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NEWS AND COMMENT

Anabolic Steroids: Doctors Denounce Them, but Athletes Aren't Listening

The scene is the auditorium of the Masonic Temple in Detroit, filled to near capacity with a turbulent audience. A brisk succession of scantily clad young men step up onto the spotlighted podium and exhibit, to music, their physical endowment. In a minute's worth of briefly held poses, each displays to best advantage his outsized arm and chest muscles, Herculean thighs, and a back that resembles a tangle of knotted ropes. The victor of this unusual modeling show will be Mr. America 1972. He can cherish the ambition of becoming Mr. Universe, an example to the world of how the human frame can be improved upon by only exercise and temperate living. Except that in recent years several Mr. America's have carried off the proud title not by their own unaided efforts, but with the help of anabolic steroids, powerful drugs that are synthetic derivatives of the male sex hormone.

Anabolic steroids feature heavily in a drug subculture that includes bodybuilders, professional footballers, and strength athletes, such as weight lifters, shot-putters, and hammer and discus throwers. Among U.S. Olympic competitors, particularly the weight lifters, consumption of anabolic steroids is probably reaching a peak this month—in a few weeks, athletes will have to lay off the drug in order to be sure of flushing all traces out of their system before the Olympic games in August. U.S. athletes will have no monopoly on steroids. Rumor has it that the drugs are widely used by South American, Russian, and European athletes. According to one member of the committee responsible for selecting the U.S. weight lifting team, victory in the Olympics has become a question of which country has the best doctors and chemists.

Just what anabolic steroids do to the human frame is a question that receives different answers from athletes, from the sports and medical establishments, and from the scientific literature. The few scientific studies that have been done are a mixed bag, some suggesting that steroids do no good for athletes, others that they are effective. The athletes who take them believe that anabolic steroids help to increase weight and muscular strength. They do so despite the warnings of sports officials and senior sports doctors, who insist that steroids do not increase muscle but do have a variety of unpleasant side effects. The American Medical Association "categorically condemns" the use of steroids by athletes. "Use of steroids is a complete waste of time and money," says Allan Ryan, team physician at the University of Wisconsin and a past president of the American College of Sports Medicine. Daniel Hanley, official doctor to the U.S. Olympic team, believes flatly that steroids have "zero effect" on muscle strength. Hanley is also a member of the International Olympics Committee medical commission, which, in a recent booklet entitled *Doping*, warned: "Anabolic steroids can severely harm the health, causing liver and bone damage, disturbances in the metabolic and sexual functions, and, among women, virilization and menstrual upset."

For a drug that, according to informed medical opinion, is both ineffective and hazardous, anabolic steroids are rather widely used. Any amateur athlete caught taking a nontherapeutic drug is liable to disqualifi-

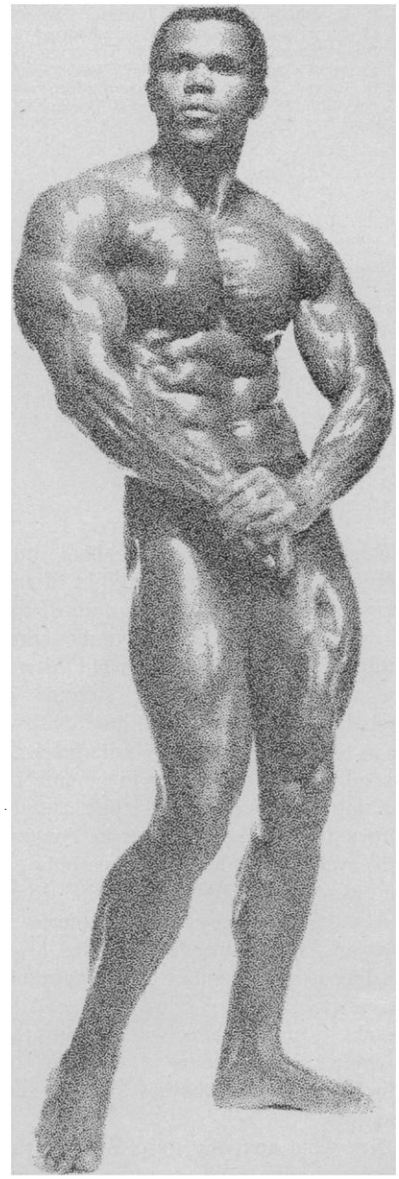
cation, so most estimates of usage depend largely on anecdote and training room gossip. Between 10 and 25 percent of weight lifters use steroids, according to Russell Wright, president of the medical committee of the International Federation of Weight Lifting. But Donald Cooper, medical committee chairman of the National Collegiate Athletic Association (NCAA), says that 80 to 90 percent of all weight lifters in the world are taking steroids. The weight of opinion seems to favor the higher estimate. Pat O'Shea, an exercise physiologist and member of the U.S. Olympic Weight Lifting Committee, told *Science*: "If we were informed we could not select an athlete taking steroids, we simply wouldn't have a team."

Reliance on anabolic steroids appears to be equally widespread among body-builders. John Grimek, a former Mr. America and now editor of *Muscular Development*, estimates that a preponderance—"between 99 and 101 percent"—of the entrants in the Mr. America contest held in Detroit last month were taking or had experimented with steroids. (Grimek himself believes the drugs are hazardous and offer little, if any, benefit to the physique.)

Professional footballers (about 75 percent, according to one estimate) are another group who use steroids to build up or retain body weight. Use of the drug is not confined to professionals; in Alabama, even high school coaches are rumored to advise young men to put on some weight with Dianabol in order to be considered for the football team.

Many of these users take steroids in large, sometimes massive, doses. In supervised trials, the usual dose is less than 10 milligrams per day for a 6-week course. But private users are tempted to keep on raising the dose. Some athletes are reported to take 5, 10, or 20 times the recommended amount. The most popular brand of anabolic steroid is Ciba's Dianabol, followed by Winthrop's Winstrol and Searle's Anavar. South American athletes are said to prefer stanozolol. The approved use of all these drugs is confined to treatment of debilitated patients and specific diseases such as pituitary dwarfism. The ready availability of the drugs to athletes appears to be largely though not entirely on a black market and under-the-counter basis.

Anabolic steroids have a murky history of use, which may, in part, account for the scanty interest shown in them to date by medical researchers. The first use of male steroids to improve performance is said to have been in World War II, when German troops took them before battle to enhance aggressiveness. After the war, steroids were given to the survivors of German concentration camps to rebuild body weight. The first use in athletics seems to have been by the Russians in 1954. John D. Ziegler, a Maryland physician who was U.S. team physician to the weight lifting championships in Vienna that year, told *Science* that Soviet weight lifters were receiving doses of testosterone, a male sex hormone. The Russians were also using it on some of their women athletes, Ziegler said.



Muscles like these are developed by training. But some body-builders believe steroids can help towards this ideal. [Adapted from *Muscle Builder*]

Besides its growth-promoting effect, testosterone induces male sexual development such as deepening of the voice and hirsuteness, which might account for the manifestation of such traits in Soviet women athletes during the 1950's. Present-day anabolic steroids stem from the discovery that testosterone can be chemically modified to diminish its sexual function, while preserving its growth-promoting, or anabolic, effects. Ziegler was probably the first in the United States to test the new anabolic steroids on athletes. "I thought they were great at first," Ziegler told *Science*. "I had some weight lifters who said the Dianabol helped them a lot. But then I gave them placebos and they said it helped them the same amount." Ziegler acknowledges the remarkable effect of Dianabol on debilitated patients, but believes that with normal people its influence is mostly psychological. He gave up experimentation with athletes when he learned that some who had taken 20 times the recommended dose had developed a liver condition. "I lost interest in fooling with IQ's of that caliber. Now it's about as widespread among these idiots as marihuana," Ziegler says. Ziegler's experiments were conducted in 1959, since when anabolic steroids have grown increasingly popular. By 1965, the drug was widely used among body-builders and weight lifters, and it now seems to have become almost universal.

Universality has not brought enlightenment as to the drug's effects, at least on the normal physiology. There seems little doubt that for debilitated patients the anabolic steroids afford notable gains in both weight and strength. But, like vitamins, they are not necessarily helpful in excess. What metamorphosis can the man in the street expect from anabolic steroids—will they turn him into a Hercules, as the athletes believe, or will they damage his libido and make him sing soprano, as the sports medicine publications insinuate? That the most basic facts about the drug are still in dispute is due to a combination of circumstances, of which athletes are the chief victims. The manufacturers of anabolic steroids are presumably not unaware of the drugs' market among athletes, but, because this use is not approved by the Food and Drug Administration, pharmaceutical companies neither promote anabolic steroids among athletes nor assume any responsibility for how

the drugs are taken. A spokesman for Ciba, makers of Dianabol, said the company has never conducted any studies into the effect of the drug on athletes. The package insert for Dianabol warns specifically, "Anabolic steroids do not enhance athletic ability." An FDA official told *Science* that the warning was required because the manufacturers had failed to provide evidence that anabolic steroids are effective for athletes. Thus the "do not enhance" in the package warning means only "have not been proved to enhance."

Medical researchers have shown little interest in the messy task of sorting out the psychological effects of anabolic steroids on athletes from the physiological effects. As for sports organizations such as the NCAA and the Amateur Athletic Union (AAU), the use of any drug is contrary to their ethos, and official attitudes range from reluctance to discuss the issue to an outright denial that the drugs are efficacious.

Such controlled studies as there are, most of them conducted by team physicians or physical educators, do little to resolve the salient issues of steroid efficacy. A recent double-blind study by S. W. Casner, former team physician at the University of Texas, indicated that an anabolic steroid caused subjects to put on weight but that the weight gain, Casner and his colleagues inferred, was in the form of retained water, not extra muscle* (the steroid used was stanozolol).

The most extensive series of experiments with anabolic steroids had been conducted by O'Shea and his colleagues at Oregon State University. In a 1969 study with Dianabol, O'Shea found that treated subjects gained significantly in weight and strength over matched controls.† (Crucial to O'Shea's treatment is that the athletes are fed a high protein diet and are made to train intensively during the anabolic treatment.) The design of this study has been criticized because athletes knew whether or not they were receiving steroids. O'Shea has now repeated the study according to a double-blind design with essentially the same results.‡ After a 4-week course of 10 mg of Dianabol per day, treated subjects increased their body weight by 5 percent (untreated controls gained less than 1 percent). The weight gain was presumably in the form of muscle, since the subjects, who were trained weight lifters, increased their weight-lifting ability by an average of 18 percent. It seems not unreasonable to infer, O'Shea concludes, "that a nutritional and physiological basis exists for the use of anabolic steroid agents for the purpose of improving physical performance."

With the moderate doses he used in these studies, O'Shea has observed no sexual effects, and the subjects reported no reduction in sexual appetite. (Paradoxically, administration of male sex hormone tends to reduce sexual drive by activating a hormonal counter-response.) The only side effect that turned up in O'Shea's studies is muscle cramps, which can be overcome by

* S. W. Casner, R. G. Early, B. R. Carlson, *J. Sports Med. Phys. Fitness* **11**, 98 (1971).
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Briefing

"High Hopes" for Chinese Exchanges

Chinese-American scientific exchanges were the subject of much of the talk last month between representatives of the Federation of American Scientists (FAS) and Chinese scientists and government officials. Just back from a month-long tour of China, FAS Executive Director Jeremy J. Stone will say only that he has "high hopes" of an exchange in the near future, but it appears nonetheless, that the date of a visit to America by Chinese scientists has been substantially advanced by the FAS trip.

A key concern the Chinese have, Stone reports, is for the security of anyone they might send. They have read about the assassination attempt on Wallace, of student demonstrations, and other forms of violence, and they wonder whether their nationals would be safe. Another question they ask themselves, Stone said, is whether an American university that had students with Chinese Nationalist backgrounds would be following a two-Chinas policy if it welcomed visiting mainland Chinese. One possible solution, even referred to by Premier Chou En-lai, Stone reports, would be traveling delegations or visitors to a series of institutions. The FAS is sending three prominent economists to China this fall.—D.S.

DBS Scientist to Head New Vaccine Bureau

A new director has been announced for the former Division of Biologics Standards (DBS), now the Bureau of Biologics in the Food and Drug Administration (FDA). He is Harry M. Meyer, chief of the DBS Laboratory of Viral Immunology and leader of the team that developed German measles vaccine.

The committee appointed by the National Institutes of Health in April to search for a successor to DBS Director Roderick Murray seemed to have been casting around for a big-name scientist from outside the DBS. With the transfer of the DBS to the FDA, appointment of the new director fell to FDA Commissioner Charles C. Edwards. His surprise choice of Meyer, whose name had not been widely mentioned as a possible candidate, together with the appointment of another DBS scientist, Ruth L. Kirschstein, as deputy director, is an expression of confidence in the DBS staff and will doubtless do much for the division's morale, which has taken some knocks in recent months.

In the controversy that has polarized the DBS for more than a year, Meyer has sought to retain a neutral position between the DBS establishment, as represented by former director Murray, and critics such as DBS staffer J. Anthony Morris and consumer advocate James S. Turner. Meyer thus has a good chance of being able to heal the division's internal wounds. As a working virologist, his appointment guarantees that science will play a dominant role in the operation of the future DBS, a condition for which its new environment did not otherwise augur well.—N.W.

magnesium tablets. The long-term effect of moderate doses, if any, is unknown.

Excessive doses of anabolic steroids are likely to result in the liver and bone damage described in the Olympic committee's antidoping booklet. Other unpleasant effects include shrinkage of the testicles and swelling of the prostate gland. These symptoms seem partly or wholly reversible. Those who believe steroids help an athlete put on muscle say that about a third of the extra muscle is lost when steroid treatment is stopped. One effect that is not reversible is in young boys; the drugs cause premature ossification of the long bones and may, in certain cases, stunt growth. O'Shea believes anabolic steroids should not be taken under the age of 22, and in any case only after careful medical evaluation. But he dismisses as "scare tactics" the warnings put out by the medical committee of the NCAA.

In O'Shea's hands, anabolic steroids are both effective (at least with weight lifters) and free of side effects (apart from muscle cramps), while in the studies cited by official sports doctors the drugs are inefficacious.

O'Shea's studies clearly need to be repeated by others before the efficacy of anabolic steroids can be proved or disproved. It would probably require a clear disproof, or discovery of a particularly damaging side effect, to shake athletes from their attachment to steroids. Even if the drugs gave only a fractional boost to performance, this might make the difference between winning an event or breaking a record. The steroids are also said to induce a feeling of well-being, which alone would guarantee a measure of popularity.

Opinions on the efficacy of anabolic steroids tend to run parallel with respective positions on ethics. Official athletic organizations such as the Olympics committee, the NCAA and the AAU, all of which exist to serve the ideal of the amateur in sports, state flatly that the use of any drug for a nontherapeutic purpose is unethical. In weight lifting and body-building, which have always been more players' sports than gentlemen's, the athletes see a distinction between steroids, which may be taken weeks before an event, and drugs such as amphetamines, which affect performance more instantaneously. Steroids, they say, are fair play.

The ethics issue is likely to remain an academic point until a practical test is developed to ascertain whether an athlete has been taking steroids. Steroids, in any case, are part of a larger phenomenon, which some describe as faddism, others as a special drug culture, among athletes. Bill Bates, former head trainer of the New England Patriots, dismisses steroids as "just another example of faddism among athletes, like ice massage, isokinetics, brewer's yeast or vitamins." But Bill St. John, a Mr. America finalist of Glassboro, N.J., says of steroids and other drugs used by athletes, "It's crazy the way some of these guys abuse these medicines—it's like a real drug culture we live in." Athletics has certainly not remained entirely free of the drug culture in society at large. Last fall, for example, a spot check of the Delaware State University football team revealed that about a fifth of the players had been taking drugs, including LSD, amphetamines, barbiturates, and heroin. Among professional footballers, the use of amphetamines is rife—the drugs are sometimes put out in the training room, according to Bates—and there are rumors that cocaine is taken too. Amphetamines have also been popular among weight lifters, at least until the National Championships in Columbus, Ohio, last year. Holders of the top six

NCI Announces Award for Fort Detrick

The National Cancer Institute last week awarded a contract to Bionetics Research Laboratories to begin converting the Army's former biological warfare facilities at Fort Detrick, Maryland, into a cancer research center. The contract, $6.8 million initially and planned to be worth $15 to $20 million a year in 5 years time, marks the arrival of biologists in the big-time spending league already reached by physicists building accelerators and geologists constructing Moholes.

Announcing the award of the contract last week Frank J. Rauscher, new director of the National Cancer Institute, said the Fort Detrick facilities will be used to study viruses and chemicals that cause cancer in animals, to continue the search for chemotherapeutic drugs, and to produce and maintain experimental animals. In other words no new initiative is planned for Detrick, only the extension of the NCI's existing programs in virology, carcinogenesis, and chemotherapy. Probably all of the 12 projects already designed for Detrick could be carried out equally well elsewhere. Detrick's facilities for handling dangerous viruses will doubtless be useful but not invaluable—the NCI has not yet outgrown the $3 million high containment laboratory recently completed for it at the National Institutes of Health.

A measure of uncertainty as to what to do with Fort Detrick is not altogether surprising. The massive installation consists of some 286 buildings and employed, in its heyday, 1800 people. After President Nixon's renunciation in November 1969 of offensive biological warfare, Fort Detrick's raison d'être ceased, but the search for alternative uses ran into trouble. The various institutes of the NIH bid to convert some of Fort Detrick's biological equipment to medical research. Of the $15 million that NIH said the conversion would cost, only $1.5 million was attributable to projects the National Cancer Institute wished to undertake. The NIH bid presumably represented the best civilian use that could be made of Fort Detrick, yet Congress was not persuaded to vote the money. The decision to salvage Detrick for the NCI arose from the cure cancer crusade launched by the White House last year to offset Senator Edward M. Kennedy's initiatives in the cancer field.

Bionetics, the company which has carried off the Detrick contract amid a field of 16 bidders, already holds several sizable contracts from the NCI. Even though scientific merit may not have been the exclusive reason for Fort Detrick's escape from mothballs, the site may nevertheless prove a promising location at which to centralize virus production, animal holding, and other cancer-related support services. Fort Detrick in its new lamb's clothing would well become a positive factor in the fight to cure cancer, as well as in the White House's cure cancer crusade.—N.W.

places had to be disqualified after the event, when analysis of urine samples revealed that all had taken Dexedrine. A drug problem of a different nature, affecting professional footballers, is the use of pain killers such as novocaine to enable a player to continue playing even when injured. Vince Lombardi, for example, took the line that no player was ever injured—"A man would have to have a bone sticking out of his skin for Lombardi to let him off," says one football trainer.

Though amphetamines and steroids are taken primarily in the belief that they will improve performance, both drugs impart a psychological kick and to this extent are no different from heroin, marihuana, and the drugs used by society at large. That athletes, the supposed exemplars of clean living and respect for their own physiology, should be so deep into drugs is presumably a consequence, at least in part, of the pressures to which they are subjected. In professional football, the advent of big gates and superstars has led some managers to use any means available to keep a player on the field. In athletics, the unceasing upward march of world records has compelled trainers to demand more and harder training schedules of their athletes. Swimmers may be required to swim 5000 yards a day, long- and middle-distance runners to run 150 miles a week. "You can't ask this of these guys and expect them to submit to the average man's diet," says O'Shea. "At every meet you go to you see world records broken in one class or another. How far can you go before something gives way?" asks St. John. If athletics is already approaching the limits of normal physiology, it is maybe inevitable that athletes will turn to artificial means to coax the last twitch of energy out of a fatigued muscle or to improve upon the masculinity of potential Mr. Americas. But the gentlemen who set the rules seem happier denouncing steroids than trying to understand the trials and temptations that push today's athletes into drugs.—NICHOLAS WADE

Dual Publication: "Ingelfinger Rule" Debated by Scientists and Press

How much should a scientist tell a journalist about his work? When? If he tells too much, too soon, does a reporter's account of his research constitute publication that legitimately precludes the investigator from subsequent publication in the "professional literature?"

These questions perennially plague, and often strain, relations between scientists and the press. Whenever they are raised, as they were recently at a meeting on scientists and the media, which the Federation of American Societies for Experimental Biology (FASEB) sponsored in Hershey, Pennsylvania, representatives of both sides call for their immediate resolution, but no pat answers are on the horizon. Thus the need for resolution persists and the debate continues. It is most intense when it focuses on the "Ingelfinger rule," named after its most ardent proponent, Franz J. Ingelfinger, editor of the *New England Journal of Medicine*. It appears that the Ingelfinger rule, which many scientists and reporters consider too rigid, might bend a little.

The Ingelfinger rule concerns itself with prior publication of research in the medical news media. "In general," Ingelfinger wrote in *Science* (28 August 1970, page 835), "the *Journal*'s attitude would be influenced in a negative way if the principal ideas of an article, as well as its crucial data and most important figures, had already appeared in a medical news medium—just as the effect would be negative if the identical items had been published by a paradigm of staid medical literature." According to the rule, an investigator should refrain from cooperating with the press to any great extent—giving texts from which to quote and slides or tables for reproduction—even with regard to work that has been formally presented at a recognized scientific meeting. Herein is the rub. Many reporters and scientists believe that material presented in such a forum is fair game, that, as far as the press is concerned, presentation at a meeting constitutes publication of a sort. Therefore, following this line of thought, a scientist who cooperates with the press under such circumstances is not guilty of circumventing peer review.

Ingelfinger agrees with this point of view only in part. "Journalists," he says, "have a duty to report developments in science and medicine." He draws the line at what he considers full disclosure in a specialized newspaper or magazine.

Ingelfinger feels so strongly about this that he occasionally discards an already accepted paper because of a news report that beat the journal into print. He estimates that he drops six or seven papers a year for this reason. Thus far in 1972, he has discarded one. (He is reluctant to disclose the particulars of that case.)

Ingelfinger stresses that he feels competitive only with the medical press. Contrary to what many persons assume, he has no quarrel with what is presented in daily lay newspapers. Nevertheless, this distinction blurs in the minds of both reporters and scientists who tend to react to the Ingelfinger rule as if it applied to any form of news coverage whatever. Many investigators behave as though the ground rules for publication in the *New England Journal of Medicine* applied to other journals as well. Ingelfinger wishes it did.

Thelma Heatwole, who runs the press operation at a number of meetings, including FASEB in the spring and the American Association for the Advancement of Science in the winter, observes that when she asks speakers for texts of their papers she is frequently confronted with their fears about violating the Ingelfinger rule even though they may have no intention of submitting a paper to the *New England Journal of Medicine*.

There are two motives behind Ingelfinger's attitude toward the press. First, the gastroenterologist turned editor has printer's ink in his blood and, quite simply, does not want to be scooped. "Why," he asks, "should people want to read my journal if they know that most of what is in it is likely to have appeared already in *Medical World News* or *Medical Tribune?*" Disputing the common counter-argument that the