

History of Doping in Sport

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Abstract

Athletes have used a myriad of performance-enhancing substances since ancient times and this practice continues today. This review discusses the early history of doping in sport, the use of stimulants and anabolics during the nineteenth and twentieth centuries, the current use of performance-enhancing drugs by Olympic, professional, university and adolescent male and female athletes, as well as the response of organised sport to this problem.

I feel sorry for Ben Johnson. All sportsmen - not all, but maybe 90%, including our own - use drugs.

Anonymous Soviet coach, *The New York Times*, October 1988

Americans like to think the U.S. leads the 'Sports without Drugs Crusade,' but 'the reality is that the U.S. is viewed as one of the dirtiest nations in the world,' says John Ruger, past chair of the USOC Athletes' Advisory Council.'

Mass Deception: Today's Athlete Is Getting Bigger, Stronger, Faster . . .
Unnaturally

Sport, August 1998

When humans compete against one another, either in war, in business, or in sport, the competitors, by definition, seek to achieve an advantage over their opponent. Frequently they use drugs and other substances to gain the upper hand. Furthermore, there have always been individuals who in the pursuit of victory have transcended social norms. In sport such conduct is usually termed cheating and has existed for as long as sport has been organised. Today, stone pedestals line the entranceway to the Olympic stadium in Olympia, Greece, site of the ancient Olympics (776BC-394AD). During these games the pedestals supported zanes, bronze life-size statues of Zeus (Pausanias, 1959). Zanes were placed there not to honour the great athletes of the time, but to punish, in perpetuity, athletes who violated Olympic rules. Cheats were banished for life from competing in the games. Inscribed on each pedestal is the offending athlete's name, his transgression, such as bribing an opponent, and the names of family members. The statues also served as a warning to athletes of the day who had to pass them on their way into the stadium to compete before 40,000 spectators.

While the violation of Olympic rules was dealt with harshly in the ancient games, it does not appear that the use of drugs and other substances to improve athletic performance was considered cheating. Nor does it appear that any culture in early history made any effort to discourage the use of ergogenic substances. In fact, after doping in sport blossomed during the latter part of the nineteenth century, it was viewed as a standard practice, out in the open, until after World War I (Hoberman, 1992b). Not until the 1920s was there any widespread attempt to admonish doping in sport, much less designate it as a formal violation of rules or as cheating (Hoberman, 1992b). In 1933 Dr. Otto Rieser, in his prophetic work, 'Doping and Doping Substances', discussed the prevalence of doping as well as the culpability of medical professionals.

The use of artificial means [*to improve performance*] has long been considered wholly incompatible with the spirit of sport and has therefore been condemned. Nevertheless, we all know that this rule is continually being broken, and that sportive competitions are often more a matter of doping than of training. It is highly regrettable that those who are in charge of supervising sport seem to lack the energy for the campaign against this evil, and that a lax, and fateful, attitude is spreading. Nor are the physicians without blame for this state of affairs, in part on account of their ignorance, and in part because they are prescribing strong drugs for the purpose of doping which are not available to athletes without prescriptions (qf. Hoberman, 1992b: 131-2).

By 1933 the word *doping* had become part of the English language (Prokop, 1970). While Rieser and others continued to speak out against doping, it was not until 1967 that the International Olympic Committee (IOC) voted to adopt a drug-testing policy banning the use of specific drugs (Todd & Todd, 2001). In 1969, however, an investigative report by *Sports Illustrated* concluded, 'not a single major U.S. sporting organization, amateur or professional . . . has specific anti-doping regulations with an enforcement apparatus' (Gilbert, 1969c: 34). In 1982 the National Football League (NFL) finally began drug-testing players, although the NFL did not test for anabolic steroids until 1987 (Ferstle, 2000). The National Collegiate Athletic Association (NCAA) did not initiate a drug-testing program until 1986. In 1998 baseball star Mark McGwire acknowledged that he used androstenedione, an anabolic steroid that is banned specifically by the IOC, the NCAA and the NFL. Professional baseball has not banned this or any other steroid and has no drug-testing program in place for performance-enhancing drugs (Ferstle, 2000). Today professional sports in the United States that do test for drugs have programs that, on average, are substantially less rigorous than the IOC program (Ferstle, 2000). While doping was outlawed in horse racing as early as 1903 (Donohoe & Johnson, 1986), it was not until at least the last third of

the twentieth century that major sport organisations began to proscribe doping, formally designating it as a form of cheating. In 1939 in his paper titled 'Doping', Boje commented on this apparent irony:

In sports in which animals took part, the use of stimulants was so widespread that several countries introduced legislation to forbid it on the grounds of its cruelty to the animals. Equal attention ought also to be paid to human beings participating in sports (Boje, 1939:440).

Early History

The use of drugs to enhance physical performance has been a feature of human competition since the beginning of recorded history (Prokop, 1970; Strauss & Curry, 1987). The goal of the user most often was to increase strength or overcome fatigue. Today we classify such drugs as anabolics and stimulants. The ancients learned empirically of the anabolic and androgenic function of the testes by observing the effects of castration on domesticated animals (Newerla, 1943). Furthermore, the ancients as well as people of the medieval period indulged in organotherapy (the eating of the organs of animals and humans) to cure disease and to improve vitality and other aspects of performance (Newerla, 1943). As early as 1400BC, the Susruta of India advocated the ingestion of testis tissue to cure impotence. Likewise, the ancient Egyptians accorded medicinal powers to the testicles (Hoberman & Yesalis, 1995). A heart may have been eaten to promote bravery and the brain to improve intelligence. Testicular extract was prescribed by Johannes Mesue the Elder (777-837) as an aphrodisiac (Rolleston, 1936).

The works of Aretaeus (1854) the Cappadocean (ca. AD150) portend the endocrine function of the testis, in particular the anabolic and androgenic effects of testosterone:

For it is the semen, when possessed of vitality, which makes us to be men, hot, well braced in limbs, well voiced, spirited, strong to think and act. . . . But if any man be continent in the emission of semen, he is bold, daring, and strong as wild beasts as is proved from such of the *athletae* as are continent. . . . Vital semen, then, contributes to health, strength, courage, and generation (Aretaeus, 1854: 346-7).

In the ancient Games, many of the athletes tried to improve their performance by studying the techniques of their sport and by experimenting with their diet (Finley & Pleckett, 1976). Charmis, the Spartan winner of the *stade* race (~200yd/183m) in the Olympic Games of 668BC, purportedly used a special diet of dried figs. Other athletes ate wet cheese and wheat meal. On the other hand, Dromeus from Stymphalos, who won the *dolichos* race (1-3miles/1.6-4.8km) twice at Olympia, twice at Delphi, three times at Isthmia and five times at Nemea, ate a meat diet (Pausanias, 1959).

The use of stimulants also dates to ancient times. The Greeks drank various brandy and wine concoctions (Voy, 1991) and ate hallucinogenic mushrooms and sesame seeds to enhance performance. Likewise, the gladiators in the Roman Colosseum used unspecified stimulants to overcome fatigue and injury (Wadler & Hainline, 1989). Medieval knights also reportedly used unnamed stimulants to improve their stamina in battle (Donohoe & Johnson, 1986).

Many of the early stimulants were of plant origin. The legendary Berserkers of Norse mythology used bufotein to increase their fighting strength twelve fold' (Prokop, 1970: 45). This drug came from fly-agaric (*Amanita muscaria*), a mushroom containing muscarine (a deadly alkaloid) (Boje, 1939). The Samoyeds used the same stimulant to induce a heightened state of combativeness. The African plant *Catha edulis* contains norpseudoephedrine, a psychomotor stimulant that has been used by the people of the region to increase strength and delay the onset of fatigue (Ivy, 1983). From ancient times West Africans used *Cola acuminata* and *Cola nitida* for running competitions (Boje, 1939). For centuries Andean Native Americans of Peru have chewed coca leaves or drank coca tea to increase endurance and protect against mountain sickness (Jokl, 1968). The Tarahumara of northern Mexico used peyote, which has strychnine effects, in their multi-day runs that were among the requirements of a fertility ritual (Hoberman, 1992b). The Australian Aborigines ate the pituri plant for its stimulant effect (Boje, 1939; Karpovich, 1941; Williams, 1974). In Styria and Tyrol in Austria, lumberjacks ingested large amounts of arsenic to increase their endurance (Csaky, 1972).

The last half of the nineteenth century saw the beginnings of modern medicine and, not coincidentally, a significant growth in the use of drugs and other substances to improve performance. While the primary emphasis was on stimulants as ergogenic aids, this period also marked the birth of scientific experimentation with the anabolic effects of hormones.

Stimulants

The stimulant effect of coffee (caffeine) has long been recognised. According to Catton (1951: 182) in *The Army of the Potomac: Mr. Lincoln's Army*, during the Civil War 'the coffee ration was what kept the [Union] army going'. The ration was 'ample for three or four pints of strong black coffee daily. . . . Stragglers would often fall out, build a fire, boil coffee, drink it, and then plod on to overtake their regiments at nightfall' (Catton, 1951: 182). The use of coffee by foot soldiers also serves as an early example that such ergogenic practices were not universally embraced: 'cavalry and artillery referred to infantry, somewhat contemptuously, as "coffee boilers"' (Catton, 1951: 182).

Coffee was also 'the drug of choice for any number of literati, scientists, and artists' of that period whose work necessitated a well-functioning brain (Hoberman, 1992b: 112). Liquors too were considered artificial stimulants to be used by soldiers and labourers working in stressful conditions (Hoberman, 1992b).

In the last third of the nineteenth century, the use of stimulants among athletes was commonplace, and moreover, there was no attempt to conceal drug use with the possible exception of some trainers who guarded the proprietary interest in their own special 'doping recipes'. Swimmers, distance runners, sprinters and cyclists used a wide assortment of drugs to gain an edge over their opponents (Boje, 1939; Hoberman, 1992b; Prokop, 1970). As early as 1865, a doping episode involving canal swimmers of Amsterdam was reported (Prokop, 1970). Boxers of the day used strychnine tablets and mixtures of brandy and cocaine (Prokop, 1970).

In 1879, 'Six Day' bicycle races began, each race proceeding continuously, day and night, for 144 hours. It is not surprising that stimulants and a variety of doping strategies were employed in these grueling contests of prolonged athletic exertion:

French racers preferred mixtures on a caffeine bases, the Belgians preferred sugar cubes dipped in ether, and others used alcohol-containing cordials, while the sprinters specialized in the use of nitroglycerine (Prokop, 1970: 45).

The cyclists of the day also used coffee 'spiked' with caffeine; and as the race progressed, they would add increasing doses of cocaine and strychnine (Donohoe & Johnson, 1986), as strychnine taken at low doses has a stimulant effect, while at higher doses it is poisonous. As trainers continued their experiments with a variety of powerful drugs and poisons, it is little wonder that someone died. The first fatality attributed to doping was reported in 1886: Arthur Linton, an English cyclist, is said by some to have overdosed on 'tri-methyl', probably a compound containing either caffeine or ether, during a 600km (373 miles) race between Bordeaux and Paris (Prokop, 1970). Others have argued that in fact Linton won the race in question and did not die until ten years later, in 1896, of typhoid fever (Donohoe & Johnson, 1986). Whatever the case, given the potency of many of the doping substances being used at that time, the health of athletes was at risk.

Another popular sport during that period in both the United States and England was the professional sport of pedestrianism. These 'go-as-you-please' walking and/or running marathon races often lasted six days and six nights (Lucas, 1968). The contestant who had covered the most miles at the end of the six days was declared the winner. During some of these more famous ultramarathons, several of the contestants in one race each completed over 500 miles (805 km), and in 1884 George Haezel of England became the first man to cover 600 miles (966 km) in the six-day period (Lucas, 1968). By their very nature, stimulants lent themselves to use in this sport. Trainers employed a variety of concoctions to keep their athlete going. These included milk-punch champagne and brandy, as well as belladonna, strychnine, and 'morphine in hot drops' (Osier & Dodd, 1979: 107).

Anabolics

The age of scientific organotherapy began on 1 June 1889, when 72-year-old Charles Edouard Brown-Sequard, a prominent physiologist and neurologist, addressed the Society of Biology in Paris. In his talk, and a subsequent paper, Brown-Sequard (1889: 105) reported how over a three-week period he had self-administered ten subcutaneous injections that contained 'first, blood of the testicular veins; secondly, semen; and thirdly, juice extracted from a testicle . . . from a dog or guinea pig'. He enthusiastically described 'radical' changes in his health including significant improvements in physical and mental energy. One month after the last injection, however, he 'experienced almost a complete return of the state of weakness' (Brown-Sequard, 1889: 106). While today most experts believe that the 'rejuvenation' experienced by Brown-Sequard was the result of the placebo effect, he was correct, not only in his rudimentary understanding of testicular function, but also about the potential value of hormonal replacement or supplementation therapy. Because of this he is considered the father of modern endocrinology.

Brown-Sequard offered free samples of his *liquide testiculaire* to physicians willing to test them. In addition, various laboratories, including some in the United States such as the New York Pasteur Institute, began preparing the extract for use (Borell, 1976). This began a swell of experiments not only in France but throughout the Western world employing testicular extracts to rejuvenate as well as treat a wide variety of diseases (Hoberman & Yesalis, 1995). The 'Fountain of Youth' had been found, once again, and a cult-like following arose (Herman, 1982). Numerous accounts of rejuvenation soon followed and continued until the early 1920s. Ironically, these uncontrolled studies and bold claims also stimulated important research in clinical endocrinology.

The 'athleticising' of testicular extracts came quickly after Brown-Sequard's initial report. In 1894 Oskar Zoth and Fritz Pregl assessed the effects of the extracts on muscular strength (Hoberman, 1992b). Although Zoth concluded that these 'orchitic' extracts improved muscular strength, it is highly unlikely they had any therapeutic or ergogenic effect beyond the power of suggestion (Hoberman & Yesalis, 1995). Nevertheless, in an 1896 paper he provides a chilling prophecy of the use of anabolic hormones in sport in the twentieth century when he states in the final sentence: 'The training of athletes offers an opportunity for further research in this area and for a practical assessment of our experimental results' (qf. Hoberman & Yesalis, 1995:61).

Twentieth Century

Looking at elite sport in the twentieth century, an unmistakable picture emerges of a doping pandemic of huge proportions. This section discusses the use of anabolics and stimulants during the twentieth century, the current use of performance-enhancing substances by Olympic, professional, university and adolescent male and female athletes, and the response of organised sport to this problem.

Anabolics

In 1912, another form of glandular therapy debuted with the transplantation of animal and human testicular material into patients with testicular dysfunction (Hamilton, 1986; Hoberman & Yesalis, 1995). As with the injection of extracts, the purposes of these transplants were curative and restorative. The practitioners of these procedures believed, incorrectly, that these testicular transplants would survive in the recipient and would function. Many respected surgeons around the world performed these transplants through the 1920s and published case reports of favorable findings in well-respected medical journals, including *Endocrinology* and the *Journal of the American Medical Association* (Lespinasse, 1913; Stanley, 1922). However, in the mid-1920s, serious concern arose in the medical community regarding these overt claims of rejuvenation (Fishbein, 1925). As a result an international committee was appointed to evaluate these claims and concluded that they were unfounded (Parkes, 1985; 1988). The practice disappeared by 1935 when scientists isolated, chemically characterised, and synthesised the hormone testosterone and elucidated the basic nature of its anabolic effects (Butenandt & Hanisch, 1935; David, Dingemans, Freud & Laqueur, 1935; Kochakian & Murlin, 1935). Shortly thereafter, both oral and injectable preparations of testosterone were available to the medical community. While there is no record of systematic use of testicular transplants or the injection of testicular extracts by athletes, these procedures likely helped lay the foundation for the subsequent use of testosterone as an ergogenic aid.

It has been rumored that some German athletes were given testosterone in preparation for the 1936 Berlin Olympics (Francis, 1990). Although the effects of other drugs on the physiology of human performance are well documented in the German medical literature, no mention of the use of testosterone as an ergogenic aid has been noted during that period (Hoberman, 1992a; 1992b). Moreover, Hoberman (1992a: 270) contends:

It is likely that public anti-doping sentiment after 1933 was related to Nazi strictures against the self-serving, individualistic, record-breaking athlete and the abstract ideal of performance. It is also consistent with Nazi rhetoric about sportsmanship, e.g., the importance of the 'noble contest' and the 'chivalric' attitude of the German athlete.

Wade (1972) has alleged that during World War II, German soldiers took steroids before battle to enhance aggressiveness. This assertion, although often cited, has yet to be documented, in spite of efforts in this regard. Furthermore, the Nazis were opposed to organism-altering drugs in general (Hoberman, 1992a; 1992b). There was a concerted campaign against the 'poisons' alcohol and tobacco, and the Nazis were not particularly interested in the popular gland transplant techniques of that period, since their idea of race improvement was genetic (Hoberman, 1992; 1992b).

Boje (1939), writing in the *Bulletin of the Health Organization of the League of Nations*, appears to have been the first to suggest that sex hormones, based on their physiologic actions, might enhance physical performance. At the same time, the anabolic effects of anabolic steroids were being confirmed in eunuchs and in normal men and women (Kenyon, Knowlton, Sandiford, Koch, & Lotwin, 1940; Kenyon, Sandiford, Bryan, Knowlton, & Koch, 1938). Uncontrolled studies also demonstrated improvements in strength and dynamic work capacity in eugonadal males (Simonson, Kearns, & Enzer, 1941) and otherwise healthy older males complaining of fatigue (Simonson, Kearns, & Enzer, 1944).

The first recorded case of an 'athlete' using testosterone was a gelding trotter named Holloway (Kearns, Harkness, Hobson, & Smith, 1942). Prior to the implantation of testosterone pellets, this 18-year-old horse had 'declined to a marked degree in his staying power and during February of 1941 in several attempts at ice racing, failed to show any of his old speed or willingness' (Kearns et al., 1942: 199). After the administration of testosterone and several months of training, Holloway won or placed in a number of races and established a trotting record at age 19.

In *The Male Hormone*, de Kruif (1945) further raised hopes and expectations for the newly synthesised anabolic steroids. He argued that these hormones had the potential to rejuvenate individuals and improve their productivity, and he assuredly reported that testosterone 'caused the human body to synthesize protein [and] . . . to be able to build the very stuff of its own life' (de Kruif, 1945: 130). De Kruif went on:

I'll be faithful and remember to take my twenty to thirty milligrams a day of testosterone. I'm not ashamed that it's no longer made to its old degree by my own aging body. It's chemical crutches. It's borrowed manhood. It's borrowed time. But just the same, it's what makes bulls bulls (de Kruif, 1945: 226).

With regard to athletes, de Kruif commented:

We know how both the St. Louis Cardinals and the St. Louis Browns have won championships supercharged by vitamins. It would be interesting to watch the productive power of an industry or a professional group (of athletes) that would try a systematic supercharge with testosterone (de Kruif, 1945: 223).

De Kruif's writings were not without effect. When these were combined with the significant positive observations reported from clinical studies in professional journals, it was a relatively easy extrapolation for some in the physical culture of bodybuilding to expect that additional anabolic-androgenic hormones, at that time universally assumed to exert no adverse effects when taken in therapeutic dosages, would allow development of greater-than-'normal' body size and strength. According to several interview reports,

experimental use of the new testosterone preparations began among West Coast bodybuilders in the early 1950s (Wright, 1978). Also suggestive of anabolic steroid use are physique photos showing highly significant changes over relatively short periods in the muscle mass of established elite bodybuilders. Since then, bodybuilding has been and continues to be strongly and consistently linked to steroid use (Duchaine, 1982; 1989; Fussell, 1990; Klein, 1986; 1993; Nack, 1998; Phillips, 1990; Wright, 1978), as has the sport's most well-known participant, Arnold Schwarzenegger (Johnston, 1974; Leigh, 1990). The elite bodybuilding community has maintained its position at the 'cutting edge' of experimentation with performance-enhancing drugs. By the early 1980s and beyond, the use of human growth hormone (hGH) was well established on that community's drug menu (Duchaine, 1982; 1989; Fahey, 2001). In 1982 Fred Hatfield (1982: 21) in his controversial book, *Anabolic Steroids: What Kind and How Many*, stated that hGH had 'become 'the state of the art' strength and size drug in the free world'.

The initiation of systematic use of anabolic steroids in sport has been attributed to reports of their use by successful Soviet weightlifting teams in the early 1950s. Statistical analysis of the performance of the Soviet lifters during this period is consistent with this assertion (Fair, 1988). In 1954, at the world weightlifting championships in Vienna, Dr. John Ziegler, the U.S. team physician, reportedly was told by his Soviet counterpart that the Soviets were taking testosterone (Fair, 1993; Starr, 1981; Todd, 1987). Ziegler returned to the United States and experimented with testosterone on himself and a few weightlifters in the York Barbell Club. Dr. Ziegler was concerned, however, with the androgenic effects of testosterone; and in 1958, when the Ciba Pharmaceutical Company released Dianabol (methandrostenolone), he began experimentation with this new drug. After several of the weightlifters with whom Ziegler was working achieved championship status while using anabolic steroids, news of the efficacy of these drugs apparently spread by word of mouth during the early 1960s to other strength-intensive sports, from field events to football.

Stimulants

Continuing the practices of their nineteenth century counterparts, athletes during the first three decades of the twentieth century used a variety of substances (alcohol, cocaine, strychnine, caffeine and nitroglycerine) for their purported 'stimulant' effects (Boje, 1939; Prokop, 1970; Jokl, 1968). Noticeably absent from this doping menu is any mention of the use of amphetamines, even though they were first synthesised in 1887 (Hart & Wallace, 1975). In the 1920s and 1930s other derivatives of amphetamines were synthesised. However, it was not until the mid-1930s that amphetamines were identified as a central nervous system stimulant, and in 1937 they became available as a prescription tablet (Ray & Ksir, 1996). In the late 1930s, amphetamines were publicised as 'a means of dissipating mental fog' and were thereafter adopted by college students 'to ward off sleep and clear their minds' (*Air Surgeon's Bulletin*, 1944: 20).

The first systematic use of amphetamines as an ergogenic aid is seen during World War Two, when both Axis and Allied powers used these drugs to combat fatigue and improve endurance. The British army used amphetamines when men 'were markedly fatigued physically or mentally and circumstances demanded a particular effort' (Robson, 1999: 99). According to a report in the *Air Surgeon's Bulletin* (1944: 20), 'one pill (*Benzedrine*) may be worth a Flying Fortress when the man who is flying it can no longer stay awake'. Going beyond staving off fatigue, the Japanese were said to have used heavy doses of amphetamines to arouse or 'psych up' their kamikaze pilots in preparation for their suicide missions (Scott, 1971). Similarly Mandell (1981) suggested that amphetamines could be used by soldiers to create a sense of fearlessness.

The use of these 'pep pills' by pre-war college students, combined with the experiences of servicemen who used them to competitive advantage in armed services football, appears to have laid the foundation for introduction of amphetamines to professional and collegiate sport at the end of the World War Two (Mandell, 1978). The spread of amphetamine use must have proceeded rather quickly, because by 1969 Gilbert (1969b: 32) concluded:

On good evidence - which includes voluntary admissions by physicians, trainers, coaches, athletes, testimony given in court or before athletic regulatory bodies, and autopsy reports - amphetamines have been used in auto racing, basketball, baseball (at all levels down to children's leagues), boxing, canoeing, cycling, football, golf, mountain climbing, Roller Derby, rodeo, Rugby, skating, skiing, soccer, squash, swimming, tennis (both lawn and table), track and field, weight lifting and wrestling.

Cycling

Cycling plays a central role in the explosion of stimulant use in sport after World War Two. Ludwig Prokop (1970: 46) describes cycling competitions of that era as 'special hotbeds of doping.' Of 25 urine samples taken from riders in a 1955 race, five were positive for stimulants. In the 1960 Rome Olympic Games, Knud Jensen, a 23-year-old Danish cyclist, collapsed during competition and died. Autopsy results revealed the presence of amphetamines (Donohoe & Johnson, 1986). During the thirteenth leg of the 1967 Tour de France, English cyclist Tom Simpson, 29, collapsed and died. His autopsy showed high levels of methamphetamine, 'a vial of which had been found in his pocket at the time of his death' (Gilbert, 1969b: 37). The impact of Simpson's death was extensive, in part because 'this was the first doping death to be televised' (Donohoe & Johnson, 1986: 8). His death substantially added to the mounting pressure on the IOC and member federations to establish doping control programs, which they did at the end of 1967 (Ferstle, 2000). One year later another cyclist, Yves Mottin, died from 'excessive amphetamine use' two days after winning a race (Todd & Todd, 2001:69).

Tests conducted on Belgian cyclists in 1965 showed that 37 per cent of professionals and 23 per cent of amateurs were using amphetamines, while reports from Italy showed that 46 per cent of professional cyclists tested positive for doping (Donohoe & Johnson, 1986). In 1967 Jacques Anquetil, a five-time winner of the Tour de France, stated:

For 50 years bike racers have been taking stimulants. Obviously we can do without them in a race, but then we will pedal 15 miles an hour [*instead of 25*]. Since we are constantly asked to go faster and to make even greater efforts, we are obliged to take stimulants (qf. Gilbert, 1969b: 32).

Longtime team masseur for professional cycling, Willy Voet, summarised the past forty years of doping in cycling by describing the three drug eras of the sport: amphetamines in the 1960s and 1970s, anabolic steroids and cortisone in the 1980s, and, thereafter, hGH and erythropoietin (EPO) (Swift, 1999). In fact, there is strong speculation that more than a dozen deaths of elite cyclists that took place the late 1980s were the result of the use of EPO (Ramotar, 1990; Fisher, 1991).

The breadth and depth of the level of doping in the cycling world were exposed to full public view in 1998 when Voet was arrested by French customs police for transporting performance-enhancing drugs. Voet began detailing the use of drugs in cycling, and a large-scale investigation by both French and Italian authorities, as well as by a number of journalists, ensued. The results of these investigations implicated many of the top teams and riders in the sport as part of a highly organised, sophisticated and long-lived doping scheme (*USA Today*, 1998d: 3C; Swift, 1999). Just hours before the 2000 Tour de France was to begin, three cyclists failed a mandatory EPO test and were expelled from competition (King5.com, 2000). Perhaps the magnitude of this problem in cycling is best summarised by Daniel Delegove, the presiding judge of the doping trial of France's cycling superstar Richard Virenque. After hearing compelling evidence of widespread doping, Judge Delegove said, 'These are not racers, they are pedaling test tubes' (Ford, 2000: 1).

Modern Olympic Sports

Thomas Hicks, the winner of the marathon in the 1904 St. Louis Olympic Games, was administered strychnine and brandy several times during the race. Dr. Charles Lucas, a physician who attended to Hicks, commented that 'the Marathon race, from a medical standpoint, demonstrated that drugs are of much benefit to athletes' (Dyreson, 1998: 89). Likewise, the 'winner' of the 1908 Olympic marathon was suspected of taking strychnine, although he was later disqualified because spectators assisted him the last few feet of the race (Donohoe & Johnson, 1986). Wilhelm Knoll, a Swiss physician, administered a stimulant, Coramin, to skiers at the St. Moritz Olympic Games in 1928 (Hoberman, 1992b).

In the 1932 Los Angeles Olympic Games, the victories of Japanese swimmers were rumoured to be the result of their being 'pumped full of oxygen' (Boje, 1939: 449; Hoberman, 1992b). There were accusations of strychnine use at the 1956 Melbourne Games, while some of the urine samples taken from cyclists after the races during the Tokyo Games 'were actually *blue* in color due to the use of various drugs' (Donohoe & Johnson, 1986:6).

Anabolic steroid use was apparently not a major problem at the 1960 Olympic Games in that it was probably limited to Soviet strength athletes and a few American weightlifters. By 1964, however, the secret behind the startling progress of a number of strength athletes began to leak out, and as a result steroids were soon being used extensively by athletes in all the strength sports (Connolly, 1973; Gilbert, 1969a, 1969b, 1969c; Payne, 1975; Starr, 1981; Todd, 1987).

Weight lifters themselves were quickly convinced that steroids made them bigger and stronger, and they began to tout the drugs. In track and field, the throwers were early converts. By the mid-1960s most of the top-ranking throwers began using anabolic steroids, including Randy Matson, the 1968 Olympic champion and world-record holder in the shot put; Dallas Long, the 1964 Olympic shot put champion; Harold Connolly, the 1956 Olympic champion in the hammer throw; and Russ Hodge, a world-record holder in the decathlon (Gilbert, 1969a; 1969b 1969c).

By 1968, according to H. Connolly (1973) and Francis (1990), athletes in a number of track and field events, including sprinters, hurdlers, and middle-distance runners, were using anabolic steroids. Dr. Tom Waddell, a US decathlete, estimated that one-third of the entire US track and field team, not just strength and field-event athletes, had used steroids at the 1968 pre-Olympic training camp (Todd, 1987). Dr. H. Kay Dooley, a team physician for the US weightlifters, stated, 'I don't think it is possible for a weight man to compete internationally without using anabolic steroids. . . All the weight men on the Olympic team had to take steroids. Otherwise they would not have been in the running' (Gilbert, 1969a: 66). This was a time when steroid use was not banned and had become much less secretive than previously. It was also the year after the IOC established a medical committee and banned certain drugs.

During the 1968 Olympic Games in Mexico City, athletes and coaches did not debate the morality or propriety of taking drugs; the only debate was over which drugs were more effective. Bill Toomey, gold medalist in the decathlon at the 1968 Olympics and winner of the Amateur Athletic Union's prestigious Sullivan Award, admitted he used drugs to aid his performance at the Mexico City Olympics (Scott, 1971).

Dosages of anabolic steroids used by strength athletes had increased by the late 1960s to two to five times therapeutic recommendations (for replacement therapy); and the variety of steroids used had increased as well, although it was not until this time that use of multiple drugs, known as stacking, and the simultaneous use of oral and injectable anabolic steroids

began. From the time substances marketed as anabolic steroids were introduced, some athletes preferred them to the more androgenic preparations, such as the oral and injectable testosterone and fluoxymesterone, primarily because the anabolic steroids were marketed for their 'anabolic' effects but also because of concern over what athletes considered undesirable androgenic effects, including aggression. However, steroid users who wished to maximise muscle mass and strength continued to use the more 'androgenic' preparations.

By 1969, the cat was completely out of the bag. Users were praising the effects of anabolic steroids on performance (Brown & Tait, 1973), and Jon Hendershott (1969), then editor of *Track and Field News*, was nonfacetiously categorising anabolic steroids as the 'breakfast of champions'. That same year a mainstream sport magazine published a three-part expose of drug use in sport, indicating on the basis of numerous interviews and observations that 'athletes were popping more pills for more purposes than were dreamt of in anybody's philosophy - or pharmacy' (Gilbert, 1969c: 30).

After the 1968 Olympic Games, a US weight lifter 'admitted most of his colleagues took a few amphetamines before competing to get that extra little lift' (Gilbert, 1969a: 66). In 1970 at the Weightlifting World Championships, nine of the first twelve medallists tested positive for amphetamines (Scott, 1971). After winning the 1971 Pan Am games in Cali, Colombia, weight lifter Ken Patera relished meeting Russian superheavyweight Vasily Alexeyev in the 1972 Olympics in Munich. Patera was quoted in the *Los Angeles Times*:

Last year the only difference between me and him was I couldn't afford his drug bill. Now I can. When I hit Munich I'll weigh in at about 340, or maybe 350. Then we'll see which are better, his steroids or mine. (Scott, 1971: 41)

Since the late 1960s, blood doping, the reinfusion of an athlete's own concentrated oxygen-carrying red blood cells or those of a typed-matched donor, shortly before competition, has been alleged to have been used by European distance runners, cyclists, cross-country skiers and biathletes (Williams, 1980). However, it was brought to the attention of the lay public during the 1976 Summer Olympic Games when several TV commentators suggested that Finnish distance runner Lasse Viren, gold medalist in the 5000 and 10,000 metre races, used blood doping (Zorpette, 2000). After the 1980 Moscow Olympics, a new assay for exogenous testosterone, developed by Dr. Manfred Donike, was retroactively applied to all urine samples. Twenty percent of all athletes (males and females) would have tested positive. This group included sixteen gold medalists (Todd & Todd, 2001).

Before the 1984 Olympics, a newspaper article alleged that shot-putters and throwers of the discus, javelin and hammer had been given information by the coordinator of a US Olympic Committee's instructional program, within the year before the Olympics, to help them circumvent tests for anabolic steroids (*Tampa Bay Tribune*, 1984). Others have argued that

this program was merely an educational effort to familiarise the athletes with the adverse consequences of anabolic steroid use and had nothing to do with evading drug tests.

Human growth hormone was described by a well-known sport physician as the 'fad anabolic drug' of the Los Angeles Olympic Games (Todd & Todd, 2001: 81). Twelve years later the Atlanta Olympic Games were jokingly referred to as the 'Growth Hormone Games' by some athletes (Bamberger & Yaeger, 1997). Tests at the 1984 Games also revealed that most of the competitors in the modern pentathlon had used beta blockers for their anti-tremor and anti-anxiety effects, although these drugs were not on the banned list at that time (Todd & Todd, 2001). After the Games, 24 members of the US men's cycling team admitted to blood doping prior to competition (Cramer, 1985; Zorpette, 2000).

In the 1988 Seoul Games, two gold medallist weightlifters tested positive for diuretics. However, the big story of the Seoul Games concerned the fact that Ben Johnson, winner of the 100-metre dash, tested positive for an anabolic steroid (Todd & Todd, 2001). A subsequent investigation by the *New York Times* concluded that 'at least half of the athletes who competed at the Olympics in Seoul used anabolic steroids to enhance their performances' (Janofsky, 1988: A1).

During the 1990s, not only were weightlifting and field events still enmeshed in performance-enhancing drug use (Noden, 1993; *USA Today*, 1995; 1997a; 1998b), but also the use of anabolic steroids, hGH, and EPO was present in other Olympic sports, including hockey, swimming, cycling, skiing, volleyball, wrestling, handball, pentathlon, bobsledding and soccer (Dubin, 1990; Todd & Todd, 2001; *USA Today*, 1997b).

After a lengthy investigation of drug use in Olympic sports, Bamberger & Yaeger (1997: 63) concluded:

three distinct classes of top-level athletes have emerged in many Olympic sports. One is a small group of athletes who are not using any banned performance enhancers. The second is a large, burgeoning group whose drug use goes undetected; these athletes either take drugs that aren't tested for, use tested-for drugs in amounts below the generous levels permitted by the IOC or take substances that mask the presence of the drugs in their system at testing time. The third group comprises the smattering of athletes who use banned performance enhancers and are actually caught.

The Sydney Olympic Games did little to dispel this grim conclusion. They were scarred as the 'Dirty Games' as dozens of news articles were published about the Sydney Games that dealt with the ongoing epidemic of drug use in Olympic sport and the IOC's continued inability (or insincerity) to effectively deal with it (Abrahamson & Wharton, 2000; Longman, 2000a; Begley & Clifton, 2000; Cazeneuve & Layden, 2000; Fish, 2000; Harvey, 2000;

Humphries, 2000; Reid, 2000; Sullivan & Song, 2000). In one of these articles Dr. Don Catlin, director of one of the IOC drug-testing laboratories, observed, 'There's probably a lot more drugs out there in sport than the general public would think. They'd be fairly horrified' (Humphries, 2000: 63). In another, Frank Shorter, 1972 Olympic marathon champion and chairman of the U.S. Anti-Doping Agency, not only recognised the magnitude of the problem but also saw that doping has consequences that reach far beyond the Olympic Games (Longman, 2000b).

An intensive two-year investigation of doping in Olympic sport conducted for the US Office of National Drug Control Policy concluded that while estimates of the magnitude of the doping epidemic vary widely (from 10% to 90% of athletes), there exists an atmosphere in our society that fosters drug use by athletes:

the high financial stakes for Olympic athletes, corporate sponsors, the TV broadcast and cable industries and sport governing bodies, coupled with the pharmacopoeia of performance-enhancing substances, the athlete's drive to win and the absence of an effective policing mechanism, create an environment that encourages doing anything - including doping - to win (National Center on Addiction and Substance Abuse, 2000:2).

Female Athletes

It is reasonable to assume that the use of anabolic steroids, stimulants and blood doping or EPO by female athletes followed closely on the heels of use by male athletes. The use of anabolic steroids by female athletes is of particular interest because these drugs have a significantly more pronounced effect in women than in men. The powerful masculinizing effects of anabolic steroids in females had been established before 1960 (Kochakian, 1976; Kruskemper, 1968). It is likely that the Soviet female track and field athletes of the 1960s, or perhaps even the 1950s, were the first women athletes to use these drugs.

The masculine appearances of a number of female track and field athletes from the Eastern bloc countries in the mid-1960s led to speculation that they were either hermaphrodites or men disguised as women. In response, a chromosome test was initiated in 1967 at the European Cup (Todd, 1987). Although several athletes did indeed fail the screening over the years and several others mysteriously retired from competition before being tested, one might wonder if many of the women who initially were suspected were neither genetic 'rarities' nor charlatans but simply had been administered testosterone and other anabolic steroids.

The spread of steroid use among female athletes followed a pattern similar to that of males, with the strength athletes the first among women to adopt the drugs. Evidence of steroid use among female throwers from Eastern bloc countries goes back at least to the 1968 Olympic Games at

Mexico City (Fikotova-Connolly, personal communication, 1991; Franke & Berendonk, 1997). By the 1972 Munich Games, it was alleged that several US women participating in the field events had used anabolic steroids (Connolly, 1989). While anabolic steroids continue to be used by female athletes in strength sports (Franke & Berendonk, 1997; Patrick, 1997), based on government records, testimonials and the results of drug tests, by the late 1970s steroid use had spread to sprinters and middle-distance runners, swimmers, rowers and athletes in various winter sporting events as well (Franke & Berendonk, 1997; Dubin, 1990; Williams, 1989). The 1976 Montreal Olympics foreshadowed the doping problem among elite female athletes. The Games saw the first female athlete to test positive for anabolic steroids and the emergence of East German women as a dominant force internationally. In particular, suspicions, now confirmed, were raised by the masculine appearance and overpowering performance of the German Democratic Republic (GDR) female swimmers. When an East German coach was asked about rumoured steroid use and observations about the deep voices of his female athletes, he allegedly answered, 'We have come here to swim, not to sing' (Todd & Todd, 2001: 74).

As with men, women's steroid use has diffused beyond Olympic sport and has now been reported at the collegiate level in sports including basketball, volleyball, soccer, field hockey, swimming, gymnastics, lacrosse and softball (Anderson, Albrecht, McKeag, Hough, & McGrew, 1991; *NCAA News*, 1997; Yesalis, Anderson, Buckley, & Wright, 1990). In 1995 a 14-year-old female long jumper and sprinter from South Africa became the world's youngest athlete to test positive for anabolic steroid use (*New York Times*, 1995). During the 1980s and 1990s there were numerous doping scandals throughout the world involving female athletes; and this suggests that, at least at the elite level, there is little or no difference in the prevalence of doping between the sexes.

National Doping Programs

Although the existence of well-organised, nationwide sport doping programs has been rumoured for decades, solid evidence has now come to light to document their reality. National doping programs transcend the all-too-common informal collusion of elite athletes, coaches and rogue physicians and sport scientists to use performance-enhancing drugs. Rather they are constituted under the direction or strong support of government and sport federation officials, as well as with the active collaboration of mainstream physicians and scientists.

Thanks to the courage and persistence of Werner Franke and Brigitte Berendonk (1997: 1262), we now have detailed information on the activities of the GDR sport doping system:

Top-secret doctoral theses, scientific reports, progress reports of grants, proceedings of symposiums of experts, and reports of physicians and scientists who served as unofficial collaborators

for the Ministry of State Security ('Stasi') reveal that from 1966 on, hundreds of physicians and scientists, including top-ranking professors, performed doping research and administered prescription drugs as well as unapproved experimental drug preparations. Several thousand athletes were treated with androgens every year, including minors of each sex. Special emphasis was placed on administering androgens to women and adolescent girls because the practice proved to be particularly effective for sport performance.

This Communist state-sponsored program was not only a highly organized assault on the rules of sport; more importantly, it also violated scientific and medical ethics. Girls and boys fourteen years of age or younger were given anabolic steroids and other drugs — and often neither they nor their parents were informed.

Successful criminal prosecutions of some of these coaches and physicians has been completed in Germany (*Des Moines Sunday Register*, 1997; *USA Today*, 1998c).

In addition, it is reasonable to conclude that similar organised sport doping programs existed in the Soviet Union and other Soviet bloc countries (Gilmour, 1998; Hoberman, 1992b; Rosellini, 1992; Voy, 1991). From as early as 1945, there is evidence from a Soviet government document that there were formal discussions regarding the viability of doping in sport (the use of stimulants) (Gilmour, 1998). The document shows a significant range of opinions on the matter, both pro and con. The conclusions reached in these discussions were that stimulants were already being used in sport, that athletic trainers and coaches were involved, that more research was needed to assess the effects, and that variations in reaction to the drugs did not justify the risks *at that time* (Gilmour, 1998). This latter judgment may well have been reassessed when in 1948 Soviet sport established a goal of meeting or exceeding all world records. Whatever the case, it appears that by 1954 the Soviets employed systematic use of testosterone with their weightlifters and thereafter use spread to other sports (Starr, 1981; Todd, 1983, 1987). While Edelman (1993) stated that the Soviet program probably was never as well organised or systematic as in the GDR, he and his colleagues nevertheless concluded as follows:

Officials, team doctors, and pharmacologists made drugs available to coaches who were under enormous pressure from the Party to produce winners. Facilities and assistance, especially pre-emptive testing, were provided to insure athletes could escape both detection and death. (Kidd, Edelman, & Brownell, 1998: 162)

After the fall of Communism in Europe, many East German coaches sought employment elsewhere, and a number of these coaches began working in China's sport programs (Fish, 1994; Hersh, 1993b; Whitten, 1994). The Chinese even established the National Research Institute, a high-performance sport science laboratory that appears to parallel the GDR's Research Institute for Physical Culture and Sports in Leipzig (Hoberman & Todd, 1992). Shortly thereafter, Chinese female athletes moved from a position of relative obscurity to world dominance, especially in swimming, track and field and weightlifting. Almost immediately accusations of doping and comparisons with the GDR spewed forth (Fish, 1993; Hersh, 1993a, 1993b; Montville, 1994; Moore, 1993; Patrick, 1993; *USA Today*, 1994; Whitten, 1994). These accusations were supported in part by the large number of positive drug tests the Chinese athletes experienced during the 1990s, including 29 track and field athletes and nineteen swimmers (Allen, 1998). At this time, however, there is no absolute evidence of a centrally controlled system of drug use in China as was the case with the GDR (Kidd et al., 1998).

Professional Football

The history of drug use in professional football in the United States spans at least six decades and comprises primarily the use of stimulants (amphetamines and cocaine), anabolics (anabolic steroids and growth hormone), and painkillers (narcotic analgesics and codeine).

Amphetamine use appeared in the National Football Leagues (NFL) immediately after World War II. An investigative report of drug use in sport published by *Sports Illustrated* in 1969 (Gilbert, 1969b: 37) noted that 'among major American sports, amphetamine usage may be the highest in football'. Amphetamines are used in a violent contact sport such as football not to mask fatigue as much as to overcome pain and get 'psyched up.' Dr. Arnold Mandell (1976: 175), an eminent psychiatrist and team physician to the San Diego Chargers from 1972 to 1974, illustrates this with a quote from a veteran player: 'Doc, I'm not about to go out there one on one against a guy who's grunting and drooling and comin' at me with big dilated pupils unless I'm in the same condition!' Mandell (1976: 175) goes on to say, 'A football player uses amphetamines once a week, like a truck driver takes them to finish a long run or a student takes them to complete a paper or cram for an exam. He usually hates the feeling and looks forward to never having to do it again. It's strictly a way to get the work done.'

The first systematic assessment of the incidence of amphetamine use in pro football, conducted in 1972, showed that over half the members of the teams sampled had used amphetamines (Mandell, 1981). George Burman, who played for three teams in the NFL during the 1960s, estimated that approximately one-third of players used the drugs (Padwe, 1973). From 1972 to 1975, Mandell (1981) conducted in-depth interviews with 87 players from eleven NFL teams and found that two-thirds of the players used amphetamines 'sometimes' and more than half used them 'regularly'.

Mandell's study also demonstrated position-related dosing to achieve different ends. Players at the skill positions, such as quarterback, wide receiver, used relatively low doses to increase energy and enhance 'creative performance', whereas defensive linemen used the highest doses to engender a sense of fearlessness or paranoid rage.

Other observers of professional football during that time noted that amphetamine use was particularly high among members of special teams — also referred to as 'suicide squads' or 'bomb squads' - to help psych themselves up during kickoffs and punt returns when they slam into their opponents at full speed (Scott, 1971). It is very likely that until at least the 1980s, amphetamine use in pro football was relatively open and that for some teams passing around the cookie jar full of different types of amphetamines was part of the pre-game routine (Courson, 1991; Gilbert, 1969b).

Cocaine use has also been a chronic problem among NFL players. Carl Eller, an All-Pro defensive lineman for the Minnesota Vikings during the 1960s, estimated that forty per cent of professional players were regular cocaine users (Donohoe & Johnson, 1986). Vic Washington, an All-Pro running back with the San Francisco 49ers in the early 1970s, said of cocaine use, 'At the time it was viewed as giving the player an edge. . . . We were in a war out there. And using cocaine was seen as a way of getting psyched up to have an edge. I understood it at the time because we were out of reality. Pro football is not reality' (Hewitt, 1993: 100).

Not long after word of the effectiveness of anabolic steroids disseminated among weightlifters and throwers in the early 1960s, football players began to incorporate these drugs into their training regimens. In 1963 the San Diego Chargers hired Alvin Roy, a Baton Rouge gym owner, as the first strength coach in professional football. Roy, previously an assistant coach for the U.S. Olympic weightlifting team, was probably already familiar with anabolic steroids, and it is alleged that he introduced the San Diego players to Dianabol (Gilbert, 1969a; 1969b; 1969c; Mix, 1987). Some of the former Chargers say that they were not informed that the little pink pills' placed next to their plates at the training table were anabolic steroids, and they add that there was a clear implication that players who refused to take the pills would be fined (Scott, 1971). Several years later, Roy left the Chargers to become the strength coach of the Kansas City Chiefs, who were known for their massive offensive and defensive lines during their heyday in the late 1960s. According to the accounts of physicians and players, members of the Kansas City Chiefs, Atlanta Falcons and Cleveland Browns used anabolic steroids during the 1960s (Gilbert, 1969a; 1969b; 1969c). It is fair to assume that trades, coaching changes and word-of-mouth interaction among football players and other strength athletes further facilitated the diffusion of steroid use in the NFL.

From the mid-1970s to the early 1980s, the Pittsburgh Steelers were said to possess one of the most sophisticated strength programs in pro football and one of the most physical styles of play. More importantly, the Steelers were a dominant force in the NFL during this period, as well as in the

NFL's Strongest Man competitions (1980-82). Some of the athletes who contributed to this success used anabolic steroids (Courson, 1988, 1991). One cannot easily discount the effect that this might have had on the further spread of steroid use in the League, where strength and power are highly valued.

The testimony of former players supports the apparent escalation of steroid use in the NFL from the late 1970s onward. Pat Donovan, a Dallas Cowboy offensive lineman for nine years who retired in 1983, said 'Anabolic steroids are very, very accepted in the NFL. In my last five or six years it ran as high as 60-70% on the Cowboys on the offensive and defensive lines' (Johnson, 1985: 43). In the same article, the Buffalo Bills' Fred Smerlas said he thought that forty per cent of the players in the NFL used anabolic steroids. 'On some teams between 75-90% of all athletes use steroids', said former Los Angeles Raider defensive lineman, Lyle Alzado. Other NFL players estimated steroid use as high as ninety per cent (Johnson, 1985: 43).

In a 1986 article in *Sports Illustrated* (Zimmerman, 1986), Los Angeles Raider defensive end Howie Long estimated the level of steroid use in the NFL: 'At least 50% of the big guys. The offensive lines 75%, defensive line 40%, plus 35% of the linebackers. I don't know about the speed positions, but I've heard that they're used there too' (Zimmerman, 1986: 18). From the same article, 'Anabolic steroids are the worst problem in the NFL,' said Indianapolis linebacker Johnny Cookes (Zimmerman, 1986: 18).

Steve Courson, who played for the Pittsburgh Steelers and Tampa Bay Buccaneers from 1977 to 1985, stated that 'Seventy-five percent of the linemen in the NFL are on steroids and 95% have probably tried them.' (Johnson, 1985: 50) While testifying before the U.S. Senate Judiciary Committee in 1989, the Atlanta Falcons' All-Pro lineman Bill Fralic described steroid use in the NFL as rampant: 'I would say that the guys I play against - that is excluding the quarterbacks, and defensive backs and wide receivers, it is probably about 75%' (Fralic, 1989: 197).

In 1991, prior to his death, NFL All-Pro lineman Lyle Alzado charged that NFL officials had known about players' extensive use of anabolic steroids but had chosen to ignore it. He said that he used drugs during his entire career in the NFL, which spanned nearly two decades. Alzado also said he believed the teams' coaches knew that he and others were taking drugs but 'just coached and looked the other way' (Alzado, 1991: 27). One of Alzado's coaches admitted that he knew about Alzado's drug use. 'When I was coaching him, I was aware that he was using steroids,' former Oakland Raiders coach Tom Flores told Steve Kelley of the *Seattle Times* (Kelley, 1991).

The current drug advisor to the NFL, Dr. John Lombardo, has stated, 'In the late '70s and the '80s, use of steroids was unbridled, uncontrolled. . . . People felt they had to take them to compete' (Miller, 1996: G4). The precise level of steroid use in the NFL during the 1970s and 1980s probably will never be known, but it appears that it was quite substantial. Unfortunately, the question of performance-enhancing drug use in the NFL persists today.

Continued speculation of epidemic levels of drug use has been fueled further by the dramatic increase in the size of NFL players, from quarterbacks to offensive linemen (Keteyian, 1998). In 1987 only 27 NFL players weighed more than 300 pounds (136 kg), while in 1997 there were approximately 240 players over 300 pounds (Noonan, 1997). Some argue that the size increase is a consequence of high-calorie diets and food supplements such as creatine (Noonan, 1997), while others point their finger at anabolic steroids and hGH as the cause (Bamberger & Yaeger, 1997; Keteyian, 1998).

NFL officials counter that the League's year-round, random drug-testing program has limited steroid use to a few marginal players (Noonan, 1997). The very integrity of the NFL drug-testing program, however, has been brought into question. Accusations have been made of covering up positive tests of star players, allowing players to 'come back tomorrow' to give their urine sample or allowing someone else to give 'your' sample (Almond, 1993, 1995; *Sports Illustrated*, 1991). If true, all of these actions are flagrant violations of accepted testing policies. Even more disturbing is the revelation of Eric Moore, an offensive lineman for the New York Giants who was arrested in 1993 for possession of anabolic steroids with intent to deliver. During his interrogation by a Drug Enforcement Administration agent:

Moore told the agent that he was usually given advance warning of any test, the centerpiece of the NFL's drug program. Moore said he was allowed to enter the testing room alone and that he kept a clean vial of urine in his jock strap to substitute for his own specimen (Almond, 1995: C1).

All this is consistent with the comments of Dr. Forrest Tennant, the former NFL drug advisor:

When I was dealing with cocaine, marijuana, and alcohol, no problem. Everybody supported cleaning that problem up. But when we decided to move into dealing with steroids, that is when you found out how many people around the league knew they worked, knew they wanted to see certain players keep taking them, and you would run into those pockets of resistance (Burrelle's Information Service, 1992 : n.p.).

The potential problems with the integrity of the testing program, combined with the fact there is no effective test for hGH and that the tests for testosterone can be circumvented, argue that performance-enhancing drug use remains a significant and widespread problem in the NFL.

Professional Baseball

In his book, *Pennant Race*, Jim Brosnan (1962), who pitched for the Cincinnati Reds in the early 1960s, admitted using amphetamines as a 'pick-me-up'. In baseball, amphetamines are not used to increase endurance as in

cycling or to heighten aggressiveness as in football, but rather to deal with the monotony and strain of a long season and numerous road trips (Padwe, 1973). The use of amphetamines in Major League Baseball gained substantial notoriety in 1970 when Jim Bouton (1970), a pitcher for the New York Yankees during the 1960s and author of the highly controversial book, *Ball Four*, admitted using amphetamines and estimated that forty per cent of other players did as well. However, Bouton (1970: 157) argued that the drugs give a false sense of security: The trouble with them is that they make you feel so great that you think you're really smoking when you're not. . . . The result is you get gay, throw it down the middle and get clobbered'.

As with football, the size and strength of professional baseball players appear to have increased markedly during the past fifteen years. As a consequence, suspicions of anabolic steroid use have dramatically escalated during the 1990s. In 1995 Randy Smith, general manager of the San Diego Padres, stated 'We all know there's steroid use, and it's definitely become more prevalent'. (Nightingale, 1995: C1) Smith estimated the prevalence of use at ten to twenty per cent of players, while an anonymous American League general manager said, 'I wouldn't be surprised if it's closer to 30%' (Nightingale, 1995: C1). Others say forty per cent (Harvey, 2000; McKinley, 2000). Among power hitters, steroid use is estimated to be as high as ninety per cent (Henderson, 2000).

Kevin Towers, San Diego Padres general manager, has been outspoken about the prevalence of anabolic steroids in baseball and about baseball's seeming inaction: I think the stuff is more prevalent in major league clubhouses than alcohol, tobacco or any other drug, but the attitude seems to be, "Let's not worry about it until someone dies" (*Denver Post*, 2000: 25).

Perhaps Towers is correct. Major league baseball's response to all these accusations has been interesting. The baseball commissioner has blamed the strong players' union for blocking action on this issue such as instituting drug testing. The players' association, on the other hand, argues that there's is no hard evidence that anabolic steroids either improve performance or represent a health or safety hazard (Reilly, 2000a).

College Sports

Given the number of World War II veterans who attended college after being discharged, it is likely that amphetamine use was introduced to college football early on. All-American George Connor (1946-7) admitted that he took 'pep pills' at Notre Dame (Gilbert, 1969b). Rick Sortun, a star football player at the University of Washington in the early 1960s, disclosed that an assistant coach would surreptitiously give players amphetamines before each game (Scott, 1971). Surveys and athlete testimonials in the late 1960s show that amphetamine use was widespread among college football players (Padwe, 1973; Scott, 1971). In a 1997 anonymous survey, 3.1 per cent of the NCAA athletes surveyed acknowledged amphetamine use, and 29 per cent of the users stated that they obtained the drugs from a physician (NCAA Research

Staff, 1997). Although the NCAA outlawed in principle the use of anabolic steroids in 1973, it was not until 1986 that a testing program was initiated, some ten years after the IOC began testing for these drugs.

The diffusion of steroid use in college football was undoubtedly delayed by the perceptions of many coaches during the 1950s and 1960s that increased muscle mass and basic strength conditioning did not afford an advantage; some coaches persisted in this thinking even in the early 1970s. Soon after, however, coaches appeared to dismiss the 'muscle-bound' theory, and elaborate weight-training facilities and professional strength coaches became an integral part of college football.

Jim Calkins, the co-captain of the 1969 University of California at Berkeley football team, claimed that he was given anabolic steroids by the team physician in order to gain weight to play tight end (Scott, 1971). Steve Courson (1988), during his playing days at the University of South Carolina, was prescribed Dianabol by the team physician in 1974. During the 1980s, football players at Stanford, the University of Oklahoma, North Dakota State University, Salisbury State, the University of Nevada-Reno, Georgia Southern University, the University of Southern California, the University of Tennessee, Louisiana State University, the University of Pittsburgh, Northwestern University, the University of Texas, the University of Minnesota and Vanderbilt, among others, were all involved in steroid use (Huffman, 1990; *Tampa Bay Tribune*, 1985; Wadler & Hainline, 1989; Yaeger & Looney, 1993). Furthermore, two of the most famous schools in college football, the University of Nebraska and Notre Dame, have been implicated in widespread steroid use (Keteyian, 1987; Yaeger & Looney, 1993).

The University of Nebraska has been at the cutting edge in strength training at the collegiate or professional level for over three decades. Unfortunately, 'no school has a bigger reputation for clandestine steroid involvement than the University of Nebraska' (Yaeger & Looney, 1993: 50). The program placed a great deal of emphasis on strength, speed, and power. 'Nebraska at times resembled less of a football team and more of a powerlifting club . . . the powerlifting mind-set that eventually permeated the squad - that led Nebraska players closer and closer to the S-word. Not strength . . . but steroids' (Keteyian, 1987: 172-3). One of the largest criminal investigations into steroid trafficking in the United States touched Lincoln, Nebraska:

According to the U.S. Attorney's Office in San Diego, where the case was prosecuted, the investigation led to the conviction of Tony Fitton, whom the Feds considered the 'kingpin' of steroids in the 1980s. Fitton admitted supplying Nebraska players with steroids. (Yaeger & Looney, 1993: 50)

In another report, a former drug dealer described steroid use at Nebraska as 'massive' and estimated use on the 1983 and 1984 teams to be as high as 85% (Keteyian, 1987). Additional evidence of rampant steroid use

derives from a number of journalistic investigations implicating such Cornhusker greats as Dean Steinkuhler, Dave Rimington, Danny Noonan, Neil Smith, and Lawrence Pete, all of whom have admitted using steroids while at Nebraska (Keteyian, 1987; Yaeger & Looney, 1993).

Regarding steroid use at Notre Dame, Yaeger & Looney (1993: 49) concluded 'First Lou Holtz arrived at Notre Dame. Then a lot of steroids did. The connection is inescapable. It also has been devastating. The football team quickly became awash in anabolic steroids, starting in 1986'.

On the basis of the results of an anonymous survey of Division I-III athletes, sponsored by the NCAA in 1989, one would expect that on a team with one hundred football players, on average ten would have used steroids in the prior twelve months (Anderson et al., 1991). A more recent survey of NCAA intercollegiate athletes shows that steroid use is on the decline in football (down to 2%) as well as in other sports (*NCAA News*, 1997). As in the case of pro football, the purported decrease in steroid use among college football players flies in the face of significant increases in the size of players and a drug-testing program fraught with loopholes. Moreover, the validity of anonymous surveys of any group of elite athletes has to be carefully scrutinised because admitting to steroid use poses a potential threat to the athlete's scholarship and future livelihood. In addition, the fear of guilt by association and its potential to adversely affect the athlete's place in sport history may result in a hesitancy to volunteer or be truthful (Yesalis, Kopstein, & Bahrke, 2001).

In addition to football, other collegiate men's sports have been linked to anabolic steroid use: these include track and field, baseball, basketball, gymnastics, lacrosse, swimming, volleyball, wrestling, soccer, and tennis (Anderson et al., 1991; *NCAA News*, 1997; Yesalis et al., 1990).

High School

Performance-enhancing drugs also spread rapidly to adolescent sport. In the late 1960s, a West Coast athletic trainer described being approached by a track coach for grade school and high school girls to procure amphetamines for his athletes (Gilbert, 1969a). In a letter submitted as testimony to the U.S. Congress in 1973, a mother of two young boys voiced her concern that participants in a local Pop Warner football league (boys 11 to 14 years of age who must weigh less than 140 lb [63.5 kg]) were being given, or encouraged by coaches to take drugs, pepper-uppers, speed, and pills to keep their weight down (Santos, 1973). In 1968, Gilbert (1968b) described instances of use of amphetamines by high school athletes (basketball and football), with one episode involving a coach supplying the drugs.

Use of anabolic steroids by high school athletes is rumoured to have begun as early as 1959 when a physician in Texas allegedly administered Dianabol to a high school football team for an entire season. As part of a clandestine 'research' program in the early 1960s, a high school football team was reportedly given steroids by a team physician working in cooperation with a pharmaceutical company (Gilbert, 1969b). In 1965 a physician in

Bloomington, California, oversaw a study in which three different commercial brands of anabolic steroids were administered to 10th and 11th grade football players (Gilbert, 1969b). Before 1972, some high school coaches in Alabama were rumoured to have advised football players to take Dianabol to help them gain weight (Wade, 1972). By the late 1980s anabolic steroid use had been reported in high school baseball, basketball, track and field, and wrestling (Buckley, Yesalis, Friedl, Anderson, Streit & Wright, 1988). The spread of steroid use to adolescents likely has involved a variety of paths over the past four decades, including interactions with older athletes, coaches, physicians and even parents.

Other Sports

Because of the competitive nature of our culture and, in some instances, lucrative financial rewards, performance-enhancing drug use has diffused to a variety of other sports and activities. For example, there appears to be an eerie parallel between the spread of anabolic steroids in various types of horse racing with that of their use in human athletics (Cotolo, 1992). As with human athletics, rumours and accusations abound that performance-enhancing drug use is epidemic in horse racing, while others say the problem is overstated; some say drug testing is behind the times and make mention of 'designer' drugs, while others argue that testing is working; some critics say a 'get tough' policy for cheaters is long overdue, while others propose that drug use should be allowed, but in a controlled fashion; and some veterinarians even argue that anabolic steroids really do not confer a competitive advantage (Cotolo, 1992).

Even golf, a sport with a clean image that is thought by many to be synonymous with integrity, has been under a cloud of doping for over thirty years. In golf there is a constant battle against tension. In 1968, Gilbert (1968b) reported on the use of sedatives and tranquilisers for their 'calming' effect by such players as Doug Sanders, Dave Hill and Al Geiberger. In 2001 the new calming drugs on the golfing menu are beta blockers, which moderate the effects of adrenaline and decrease heart rate (Blauvelt, 2001).

Other sports and activities now under the shadow of doping include rugby, professional wrestling, Paralympics and even pigeon racing (*Chicago Sun-Times*, 1994b; O'Brien, 1993; Reilly, 2000b; Reuter Information Service, 1995; Struman, 1992; *USA Today*, 1992).

Conclusion

In 1939 Ove Boje appeared to clearly understand the core issues involved in doping:

There can be no doubt that stimulants are to-day widely used by athletes participating in competitions; the record-breaking craze and the desire to satisfy an exacting public play a more and more prominent role, and take higher rank than the health of the competitors itself (Boje, 1939: 439-40).

Looking at elite sport in the twentieth century through the eyes of historians and journalists as well as the athletes themselves, an unmistakable picture emerges of a doping pandemic of huge proportions in elite sport. Sport federation officials, however, most often either have tended to deny that a major doping problem exists or have at least downplayed its magnitude (*Chicago Sun-Times*, 1994a; Donohoe & Johnson, 1973; Gilbert, 1969c; *Milwaukee Sentinel*, 1993; Shipley, 2000; *Sports Medicine Digest*, 1996). In fact, when the Dubin Commission (Dubin, 1990: 336) in Canada investigated the extent of doping in Olympic sport, its report referred to a 'conspiracy of silence' and a 'pact of ignorance' among those in sport organisations when it comes to discussing the issue of drug use. Ten years later, another investigation of doping in Olympic sport again concluded that in the rush for gold, governments, coaches or trainers have often turned a blind eye or have actively supported the use of performance-enhancing substances (National Center on Addiction and Substance Abuse, 2000). When pushed, however, some sport officials eventually acknowledge, they have had problems in the past, but things are different now (*Champaign News Gazette*, 1995; *Chicago Tribune*, 1992; *USA Today*, 1998a; Yesalis, 1996; 2000).

Although it has taken over a century, there presently appears to be a consensus among various interest groups, including many athletes, physicians, coaches, administrators and spectators, that performance-enhancing drug use in most sports is a serious and growing problem. Numerous international and national meetings as well as a variety of books and reports have been devoted exclusively to this issue (Dubin, 1990; Lin & Erinoff, 1990; National Center on Addiction and Substance Abuse, 2000; National Steroid Consensus Meeting, 1989; U.S. Drug Enforcement Administration, 1994; Voy, 1991; Yesalis, 1993, 1995; Yesalis & Cowart, 1998).

As with many problems that are long-standing and vexing, society seeks not only solutions but also someone or something to blame. Most, if not all, the blame to date has been laid at the feet of the athlete by politicians, the press, sport federations and the medical community. In this regard, when we review the history of performance-enhancing drug use in sport, ironies present themselves. Not only did the medical community develop these drugs, but it also played a role early on in 'selling' these potential fountains of youth. It was physicians and trainers who administered powerful 'stimulants' to a variety of athletes in the nineteenth and twentieth centuries. It was a physician and some officials and supporters of the U.S. weightlifting team who initiated use of anabolic steroids in the 1950s. It was government scientists and sport federation officials who institutionalised use of performance-enhancing drugs in several countries. It was physicians and/or coaching staffs at the professional, collegiate or high school level in a number of instances who provided the substances or facilitated or encouraged the use of anabolic steroids and other drugs, the most recent example being the 1998 Tour de France doping scandal. It was physicians who served as the primary source of anabolic steroids for over one-third of the steroid users in

this country (Scott, 1971; Yesalis et al., 1990; Green, Uryasz, Petr, & Bray, 2001). Sport federations for decades covered up the doping problem, conveniently looking away or instituted drug-testing programs that were designed to fail (Dubin, 1990; Franke & Berendonk, 1997; Longman, 2000; National Center on Addiction and Substance Abuse, 2000; Voy, 1991; Yesalis & Cowart, 1998). As Boje described over sixty years ago, it is our society that emphasises and rewards speed, strength, size, aggression and, above all, winning. As with other types of drug abuse, doping in sport is primarily a demand-driven problem. In this instance demand encompasses more than the demand for performance-enhancing drugs by athletes and includes the demand by the fan for the high-level performances that doping brings. Arguably, the behaviour of athletes and sport officials are congruent with the desires of their customers. Thus, a key question is, How concerned are sport fans about doping? It is likely that the large majority of them really do disapprove of drug use in sport, but the real question is, do they disapprove enough to turn off their televisions?

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