Androstenedione and Anabolic–Androgenic Steroids: What You Need to Know

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Today's society is extremely success oriented, which can be manifested in a variety of behaviors. In athletics, a "win at any cost" attitude is sometimes noticeable in coaches and parents who lose control on the sidelines because a kid doesn’t run the right play or makes a mistake that influences the outcome of a game. The overall importance of this event is lost, and the athlete walks away feeling like a failure. Low self-esteem, as well as external pressures to be successful, can lead to athlete expectations (Goldberg et al., 1996). Currently there are over 30 classes of anabolic-androgenic steroids and related substances, such as androstenedione, prohibited by the International Olympic Committee (IOC, 1999; Yesalis et al., 1998). Although anabolic-androgenic steroids have been present in athletics and among the general public for many years, androstenedione has only recently gained notoriety and attention. Athletic trainers and therapists, team physicians, and other allied health personnel who work with athletes on a daily basis should have a basic understanding of androgens and be prepared to discuss with their athletes the positive and negative ramifications of using these substances.

In this article we present information on androstenedione and anabolic-androgenic steroids as performance-enhancing drugs and the concerns surrounding these substances. We also provide signs and symptoms of androgen use and counseling tips for working with individuals suspected of using these particular drugs. This information will enable sports medicine professionals to better understand these substances and disseminate accurate information about their adverse effects.

Androstenedione

Androstenedione is a metabolic intermediate compound found in the steroid biosynthetic pathway in the adrenal cortex and gonads. Gonadal production of testosterone is similar to that of its adrenal counterpart, with the notable exceptions that much less testosterone is produced in the adrenal cortex than the gonads and dehydroepiandrosterone (DHEA), another androgen, can undergo conversion to...
androstenediol, a weak estrogen, and then to testosterone, bypassing the formation of androstenedione (Granner, 1990a). In addition, it should be noted that regardless of site, the fate of androstenedione is not guaranteed to be formation of testosterone (Granner, 1990b).

The concerns over the use of exogenous androstenedione are twofold: Androstenedione can have potentially adverse health consequences (King et al., 1999), and there is a question of ethics surrounding its use in athletics. These concerns are often ignored or poorly understood, which makes it more difficult for athletes to make an informed decision about using such products.

Recent Controversy Over Androstenedione

Androstenedione was virtually unheard of as a performance-enhancing substance until it gained widespread public recognition as a result of Mark McGwire's shattering of Roger Maris's 35-year record for the most home runs in a single season. McGwire has openly admitted to using androstenedione, and this has likely fueled its popularity. McGwire claimed that by using androstenedione he is able to "train harder and recover quicker from injuries" (Schrof, 1998).

Androstenedione is transformed by an enzyme in the liver into testosterone, thereby promoting anabolic actions or tissue-building effects in the body (Hoberman & Yesalis, 1995). Excess testosterone in the body can have very serious side effects leading to liver disease, cancer, and heart problems (Schrof, 1998; Yesalis & Bahrke, 1995). The National Collegiate Athletic Association (NCAA), the IOC, and the NFL have banned androstenedione, but it is currently legal in Major League Baseball, the NBA, and the NHL.

Use of hormonal supplements such as androstenedione, anabolic-androgenic steroids, or DHEA can be detected via urinalysis using gas chromatography and mass spectrometry (Tucker, 1997). Thus, various agencies such as the NCAA and the IOC have a means of detecting abuse of these performance-enhancing substances.

Availability of Androstenedione

Androstenedione is a product that is readily accessible to the public; therefore, the potential for abuse exists, especially when individuals taking the substance exceed the intake recommended by most manufacturers. Androstenedione is normally only available in 50- and 100-mg tablets in many health and nutritional outlets; however, some stores market the substance in 1,000-mg tablets, which is 10 times the daily amount recommended by manufacturers (Schrof, 1998).

Several Internet Web sites currently post information on androstenedione and offer ways to purchase the product on-line. These sites provide basic information on androstenedione and present very little evidence of its efficacy. Some of these Web sites emphasize the legality of using androstenedione by pointing out that it is a hormone that is found naturally in the body, meats, and some plants (mesomorphosis.com, 1999). There is no discussion on the Web sites of the potentially harmful side effects of using this steroidlike substance or of the fact that little research has been conducted on its use, nor is there any mention of the fact that androstenedione is banned by many sport and athletic organizations.

Clinical Studies of Androstenedione

Minimal scientific research is available on the effects of androstenedione supplementation on athletic performance. A German patent for androstenedione claims that serum testosterone concentrations increased as much as 237% within 15 min of ingestion (Hacker & Mattern, 1995). However, interpreting this claim is impossible because the sample was not described with respect to age, sex, or hormonal status, and no data were presented (King et al., 1999).

Mahesh and Greenblatt (1962) reported that female volunteers (N = 2) who received androstenedione achieved maximum concentrations of testosterone 60 min after administration, but only very small quantities of testosterone were detectable in the blood 90 min after androstenedione was administered. The sample consisted of only 2 volunteers, however, and such small samples do not produce reliable results.

More recently, a study found that androstenedione supplementation does not increase serum testosterone concentrations or enhance skeletal muscle adaptations to resistance training in young men (King et al., 1999). Thirty healthy male participants were