

Research

Conflicting Information and Unknown Risks Surrounding Counterfeit Anabolic Steroids

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Abstract

Anabolic-androgenic steroids (AAS) have been a topic of considerable concern to both the sporting and medical communities. Pursuant to this problem, extensive literature has been devoted to AAS and the potential physical problems associated with using and abusing. Most literature only addresses the use of pharmaceutical-grade steroids regardless of the overwhelming prevalence of counterfeit steroids world-wide. When comparing resources pertaining to counterfeit steroids, numerous inconsistencies and information gaps become apparent; what constitutes a counterfeit steroid, how much of the steroid supply is counterfeit, and the potential physical risks of using these drugs. For those who academically or persuasively address steroid use and abuse, the risks of counterfeit steroids are rarely addressed. Scientific information on counterfeit steroids is not abundant, however recent strides have been made with respect to understanding the nature by which these drugs are counterfeit as well as what percentage of the available supply is counterfeit. Copious amounts of information can be found in legal, governmental, lay-literature, and on numerous websites. It is the purpose of this article to discern what constitutes a counterfeit steroid, how much of the supply is counterfeit, and the potential risks from counterfeit steroids.

Introduction

The known side effects of using or abusing anabolic-androgenic steroids (AAS) notwithstanding, an inherent risk of using steroids as they are today is the presence of counterfeit steroids. Interestingly, professional organization position stands give relatively little attention to this topic, while governmental, law enforcement and lay-literature resources are more forthcoming.¹⁻¹¹ Only recently has there been a large-scale research publication on this topic.¹² Likely, the most attentive entities with respect to

counterfeit steroids are the countless internet websites devoted to providing steroid information, sales, and anti-scramming information.¹³ Proprietors of many such websites, their moderators, and their membership maintain an almost hyper-vigilant watch on counterfeit steroids. Many sites actively report scammers and warn against the deceptive practices of those who sell steroids; however these very same sites may engage in the same questionable practices to drive revenue. Such practices may include selling counterfeit products, hosting pay-for-view lists of so-called “authentic” suppliers of steroids, or selling products that are clearly marketed as steroids, but are at best steroid-like in name only.¹³

Due to the frequently interconnected nature of different steroid-related websites, many deceptive sales tactics and recommendations are believed to direct business away from other sites to their own.¹³ Steroid-related Internet business appears to thrive on paranoia created in this environment. For whatever reason, creating fear of a counterfeit product-base in a credibility-challenged environment appears to keep many websites in business. Precisely understanding why investigating anabolic steroids sold in a less than honest online environment is even relevant may be difficult to appreciate. However, according to a report presented to the U.S. House of Representatives in 2005, the Internet is now the most widely used means of buying steroids illegally and most illegal steroids in the United States come from abroad.⁹⁻¹⁰

The Concern Surrounding Counterfeit Steroids

Among the numerous available forms of steroid-related media, most fail to answer three principal questions with clarity. First, what constitutes a counterfeit steroid? While there are formal definitions of the term counterfeit, its definition as related to drugs is complicated by a person's point of view or country of origin.¹¹ Interestingly, what is considered counterfeit in one country may be considered normal or only substandard in a different country. Second, how much of the illegally obtained steroid supply is counterfeit especially those obtained through the black market or the Internet? There appears to be substantial variances in the numerical estimates of counterfeit steroids given by research, governmental institutions, websites, and numerous private entities. Third, what are the origins and risks of using counterfeit steroids? As it appears, the origins and risks of these steroids may be intertwined. Often how the drugs were produced may determine the risk of use. Since it is generally not specified to the contrary, the copious amounts of literature that address steroid-related side effects assumedly address side effects known to occur with pharmaceutical-grade steroids. In the world of illicit steroids, pharmaceutical-grade steroids do not appear to be the standard of quality. Large- and small-scale seizures of these drugs by law enforcement agencies have shed light on the origins of steroids on an international scale.⁴⁻⁹

Researching Counterfeit Steroids

Researching what constitutes a counterfeit steroid, how much of the available supply is counterfeit, and understanding the origins and risks of counterfeit steroids are relatively straight forward. Gaining the proper perspective requires an expansion of research resources to less-traditional venues that are authoritative, but possibly outside of the peer-reviewed realm. Websites providing reliable resources regarding counterfeit steroids and related topics include, but are not limited to the World Health Organization, the United States Drug Enforcement Administration, and the United States Food and Drug Administration. Respectively these websites provide credible information on the global proliferation of counterfeit drugs, the nature of drug seizures and legal proceedings, and safety and marketing practices.

Within these sites, using search terms such as “counterfeit steroids”, “counterfeit drugs”, “anabolic steroids”, and “supplements steroids” are effective for locating relevant materials. It is the purpose of this article to discern what constitutes a counterfeit steroid, how much of the supply is counterfeit, and the potential risks from counterfeit steroids.

What is a Counterfeit Steroid?

What constitutes a counterfeit steroid officially and unofficially are often dissimilar. Officially, counterfeit steroids are not separated from other counterfeit drugs. To that extent, the magnitude of the counterfeit steroid problem is not precisely known since no global study has been carried out.¹¹ Between January 1999 and October 2000, there were 46 confidential reports of counterfeit drugs to the World Health Organization (WHO), only forty percent of which were from developed countries.¹¹ The report noted that few countries were willing to provide information about incidences of counterfeit drugs. To further complicate this issue, WHO member states do not have consistent distinctions between counterfeit and substandard drugs, thereby making accurate estimates of counterfeit drugs even more difficult. The drugs named in the report occupy six different categories of counterfeit classification; 1) products without active ingredients, 2) those with incorrect quantities of active ingredients, 3) those with the wrong ingredients, 4) products containing correct quantities of active ingredients but with fake packaging, 5) those that are copies of an original product, and 6) products with high levels of impurities and contaminants.¹⁶ Steroids and hormones comprised two of the six drug classifications most recognized as counterfeited substances. In many cases, little is known about the true contents of these drugs as these factors were either not analyzed or released.¹¹

Unofficially, defining counterfeit appears much simpler. A large amount of online rhetoric is designated to discussing what the online community refers to as “fake gear”. Online steroid-related forums and venues typically, but not exclusively regard counterfeit as being tainted with some foreign substance, not being effective, or containing something other than what was purchased. The principal concern regarding the use of illegally obtained steroids is that so many of them are regarded as counterfeit.^{4-9, 14-19} Unfortunately, most warnings about the existence of counterfeit steroids are superficial and contain few specifics as to what that means. To date, only one scientific investigation explores likely physical consequences due to using counterfeit steroids.¹⁹

How Much of the Steroid Supply is Counterfeit?

Estimates of the percentage of steroids that are counterfeit are extremely varied and are often speculative at best. Historically, refereed investigations have been quite limited in sample size and scope.^{14-16, 18-19} Collectively, six categories of information address this topic; commercial websites, refereed scientific publications, governmental or world-health entities, private, non-commercial websites and numerous non-refereed publications. Commercial websites provide steroid-related services ranging from steroid information sites to rogue online pharmacies. Information contained within these sites generally asserts that 90-99% of steroids sold online or otherwise are counterfeit.¹³ Seemingly, claims of this level of prevalence are used to promote online business. Currently there are no refereed publications that support claims of this magnitude.

Most refereed toxicological investigations of steroids fail to describe the exact content of the supposed steroid as compared to the label. Most describe the nature of the product relative to the product label.^{12, 14-19} Most investigations use gas chromatographic and mass spectrometric methods to analyze

the product. In what is likely the largest refereed investigation of counterfeit steroids, da Juesta Nevis and colleagues investigated 2,818 samples of seized steroids from Paraguay and Brazil. In all, they found that 31.7% of seized products were counterfeit. Almost half of the samples did not contain declared substances and 28.3% had non-declared substances.¹² Coopman and Cordonnier analyzed 74 black market pharmaceutical preparations commonly distributed among bodybuilders. Twenty-five of the 74 products did not match their label. Of the 40 oil-based injectable steroids analyzed, the active ingredients in 21 (52.5%) did not match the label, one did not contain an active ingredient, and remaining 20 samples contained other or more active ingredients.¹⁷ In 2012, Pellegrini and colleagues performed toxicological analysis on 15 steroid preparations from the black market. Two of the samples were compliant with their labeling. In the remaining 13 preparations, there was either no active substance or the substance was different from the labeling.¹⁸ In 2008, Thevis and colleagues analyzed seventy different drugs (steroids) confiscated from house searches.¹⁶ Forty-eight of the seventy samples were steroidal compounds. Seventeen of the 48 samples (35.4%) did not contain the declared ingredients. In most cases the actual content of the drug was a different type of steroid or steroid-blend than the label claimed. This investigation also brought to the forefront the growing sophistication of counterfeiters. Investigators noted that visual inspections were no longer adequate to detect counterfeit products as compared to authentic.¹⁶

An investigation of image-enhancing drugs (steroids and HGH) was conducted by Graham and associates in conjunction with the World Anti-Doping Agency (WADA). Steroids and HGH confiscated from the underground market, were analyzed by a WADA accredited laboratory.¹⁹ In this investigation, thirty-eight injectable and nineteen orally administered samples were analyzed to determine product integrity. Four of the nineteen oral samples were labeled as stanozolol, but only one actually contained that steroid. In the three that were not stanozolol, two were completely different steroids than the label claimed and the remaining sample did not contain an active ingredient. The other fifteen oral samples contained the proper ingredients. Eighteen of the 38 vials of injectable steroids contained what the label claimed. Eight contained something other than what the label claimed. The remaining vials did not contain an active ingredient. Overall, 42% of the 57 samples were determined to be counterfeit by virtue of not meeting label claims.¹⁹

Musshoff, Daldrup, and Ritsch (1997) analyzed forty-two anabolic steroid products found on the illegal market in Germany.¹⁴ Thirty-five point seven percent (35.7%) of these samples were found to be counterfeit. In many cases, cheaper steroidal agents were substituted for labeled drugs. In 2000, Ritsch and Musshoff analyzed German black market steroids.¹⁵ As was similar to the previously mentioned inquiry, they found that fifteen of the forty samples (37.5%) contained a different compound than listed or no pharmacologic agents. It was also noted in this investigation that “differentiation between original and fake packaging was impossible”.

A 2005 report published on the United States Government Accounting Office website and presented before the U.S. House of Representatives detailed a governmental purchase of anabolic steroids over the Internet.⁹ In this inquiry, purchases of anabolic steroids were made over the Internet by investigators. A total of twenty-two orders were placed through twenty-two randomly chosen websites, using a fictitious name and email account. Only fourteen of the twenty-two orders (63.6%) were received. Following FDA laboratory testing, ten of the fourteen were deemed anabolic steroids. Four of the fourteen samples were found to be something other than steroids. Ten of the samples that did contain steroids came from abroad. The samples originating from sources within the United States contained no steroid-compounds.⁹

The website, <http://anabolic-steroids.info/>, claims to be an independent, non-commercial website. According to the site authors, the site exists to inform athletes about anabolic steroids, their effects, side-effects, and legal issues. Purportedly, the only fees accepted are for supporting lab tests of black-market steroids. Interestingly, the proprietors of the website provide instructions for those who have obtained steroids to send small samples of their drugs and accompanying packaging for analysis and authentication. An author for this site claims to have facilitated the analysis of hundreds of steroid samples from many different pharmacies in Europe. Proprietors of this site claim to have tested, "more than 300 different products from 42 online pharmacies". According to posted results, sixty-five percent of drugs analyzed had little or no active ingredient. Twenty-three percent (23%) contained a less active ingredient. Twelve percent were found to be original drugs or high-quality, black market generics. In total, 88% of the tested samples did not meet label claims. A more recent post on this website outlines the results of a larger, long-term study of black market steroids. Their sample reportedly consisted of 1,242 steroid samples, 941 of which were purchased online. Analyzed samples were placed into four different categories, 1) good quality, in which the active compound didn't fluctuate by 10% and was not contaminated, 2) acceptable quality; relatively good quality, fluctuations did not exceed 17% with no serious contamination, 3) unacceptable quality; had twenty to eighty percent levels of stated active compounds and may cause some serious health concerns, and 4) fake; not meaning counterfeit, no or very little active substance, with various contamination levels. Across all samples an average of 17% of samples were considered in the good, quality category. Eighty three percent (83%) comprised the remaining categories.

Likely, the most publicly-known steroid analysis data comes as a result of the 2007 underground market analysis initiated by Dr. William Llewellyn.²⁰ Copies of this data analysis appear in countless websites and forums around the Internet and in William Llewellyn's *Anabolics*, 9th Edition. Due to its presence online, outcomes of this investigation appear to have resonated with the online community. Llewellyn's testing parameters were unique compared to most previously mentioned investigations of steroid integrity. Fourteen underground steroid samples from small, mid-level, and larger producers were chosen for analysis. Testing parameters included heavy metal analysis, dosage accuracy, contamination, and presence of other substances that would indicate the presence of food-grade oils rather than pharmaceutical-grade. According to this analysis, 21% of the products contained heavy metal contamination. Thirty-five percent (35%) of the products were significantly overdosed. Drugs that exceeded the labeled dosage did so by a range of 102% to 459% as compared to the label. Unidentified steroidal compounds were discovered in approximately 60% of the samples. Most of the unidentified compounds were found to be inert steroid precursors or other intermediary compounds. Finally, about 14% of steroids were found to be produced with food-grade oils. Although readily admits that the scope of testing for this project was limited, it was adequate for a strong majority of the analyzed steroids to fail testing.²⁰

What are the Risks of Counterfeit Steroids?

How harmful a counterfeit steroid may be to a user is likely dependent upon the specific nature by which it is regarded as counterfeit. As it stands, the manufacturing process and/or location in which it is sold may determine the probable risks of consuming the product. According to 2007 report by the U.S. Drug Enforcement Administration, buying steroids over the Internet poses a great danger as illegally operating companies have no regard for product safety. Products are often sold with no safety guarantee and are commonly mislabeled, both intentionally and unintentionally.⁵ Due to the fact that steroid chemical analysis and production conditions aren't commonly divulged, assessing the potential

for injury to the user is often left to conjecture. In general, medical documentation of injury due to counterfeit steroid use is rare.

Operation Raw Deal was a two-year international investigation that targeted the illegal trafficking of anabolic steroids and raw materials. Federal agents reported that many of the underground steroid labs seized in Operation Raw Deal were “extremely unsanitary” and that “huge amounts of raw materials were mixed in bathtubs and bathroom sinks”.⁵ Another of many examples of this type of problem was outlined in a Department of Justice press release from 2007 detailing an Internet pharmacy scam in which the defendants were involved in an international drug scheme.⁴ In this scheme, multiple drugs, including anabolic steroids, were created in another country and then sold in the U.S. over the Internet using “spam” advertisements. According to former U.S. Attorney David E. Nahmias, “the defendants were involved in making controlled substances in squalid conditions in Belize, and then selling those drugs to unsuspecting consumers in the U.S.”.⁴ The previously mentioned Graham et al. (2009) investigation provided some greater understanding of the nature of steroid contamination and the risk potential it carries. According to the authors the analysis of steroid compounds was performed in response to what they called “a series of intramuscular abscesses requiring surgical treatment”.¹⁹ Microbiological cultures were performed on steroid samples originating in vials. Contaminants found in the vials were identified as “skin commensal organisms” (bacteria) which the authors suggested may contribute to the development of abscesses. The Graham et al. investigation (2009) investigation likely represents one of very few published documentations of a medical consequence of using a counterfeit or low-production value steroid.¹⁹

Producing counterfeit steroids is not a completely recent practice. In April of 1987, a joint investigation by the FDA, IRS, and Department of Justice halted one of the largest counterfeit steroid rings in the United States. The dealers involved in this operation manufactured fourteen different products marketed as steroids. Oral steroids were often substituted with low-dose vitamins purchased in unlabeled bottles from legitimate manufacturers. Bottles were subsequently labeled and repackaged as brand-name steroids. Injectable steroids were often substituted with numerous substances such as sesame oil, water with artificial sweetener, and diluted milk of magnesia.⁸ The potential physical impact of injecting such substances was not mentioned. In 1988, a legal action was carried out by the FDA and Postal Service Agents against a private steroid producer and distributor.⁷ A husband and wife team was found to have purchased corn oil at a local grocery store and substituted it for injectable steroids. Purportedly, the corn oil was chosen as a substitute because it looked like an authentic steroid product. Camphor was reported to have been added to these samples as it made it smell more medicinal. As a substitute for oral steroids, caffeine tablets were resold as oral steroids for as much as \$25 per bottle. According to the report, both “oral” and “injectable” substitutes were packaged under unsterile conditions in a home. The FDA could offer no information on how many individuals may have suffered adverse reactions as a result of injecting corn-oil.⁷

The Rise of Counterfeit Steroids in the United States

As long as there has been money to be made, counterfeit products have been available. To understand the propagation of counterfeit steroids in the United States, it is helpful to be aware of the series of recent legal actions that may have contributed to this increase. In 2005, Operation Gear Grinder (OGG) culminated in what is regarded as the largest steroid “bust” in history.⁶ This operation was part of the Virtual Enforcement Initiative, Operation Cyber Chase, and Operation CYBERx which were all aimed at illegal Internet drug trafficking. This 21 month investigation targeted eight major steroid manufacturing

companies, their owners, and trafficking associates. The Drug Enforcement Administration (DEA) forensic laboratories found that 82% of the steroids seized in this operation were from Mexico.⁵⁻

⁶ According to documents seized in OGG, the targeted Internet businesses had combined sales of \$56 million per year in the United States. Sales were tailored to U.S. customers by selling high-quality products and having Internet sites that accepted credit cards. The eight Mexican companies involved in this operation masked the true consumers of their products by marketing steroids for veterinary purposes.⁵⁻⁶

In 2007, Operation Raw Deal was concluded. This operation had four main points of focus; 1) raw material manufacturers and suppliers in China and other countries, 2) underground steroid labs in the U.S., Canada, and Mexico; 3) numerous U.S. based websites distributing materials used to convert raw steroid powders into finished product; and 4) Internet discussion boards that educate individuals regarding the intricacies of using, locating, and purchasing steroids. This operation dismantled approximately 100 websites, 56 steroid labs in the U.S., and 30 in China. In total, 11.4 million steroid doses and 242 kilograms of raw steroid powder of Chinese origin were seized.⁶

These different operations undoubtedly diminished the supply of higher-grade steroids in the United States. Speculatively, the diminished U.S. supply wasn't necessarily accompanied by a concurrent decrease in demand. This created opportunity for other countries to continue the supply where Mexico and the U.S. could not. Subsequently, the Internet became the primary avenue to purchase steroids from abroad. This is evidenced by the availability of steroids from abroad and the available supply of raw materials and instructions on how to reconstitute the drugs. It is not likely that producers of counterfeit steroids are worried about sending a counterfeit product into an illegal market.

Conclusions

For those who address counterfeit steroids as part of a steroid-education program the following points should be considered;

- The accounts of the prevalence of counterfeit steroids differs between academic, legal, governmental, lay-literature, and internet sources. Depending on which resource is credible, between 35 and 99% of available, illegal steroids are counterfeit.
- Exactly what constitutes a counterfeit steroid is dependent upon where they are purchased and how they are produced. As it stands, a counterfeit steroid can consist of anything ranging from being tainted with a harmful substance, a substandard version of the intended drug, a completely different drug, a completely inactive substance, or an over- or under-dosed drug.
- As opposed to the already recognized health risks of using and abusing pharmaceutical-grade steroids, exactly how harmful counterfeit steroids may be is likely dependent upon what factors qualify them as counterfeit. A lack of information, research, and medical reports regarding potentially serious physical effects does not indicate they are harmless.
- It is doubtful that steroid use and abuse will cease to be a topic of concern for health professionals as well as strength and conditioning professionals. Qualified information regarding counterfeit steroids is a necessary component of steroid education in each of these areas as the risks of using such drugs are not forthcoming. This information should not just be relegated to educating those who work in the different health professions. The potential for performance enhancing drugs to counterfeit should be an ongoing part of any steroid education agenda.

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