PERSPECTIVES

HIV-Infected Competitive Athletes

What Are the Risks? What Precautions Should Be Taken?

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The human immunodeficiency virus (HIV) and competitive athletics have had an uneasy association. Much of the debate about whether HIV-infected athletes should be permitted to compete has been shrouded in myth. The medical community, athletic administrators, and the courts have debated whether competitive athletics places both HIV-infected and noninfected participants in significant danger, yet both the public and those directly involved in the administration of competitive sports often appear uncertain of both the actual risk of transmission of HIV infection in the athletic setting and the risk of exercise for immunocompromised individuals.

The public is acquainted intimately with HIV-positive athletes who have continued to compete while infected with the virus. On November 7, 1991, when Earvin "Magic" Johnson announced that he had tested positive for HIV antibodies, increased HIV awareness and an indelible linking of HIV and athletes ensued. The HIV infection of diver Greg Louganis, retired tennis player Arthur Ashe, and more than 30 male ice skaters has provided public verification of the reality that HIV-infected athletes compete at the high school, intercollegiate, professional, and amateur international level. Recently, boxer Tommy Morrison's infection and return to the ring has placed another prominent athlete on the front pages of newspapers throughout the country.

This article will address current knowledge concerning HIV infection and competitive sports, including the prevalence of HIV among athletes, the risk of infection during competition, the effect of exercise in HIV-infected individuals, and suggested guidelines for athletes, coaches, and health personnel.

PREVALENCE OF HIV INFECTION AMONG ATHLETES

The number of HIV-positive competitive athletes appears quite small. In a survey of National Collegiate Athletic Association (NCAA) member institutions, only 12 of the 548

schools responding reported having HIV-positive or AIDS-diagnosed athletes.¹ In this 1992 study, "routine" HIV testing of athletes was performed at only 22 (4%) of responding schools, of which only 2 had mandatory testing. Policies governing athletic competition by HIV-positive students were promulgated by only 33 (6%) of the responding NCAA institutions. Of the 15 schools restricting participation, 6 prohibited competition by an HIV-infected person in any sport, while 9 limited participation in only "combative" sports such as ice hockey, wrestling, or football. The actual number of HIV-infected university athletes is difficult to determine. The prevalence of HIV among university students has been estimated at 0.12% to 0.2%,^{2,3} with a seroprevalence of 0.5% among men and 0.02% among women.

Interestingly, evidence exists suggesting that the baseline risk of HIV may be higher in competitive athletes. Nattiv and Puffer found a significantly higher proportion of "risky" lifestyle behavior among intercollegiate athletes compared with nonathlete controls, including quantity of alcohol consumed, inconsistent contraceptive use, number of sexual partners and number of episodes of sexually transmitted diseases.⁴ This association underscores the reality that the risk of HIV infection in college athletes is much more likely to be the result of off-field behavior than the extremely rare risk of contracting HIV during competition.

Intramuscular injection of anabolic steroids constitutes another HIV risk behavior associated with athletes. Between 4% and 12% of high school seniors, many of them football players, bodybuilders, and competitors in other strength-related sports, report using steroids. One study of 1,010 college men estimated the extent of steroid use of intercollegiate athletes at between 2% and 20%.⁵ Although only one case of HIV transmission via shared contaminated needles used in anabolic steroid injection has been reported, the estimate that 38% of steroid users utilize injectable steroid packages suggests that contaminated needles may be a more worrisome source of future HIV infection.⁶

RISK OF HIV INFECTION DURING COMPETITION

What, if any, is the risk of HIV transmission in the competitive athletic setting? In 1989, physicians at the division of infectious diseases in Varese, Italy reported a seroconversion after a head-to-head collision in a soccer

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match between a seronegative player and an HIV-positive intravenous drug user.⁷ Officials later could not confirm that the player was not a victim of a work-related infection at the drug rehabilitation center where he was employed. The Centers for Disease Control and Prevention verified the transmission of HIV during a pair of bloody fist fights, one of which involved a nasal hemorrhage that bled into a laceration on the forehead of a previously seronegative male.⁸ The risk of HIV transmission in the athletic setting via blood contact is therefore a reality, albeit a rare one.

Any future blood-borne HIV infection acquired during athletic competition would presumably be more common in one of the contact or so-called combative sports. Not only is the possibility of lacerations, bruises, and other bleeding injuries increased in such sports, but the overall rate of injury requiring medical care is greater in sports involving some level of physical contact between participants. In an analysis of sports insurance claims made by athletes, participants in karate, judo, and ice hockey had much higher rates of bruises, sprains, and dislocations than did those in basketball, volleyball, and soccer.⁹ Extrapolating from such data, male athletes aged 20 to 24 years are likely to be at higher risk than other groups because they participate in combative sports in greater numbers. The highest potential HIV risk in competition, then, would involve blood contact in either practice, competition, or postinjury treatment of a young male athlete involved in a combative sport. Statistical analysis, however, reveals the threat of such transmission to be extremely small. Measuring the frequency of bleeding injuries during the course of a National Football League regular season and taking into account the prevalence of HIV among college men, and the rate of HIV transmission of exposed health care workers, the overall risk of HIV transmission in professional football was estimated to be *1 per 85 million* game contacts.¹⁰

No documented evidence exists that transmission of HIV via sweat or saliva is possible.¹¹ Current methodology utilizing polymerase chain reaction for HIV RNA or proviral DNA has not demonstrated HIV in eccrine sweat¹²; however, evidence indicates that HIV may be present in skin.¹³ The lack of transmission of HIV via sweat is important public health information that should be disseminated to athletes.

ATTITUDES TOWARD HIV AND SPORT

Although no definitive study of the knowledge of HIV among competitive athletes has been attempted, studies of the HIV knowledge of college students suggest that many athletes harbor misconceptions about the risks of contracting HIV. Despite the minuscule chance of contracting the virus during athletic competition, many athletes presumably would balk at competing against those infected with HIV. In one survey, 36% of college students, for example, believed, incorrectly, that if one kisses an HIV infected individual, HIV infection may ensue.^{14,15}

Twenty-six percent of college students in a study conducted at Case Western Reserve University would prohibit students with AIDS from living in dormitories; 20% would not allow HIV-positive students to participate in social activities, while 13% would bar them from all college classes.¹⁶ One would expect that a "social" activity involving close body contact such as intercollegiate wrestling would elicit even more opposition. Misconceptions concerning transmission of HIV among students is common. Additional educational efforts are vital.

EFFECTS OF EXERCISE ON HIV-POSITIVE INDIVIDUALS

Concern for an HIV-positive athlete's well-being represents another route by which HIV-infected competitors might theoretically be barred from participation in their chosen sport. Yet moderate exercise appears to be beneficial to the infected athlete. The link between moderate exercise and a strengthened immune response has been demonstrated in studies involving both HIV-positive and HIV-negative subjects. A physician-prescribed 12-week regimen of moderate exercise according to guidelines established by the American College of Sports Medicine for healthy adults has been found to enhance immune function and improve cardiorespiratory fitness.¹⁷ Exercise may reduce psychological stress, possibly related to increases in endorphins and enkephalins, while decreasing corticosteroid release.¹⁸ Other evidence indicates that individuals with advanced HIV infection characterized by AIDS-related symptoms, or an AIDS-defining opportunistic infection, respond to an exercise regimen with an increase in CD4 cell counts, CD4:CD8 ratio, and decrease in anxiety and depression.^{19,20} However, Ullum et al., in a study comparing HIV-infected individuals and control subjects, found that infected subjects had an impaired ability to mobilize neutrophils and natural killer cells in response to 1 hour of work on an ergometer bicycle calculated to give an oxygen uptake of 75% of maximum.²¹ Further study is needed to determine the exact relation between intensity and duration of exercise and its effect in both asymptomatic HIV-positive subjects and those with AIDS.

Kotler studied body-cell mass and the degree of wasting in persons with AIDS as a correlate of survival.²² Maintenance or augmentation of body-cell mass may prolong life or improve muscle function and mitigate AIDS-related wasting.²³ AIDS is not incompatible with an improvement in muscular function related to exercise training. One study randomized 24 AIDS patients in a 6-week program of progressive resistance exercise.²⁴ The exercising group had improved muscle function, body dimensions, and mass compared with nonexercising control subjects. Others have confirmed that weight training may enhance muscle strength, bulk, and muscle function in HIV-infected individuals, suggesting that muscle wasting may be mitigated by specific training.¹⁷

The available evidence suggests, then, that moderate exercise may be beneficial, and strenuous exercise may

not.²⁵ Thus, firm recommendations regarding the advisability of prolonged or vigorous physical exertion for AIDS-infected athletes cannot be made currently. Some HIV-positive individuals do exercise strenuously, competing successfully at all levels, including elite and professional.

LEGAL AND REGULATORY ASPECTS OF HIV AND COMPETITION

American courts thus far have refused to consider potential or early immunocompromised status as grounds for exclusion from competition. The courts have given great leeway to physicians in determining the suitability of HIV-infected athletes for competition. Without sufficient medical reason, an HIV-positive athlete cannot be excluded from a sport (*School Board of Nassau County, Florida v. Arline*, 480 U.S. 273 [1987]). Additionally, concern about the potential, deleterious immune system effects of competition has not been viewed as legally valid grounds for exclusion of HIV-infected athletes from sanctioned athletic events.²⁶

Since courts have upheld the basic right of HIV-seropositive individuals to participate in athletic events, athletic administrative bodies have been compelled to enact regulatory guidelines that would prevent the potential, albeit minuscule, risk of HIV transmission. The NCAA now treats a bloody uniform as a health hazard, requiring a change in uniform before a player may be allowed to return to competition. Moreover, any open wound must be covered immediately in both practice and competition, and skin lesions must be examined to determine the possibility of HIV transmission. The NCAA, the American Academy of Pediatrics Committee on Sports Medicine and Fitness, and the World Health Organization have all issued roughly equivalent guidelines for the management of HIV in the athletic setting. "Universal precautions," including the wearing of sterile gloves, the cleansing of wounds with antiseptics, the cleaning of bloody training tables with appropriate decontaminants, and the rapid reporting of any bleeding in a combative sport to appropriate medical personnel are now the norm in high school, intercollegiate, professional, and amateur sporting events.²⁷⁻²⁹ Such universal precautions have been adapted from those required in health care settings where the risk of HIV and hepatitis B virus (HBV) exposure is much greater.

Athletic departments and governing bodies have enacted, on a smaller scale, the medical protocol of the nation's emergency departments, operating rooms, and clinics. The procedures outlined by the NCAA and other health organizations for handling HIV-infected athletes do not differ significantly from those suggested by universities for all students. Many universities, in response to the threat of HIV, have issued AIDS policy statements, committing themselves to AIDS education efforts and promulgating standards for the management of an HIV-infected student or faculty member. A typical one, printed at Connecticut College, a small liberal arts school in New London, Connecticut, guarantees complete confidentiality

and "full access to all college facilities and full participation in all college activities" for the asymptomatic HIV-infected individual. Any restriction of access to facilities must be based on sound medical evidence provided after consultation with a private physician, a university health service physician, and any necessary specialists.³⁰

Statements by athletic organizations do not differ considerably. None of the guidelines promulgated by the American Academy of Pediatrics, the NCAA, or the World Health Organization propose barring HIV-positive athletes from competition, requiring HIV-positive athletes to divulge their seropositive status, or mandating HIV testing of athletes competing in combative sports. One slight departure from this approach is the American Academy of Pediatrics' statement, which encourages physicians counseling a known HIV-infected athlete wishing to compete in a combative sport to apprise the athlete of the theoretical possibility of transmission and "strongly encourage" the athlete to play another sport.²⁸

Professional boxing organizations, however, remain the major exception among athletic bodies to the basic right of an HIV-infected athlete to confidentiality and participation. In 1988, the Nevada Athletic Commission instituted a mandatory HIV test for boxers competing in its state; a positive result automatically disqualifies a boxer from fighting. Since the institution of this policy, Nevada has tested 2,100 boxers for HIV; two men have tested positive. In 1993, the World Boxing Organization stripped Ruben Palacio of his boxing title, refusing to allow him to compete after he had tested positive for HIV. In 1996, in the wake of boxer Tommy Morrison's positive HIV test, the New York and New Jersey athletic commissions joined Nevada as well as Washington, Oregon, Arizona, and Puerto Rico in requiring HIV testing of all potential boxers. This mandatory testing raises some contentious right-to-privacy issues. Legally, boxers are subjected to mandatory testing without proof of the necessity of testing to protect the safety of the infected athlete (*Schall v. Tippecanoe County School Corp.*, 864 F. 2d 1309 [7th Cir. 1988]), or other competitors (*Brooks v. East Chambers Consol Indep School Dist.*, 730 F. Supp. 759 [S.D. Tex 1989] *aff'd* 930 F. 2d 915 [5th Cir. 1991]). Mandatory testing does not exclude the possibility of acute HIV infection. In fact, a negative HIV test may inappropriately convey a false sense of security in the face of blood exposure. Rather than require mandatory HIV testing, it would be more beneficial to boxers' safety to reduce the likelihood of both injury and blood exposure by instituting protective measures such as heavier gloves and protective helmets.

The NCAA and other governing bodies still have some difficult decisions to make about athletes and HIV, as well as HBV and other infectious diseases. Current NCAA guidelines, for example, suggest that when a student-athlete develops acute HBV, administrators and coaches should remove the athlete from sustained close-contact sports such as wrestling.²⁷ The very notion of "close-contact" sport raises some interesting questions. What, in fact, is a close-contact sport? Is it a sport in which the

possibility of blood transfer exists? Some sports exist on the cusp; squash, for example, does not mandate contact as in football or wrestling, but incidental and, at times, substantial contact does occur. Should an athlete infected with HIV wish to compete in a highly combative sport such as wrestling, who should decide whether he poses a significant risk to self or others? His doctor, the coach, administrators, or the athlete himself? Assuming clearance for competition, should an athlete's HIV status remain confidential? Currently, all major sports governing bodies require the athlete to consult a physician and safeguard patient-doctor confidentiality. Should athletic staff be notified of an athlete's HIV status as are surgeons operating on HIV-infected patients? In light of the slight, though real risk of contracting HIV from combative sports, and the theoretic risk of a blood-borne HIV transmission, should athletes be required to wear extra protection on high-risk areas of the body such as elbows and hands? As weighty as the AIDS issue has become, these and other questions regarding HIV and the competitive athlete must be guided by scientific inquiry, not unfounded alarm.

CONCLUSIONS

Given the data that have been presented, numerous recommendations regarding the participation of HIV-seropositive individuals in recreational or competitive athletics can be made. The two most important pieces of information, however, are that the risk of HIV transmission during athletic participation appears to be extremely small, and that the risk of HIV infection from unsafe, "off-field" behavior may be greater. Nevertheless, it seems prudent for universal precautions to be routinely employed during recreational or competitive sport. Finally, when an HIV-infected athlete wishes to engage recreationally or competitively in sport, individualized recommendations regarding participation should be based on the clinical status of the athlete, the possible immune response to the exercise in question, and the risk of blood exposure in the specific sport.

REFERENCES

- McGrew CA, Dick RW, Schniedwind K, Gikas P. Survey of NCAA institutions concerning HIV/AIDS policies and universal precautions. *Med Sci Sports Exerc.* 1993;25:917-21.
- Gayle HD, Keeling RP, Garcia-Tunon M, et al. Prevalence of the human immunodeficiency virus among university students. *N Engl J Med.* 1990;323:1538-41.
- Raab GM, Burns SM, Scott G, et al. HIV prevalence and risk factors in university students. *AIDS.* 1995;9:191-7.
- Nattiv A, Puffer JC. Lifestyles and health risks of collegiate athletes. *J Fam Pract.* 1991;33:585-90.
- Pope HG Jr, Katz DL, Champoux R. Anabolic-androgenic steroid-use among 1,010 college men. *Phys Sportsmed.* 1988;16:75-84.
- Sklarek HM, Mantovani RP, Erens E, Heisler D, Niederman MS, Fein AM. AIDS in a bodybuilder using anabolic steroids. *N Engl J Med.* 1984;311:1701.
- Torre D, Sampietro C, Ferraro G, Zeroli C, Speranza F. Transmission of HIV-1 infection via sports injury. *Lancet.* 1990;335:1105. Letter.
- Ippolito G, Del Poggio P, Arici C, et al. Transmission of zidovudine-resistant HIV during a bloody fight. *JAMA.* 1994;272(6):433-4.
- Kujala UM, Taimela S, Antti-Poika I, Sakari O, Tuominen R, Myllynen P. Acute injuries in soccer, ice hockey, volleyball, basketball, judo and karate: analysis of national registry data. *Biomed J.* 1995;311:1465-8.
- Brown LS, Drotman DP, Chu A, Brown CL, Knowlan D. Bleeding injuries in professional football: estimating the risk for HIV transmission. *Ann Intern Med.* 1995;122:271-4.
- National AIDS Clearinghouse, CDC Factsheet on HIV and Transmission. Atlanta, Ga: Centers for Disease Control and Prevention.
- Wormser GP, Bittker S, Forseter G, et al. Absence of infectious human innumodeficiency virus type 1 in a "natural" eccrine sweat. *J Infect Dis.* 1992;165:155-8.
- Stingl G, Rappersberger K, Tschachler E, et al. Langerhans cells in HIV-1 infection. *J Am Acad Dermatol.* 1990;22:1210-17.
- Thomas SB, Gilliam AG, Iwrey CG. Knowledge about AIDS and reported risk behaviors among black college students. *J Am Coll Health.* 1989;38:61-6.
- Schneider D, Greenberg MR, Devanes M, Sajjia A, Goodhart F, Burns D. Evaluating HIV/AIDS education in a university setting. *J Am Coll Health.* 1994;43:11-14.
- Landefeld S, Chren MM, Shega J, Speroff T, McGuire E. Student's sexual behavior, knowledge, and attitudes relating to the acquired immunodeficiency syndrome. *J Gen Intern Med.* 1988;3:161-5.
- Rigsby LW, Dishman RK, Jackson AW, Maclean GS, Raven PB. Effects of exercise training on men seropositive for the human immunodeficiency virus-1. *Med Sci Sports Exerc.* 1992;24:6-12.
- Lawless D, Jackson CG, Greenleaf JE. Exercise and human immunodeficiency virus (HIV-1) infection. *Sports Med.* 1995;19:235-9.
- Keyes C, Rodgers P, Wolert J, et al. Effect of cardiovascular conditioning in HIV infection. Fifth International Conference on AIDS, Montreal, Canada; 1989.
- Laperriere A, O'Hearn P, Ironson G, et al. Exercise and immune function in healthy HIV antibody negative and positive gay males. 9th Annual Scientific Sessions of Society of Behavioral Medicine, Boston, Mass; 1988.
- Ullum H, Palmo J, Halkjaer-Kristensen J, et al. The effect of acute exercise on lymphocyte subsets, natural killer cells, proliferative responses, and cytokines in HIV-seropositive persons. *J AIDS.* 1994;7:1122-32.
- Kotler DP. Pathophysiology and treatment of the AIDS wasting syndrome. *AIDS Clin Rev.* 1995;6:229-75.
- Grunfeld C, Feingold KR. Metabolic disturbances and wasting in the acquired immunodeficiency syndrome. *N Engl J Med.* 1992;327:329-37.
- Spence DW, Galantino MLA, Mossberg KA, Zimmerman SO. Progressive resistance exercise: effect on muscle function and anthropometry of a select AIDS population. *Arch Phys Med Rehabil.* 1990;71:644-8.
- Eichner ER, Calabrese LH. Immunology and exercise: physiology, pathophysiology, and implications for HIV infection. *Sports Med.* 1994;78:377-87.
- Johnson RJ. HIV infection in athletes: what are the risks? Who can compete? *Postgrad Med.* 1992;92:73-75, 79-80.
- National Collegiate Athletic Association. Guideline 2h: Blood-Borne Pathogens and Intercollegiate Athletics. NCAA, Overland Park, Kan; June 1994:24-7.
- American Academy of Pediatrics, Committee on Sports Medicine and Fitness. Human immunodeficiency virus (AIDS virus) in the athletic setting. *Pediatrics.* 1991;88:640-1.
- World Health Organization. Consensus statement: consultation on AIDS and sports. *JAMA.* 1992;267:1312.
- AIDS Policy Statement. New London, Conn. Connecticut College, Office of Public Information and Publications 88/017: 1-4.