: none"> 1. masking agent (for anabolic steroids) 2. testicular damage (due to anabolic steroid use) counteraction 3. testosterone and epistestosterone production stimulation <p>Used medically to treat the following symptom:</p> <ul style="list-style-type: none"> 1. infertility (females) 	<ul style="list-style-type: none"> 1. increased risk of gynaecomastia 2. similar effects as <u>anabolic steroids</u>
<p>62. Insulins</p> <ul style="list-style-type: none"> • intramuscular injection • 	<p>Enhances athletic performance in the following ways:</p> <ul style="list-style-type: none"> 1. muscle definition when used in conjunction with other substances 2. muscle growth when used in conjunction with other substances 3. protein breakdown reduction <p>Used medically to treat the following disease:</p> <ul style="list-style-type: none"> 1. diabetes 	<ul style="list-style-type: none"> 1. brain damage 2. breath shortness 3. coma 4. death 5. drowsiness 6. hypoglycaemia 7. nausea 8. shaking 9. weakness
<p>63. Corticotrophins (ACTH)</p> <ul style="list-style-type: none"> • intramuscular injection • 	<p>Enhances athletic performance in the following ways:</p> <ul style="list-style-type: none"> 1. increases adrenal corticosteroid levels 2. antiinflammatory action aids recovery from injury <p>Used medically to treat the following symptom:</p> <ul style="list-style-type: none"> 1. spasms (infants) 	<ul style="list-style-type: none"> 1. psychological effects such as irritability 2. softening of connective tissue 3. stomach irritation and ulcers 4. weakening of an injured area in muscles, bones, tendons or ligaments, osteoporosis and cataracts
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III. BETA-2 AGONISTS (1)		
<ul style="list-style-type: none">• intravenous injection •		
Health Effects		
	Pro	Con
<p>64. All beta-2 agonists including their D- and L- isomers (except formoterol, salbutamol, salmeterol and terbutaline when administered by inhalation and Therapeutic Use Exemption is obtained)</p>	<p>Enhances athletic performance in the following ways:</p> <ul style="list-style-type: none"> 1. aerobic exercise improvement 2. fat reduction 3. muscle growth 	<ul style="list-style-type: none"> 1. anxiety 2. arrhythmias 3. dizziness 4. headache 5. insomnia 6. mood disorders 7. muscle cramps

	Used medically to treat the following symptom and disease: <ol style="list-style-type: none"> 1. asthma 2. chronic obstructive pulmonary disease 	<ol style="list-style-type: none"> 8. nausea 9. palpitations 10. sweating 11. tachycardia 12. tremor (usually of the hands)
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IV. HORMONE ANTAGONISTS & MODULATORS (13) <i>* intramuscular injection *</i>	Health Effects	
	Pro	Con
<p>A. Aromatase inhibitors including, but not limited to:</p> <ol style="list-style-type: none"> 65. aminoglutethimide 66. anastrozole 67. exemestane 68. formestane 69. letrozole 70. testolactone <p>B. Selective estrogen receptor modulators (SERMs) including, but not limited to:</p> <ol style="list-style-type: none"> 71. raloxifene 72. tamoxifen 73. toremifene <p>C. Other anti-estrogenic substances, including but not limited to:</p> <ol style="list-style-type: none"> 74. clomiphene 75. cyclofenil 76. fulvestrant <p>D. Agents modifying myostatin function(s) including but not limited to:</p> <ol style="list-style-type: none"> 77. myostatin inhibitors 	<p>Enhances athletic performance in the following ways:</p> <ol style="list-style-type: none"> 1. <u>anabolic effects</u> 2. strength increase 3. reduction of anabolic steroid use side effects (i.e. breast tissue growth) <p>Used medically to treat the following symptom and disease:</p> <ol style="list-style-type: none"> 1. breast cancer 2. infertility (females) 	<ol style="list-style-type: none"> 1. abdominal discomfort 2. cancer 3. hot flushes 4. libido reduction 5. verbal slurring

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V. DIURETICS & OTHER MASKING AGENTS (16) <i>* intramuscular injection *</i>	Health Effects	
	Pro	Con
<p>A. Diuretics:</p> <ol style="list-style-type: none"> 78. acetazolamide 79. amiloride 80. bumetanide 81. canrenone 82. chlorthalidone 83. etacrynic acid 84. furosemide 85. indapamide 86. metolazone 87. spironolactone 88. thiazides 89. triamterene <p>B. Other masking agents:</p> <ol style="list-style-type: none"> 90. epitestosterone 91. probenecid 92. alpha-reductase inhibitors 93. plasma expanders 	<p>Enhances athletic performance in the following ways:</p> <ol style="list-style-type: none"> 1. prevent detection of banned substances 2. produce urine excretion to reduce concentration of banned substances 3. weight loss <p>Used medically to treat the following symptoms:</p> <ol style="list-style-type: none"> 1. heart failure from the kidneys 2. high blood pressure 	<ol style="list-style-type: none"> 1. blood pressure drop 2. cramps 3. death 4. dehydration 5. dizziness 6. electrolyte imbalance 7. headaches 8. heart failure 9. kidney failure 10. muscle cramps 11. nausea 12. potassium depletion 13. volume depletion

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VI. STIMULANTS (62) <i>* oral, inhalation, intranasal, or intramuscular injection *</i>	Health Effects	
	Pro	Con

94. adrafinil
95. adrenaline
96. amfepramone
97. amiphenazole
98. amphetamine
99. amphetaminil
100. benzphetamine
101. benzylpiperazine
102. bromantan
103. cathine
104. clobenzorex
105. cocaine
106. cropropamide
107. crotetamide
108. cyclazodone
109. dimethylamphetamine
110. ephedrine
111. etamivan
112. etilamphetamine
113. etilefrine
114. famprofazone
115. fenbutrazate
116. fencamfamin
117. fencamine
118. fenetylline
119. fenfluramine
120. fenproporex
121. furfenorex
122. heptaminol
123. isometheptene
124. levmethamphetamine
125. meclofenoxate
126. mefenorex
127. mephentermine
128. mesocarb
129. methamphetamine (D-)
130. methylenedioxyamphetamine
131. methylenedioxymethamphetamine
132. methylamphetamine
133. methylephedrine
134. methylphenidate
135. modafinil
136. nikethamide
137. norfenefrine
138. norfenfluramine
139. octopamine
140. ortetamine
141. oxilofrine
142. parahydroxyamphetamine
143. pemoline
144. pentetrazol
145. phendimetrazine
146. phenmetrazine
147. phenpromethamine
148. phentermine
149. 4-phenylpiracetam (carphedon)
150. prolintane
151. propylhexedrine
152. selegiline
153. sibutramine
154. strychnine
155. tuaminoheptane

Enhances athletic performance in the following ways:

1. aggressiveness increase
2. alertness increase
3. competitiveness increase
4. responsiveness increase
5. tiredness reduction
6. weight loss

Used medically to treat the following symptoms:

1. allergies
2. asthma
3. attention deficit hyperactivity disorder (ADHD)
4. cold
5. headache
6. nasal congestion

1. addiction/withdrawal
2. aggressiveness
3. alertness
4. anxiety
5. blood pressure increase
6. cardiac arrhythmia
7. cerebral hemorrhage
8. coma
9. convulsions
10. death
11. dehydration
12. hand tremors
13. heart attack
14. heart rate increase
15. heat stroke
16. inhibited judgment and decision making
17. insomnia
18. stroke
19. sweating
20. tremor
21. weight loss

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VII. NARCOTICS (11)

* oral or intramuscular/intravenous injection *

Health Effects

Pro

Con

156. buprenorphine
157. dextromoramide
158. diamorphine (heroin)
159. fentanyl
160. hydromorphone
161. methadone

Enhances athletic performance in the following ways:

1. invincibility feeling
2. pain killer
3. pain threshold increase

1. addiction/withdrawal
2. balance and coordination loss
3. cardiovascular collapse
4. concentration ability decrease

162. morphine 163. oxycodone 164. oxymorphone 165. pentazocine 166. pethidine	4. sensation of euphoria Used medically to treat the following symptoms: 1. pain	5. death 6. injury risk 7. nausea 8. respiratory depression 9. sleepiness 10. vomiting
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VIII. CANNABINOIDS (1) <i>* oral or inhalation *</i>	Health Effects	
	Pro	Con
167. cannabinoids (i.e. hashish, marijuana)	Enhances athletic performance in the following ways: 1. euphoric sensation 2. sedative Used medically to treat the following symptoms: 1. see Medical Marijuana ProCon.org	1. addiction/withdrawal 2. anxiety 3. apathy 4. appetite increase 5. balance and coordination impairment 6. bronchitis 7. cancer in the lung, throat, mouth, and tongue 8. concentration loss 9. drowsiness 10. hallucinations 11. heart rate increase 12. dry mouth 13. learning ability impairment 14. memory impairment 15. mood swings 16. motivation loss 17. motor skill impairment 18. panic attacks 19. paranoid thinking 20. reflex loss 21. weight gain

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IX. GLUCOCORTICOSTEROIDS (1) <i>* oral, rectal, inhalation, intravenous, or intramuscular injection *</i>	Health Effects	
	Pro	Con
168. glucocorticosteroids	Enhances athletic performance in the following ways: 1. anti-inflammatory agent Used medically to treat the following symptoms: 1. arthritis 2. asthma 3. inflamed joints 4. allergic reactions	1. fluid retention 2. hyperglycemia 3. mood alteration 4. musculoskeletal problems 5. systemic infections

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X. ALCOHOL (1)

* oral *

Health Effects

Pro

Con

169. ethanol

Enhances athletic performance in the following ways:

1. anti-anxiety effect
2. maximize effects of other drugs taken at the same time
3. sedative

1. addiction/withdrawal
2. cirrhosis of the liver
3. death
4. depression
5. double vision
6. incontinence
7. judgment impairment
8. memory and comprehension loss
9. reflex and muscular coordination impairment
10. sleepiness
11. speech slurring
12. suicide
13. vomiting

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XI. BETA-BLOCKERS (20)

* oral *

Health Effects

Pro

Con

170. acebutolol
171. alprenolol
172. atenolol
173. betaxolol
174. bisoprolol
175. bunolol
176. carteolol
177. carvedilol
178. celiprolol
179. esmolol
180. labetalol
181. levobunolol
182. metipranolol
183. metoprolol
184. nadolol
185. oxprenolol
186. pindolol
187. propranolol

Enhances athletic performance in the following ways:

1. muscle tremor reduction in precision sports
2. sedative



Used medically to treat the following symptoms:

1. anxiety
2. heart problems
3. high blood pressure
4. migraine

1. blood pressure lowering
2. heart rate decrease
3. performance capacity decrease in endurance sports
4. sleep disturbance
5. tiredness

188. sotalol 189. timolol		
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XII. BANNED METHODS (3)	Health Effects	
	Pro	Con
190. enhancement of oxygen transfer (i.e. blood doping and artificially enhancing the uptake, transport or delivery of oxygen)	Enhances athletic performance in the following ways: <ol style="list-style-type: none"> 1. endurance performance improvement 2. ability to perform better at higher altitudes 	<ol style="list-style-type: none"> 1. allergic reactions if wrong blood type is used 2. blood poisoning 3. cardiac output decrease 4. contraction of infectious diseases such as viral hepatitis, malaira, cytomegalovirus, or HIV 5. death 6. heart failure 7. hypertension 8. immune system overload 9. infection 10. intravascular clotting 11. iron overload 12. kidney damage 13. platelet count reduction 14. sexual dysfunction 15. thrombosis 16. transient fever
191. chemical and physical manipulation	<p>Chemical and physical manipulation of samples can include tampering with samples, substitution and/or alteration of urine, catheterisation, and intravenous infusion. Such manipulation can allow athletes to benefit from the use of performance enhancing drugs <u>without testing positive for prohibited substances</u>.</p> <p>Intravenous infusion is also prohibited unless there is an acute medical situation (i.e. acute blood loss) in which the use of this method is necessary.</p>	<ol style="list-style-type: none"> 1. infection 2. over hydration
192. gene doping	<p>Gene doping, when used in sports, can provide <u>a variety of performance enhancing effects</u> depending on the function of the gene.</p> <p>In terms of medical treatment, there have been cases of doctors using gene therapy to treat patients with chronic or fatal illnesses.</p>	Effects are unknown due to experimental phase of gene doping technologies
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XIII. NOTES & SOURCES

Substances and methods that are prohibited by the [World Anti-Doping Agency's \(WADA\) "2008 Prohibited List International Standard"](#) (147 KB)  are not limited to those specifically enumerated above. Please refer to [WADA's Prohibited List](#) (147 KB)  for banned related metabolites and isomers of substances, exceptions, classification of drugs and methods as prohibited in and/or out of competition or for specific sports, and the systematic International Union of Pure and Applied Chemistry (IUPAC) names of the substances.

The pros and cons of the health effects provided in our chart were compiled from the following sources unless otherwise noted:

1. [Australian Sports Anti-Doping Authority \(ASADA\)](#), "2008 Anti-Doping Handbook," ASADA website, 2008
2. [US Anti-Doping Agency \(USADA\)](#), "Guide to Prohibited Substances and Prohibited Methods of Doping," USADA website, Dec. 2007
3. [David R. Mottram, PhD](#), *Drugs in Sport*, 2003
4. [William D. Knopp, MD](#), et al., "Ergogenic Drugs in Sports," *Clinics in Sports Medicine*, July 1997

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