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# Human Growth Hormone: A Performance Enhancing Drug

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## INTRODUCTION

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Performance enhancing drugs have been a topic of conversation for many years now, and have been immersed in controversy. The arguments of whether they are good or bad, should be illegal or legal, and how they affect human health have been going on for quite awhile. One drug that has been under particular scrutiny in recent years is Human Growth Hormone, or hGH. This substance has become vastly popular amongst body builders, athletes, and young people because it gives them the competitive edge. Human growth hormone is easy to obtain, easy to use, and recent studies have shown that its use in improving performance is increasing. With the growing popularity, one thing is clear: hGH is a significant problem.

### What is hGH and how does it work?

Human growth hormone is a bioregulatory proteohormone that is naturally produced by somatotrophic cells in the anterior pituitary gland. Its secretion is regulated by growth hormone releasing hormone (GHRH) and somatostatin. GHRH stimulates hGH secretion from the anterior pituitary, while somatostatin inhibits it. While hGH is only be present naturally in the human body, a form known as recombinant hGH (rhGH) was successfully genetically engineered in the 1980s (Bidlingmaier). This engineered version has been used to treat those with naturally deficient hGH levels and has nearly identical effects on the body as naturally produced hGH. This hormone is primarily known for producing longitudinal growth in children and teens, but also serves various other functions in the adult metabolism throughout life. Under natural conditions, it acts by binding to a hGH receptor, which induces direct effects on the production and secretion of insulin-like growth factor 1 (IGF-1), a significant mediator of the effects of hGH. However, the controversy results from its effects on adults and teens when taken as a supplement (Bidlingmaier).

### Effects of hGH

The primary effect of natural hGH production during developing years of children and adolescents is stimulated longitudinal

growth. However, the effects of taking supplemental hGH (or rhGH) are significantly different. Several studies using hGH therapy have shown that the replacement of hGH in the body leads to increased lipolysis and lean body mass, decreased fat mass, and maximal power output by muscles (Bidlingmaier). While it appears that hGH has a lot of positive effects, it is also apparent that there are several negative possible side effects. These include nerve and joint pain, swelling of the body's tissues, carpal tunnel syndrome, acromegaly, diabetes, cardiomyopathy, osteoporosis, and decreased HDL-cholesterol levels (Bidlingmaier). These effects have the potential to be extremely harmful to the human body and drive those trying to prevent its use. Clearly there are both positive and negative effects of hGH use, but many people still choose to use it for an advantage in performance and competition.

### How can hGH be taken?

Human growth hormone and its engineered counterparts are not difficult to obtain and come in a variety of ingestible forms. The most common methods of intake include subcutaneous injections, oral pills, and oral mists (HGH). The injection method is by far the most viable, because those taken orally are digested in the stomach, significantly reducing the amount of hGH absorbed by the bloodstream. The methods of ingestion are important, as they are all relatively simple ways of taking a substance and are part of the reason that these supplements are so readily available (HGH).

### Why are performance enhancing drugs used?

A performance enhancing drug is defined as a substance that is taken in order to give someone an unfair advantage. This is commonly used as a term to describe substances that athletes take in order to better their performance. It is quite evident that human growth hormone fits in this category. The primary reason that hGH is

seen as a performance enhancing drug is that many athletes use it as a doping agent (Saugy). This is defined as “the administration to or use by a healthy individual of any agent or substance not normally present in the body... with the purpose and effect of increasing artificially and in an unfair manner the performance of that individual during the period of competition (Saugy).” Human growth hormone falls in this category due to the fact that it can have a variety of positive effects on athletic ability. When dosed appropriately, hGH has been known to increase anabolic action, increase endurance, and increase muscle mass and power. With the mentioned positive effects, it is clear why athletes use hGH. If their performance on the field or court is enhanced, then they have a much greater chance of winning when winning is of utmost importance to many athletes. Unfortunately, winning is only part of the reason for performance enhancing drug use (Saugy).

The other primary reasons for its popularity is that it is hard to detect and has a low risk of producing the androgenic side effects that are common amongst most anabolic steroids. Its difficulty of detection is quite evident in the most recent controversy in the NFL. In the bargaining agreement that the NFL and players union signed in 2011, hGH testing was added to the list of tests that NFL officials could perform on players. This didn't take effect until 2014, and in the first year of hGH testing, all the tests came back negative. This shows how easy it is to use hGH undetected, as it is known that several NFL players have used the substance and not tested positive (Sports). While this is merely one example, it is viable evidence that hGH abuse is very difficult to detect. This makes it quite clear why hGH is commonly used by athletes and seen to provide an unfair advantage.

#### Can it be detected?

As mentioned previously, hGH is known for its difficulty of detected, but in recent years methods of detection have been steadily improving. The only relatively reliable method that has been developed is the “direct approach” method of blood sampling. This method uses two specific

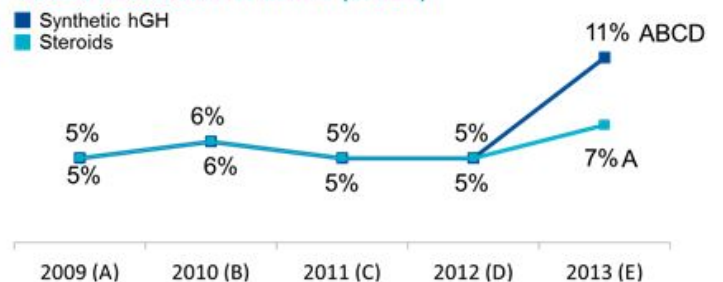
immunoassays to quantify the amount of recombinant hGH present in the blood. The recombinant hGH is represented as the native 22kDa form of hGH, and can be screened for in the blood. This style of test was first used in the 2004 Athens Olympics and has potential to become the most effective way to screen for hGH doping among athletics for the future (Saugy).

#### A Growing Problem

The real concern with hGH, as well as other performance enhancing drugs, is their growing use by today's youth. While the original intent of genetically engineered hGH was to treat people with a GH deficiency, it began to spread in popularity among athletes. This trend caught on amongst youth athletes too, and has become a rapidly growing problem. Recent studies have shown that youth are using hGH more than they ever have, and its use is increasing at an alarming rate (Dallas). The study revealed that slightly over 11% of teenagers have admitted to using hGH, which is over two times the amount from the study the previous year (Dallas). This alarming change is also seen in other performance enhancing drugs, such as steroids where usage increased to 7% of teens (Dallas). These studies show that there is most definitely a growing problem within today's young athletes. While there have been several attempts to regulate the usage of hGH, they have proven to be less than effective due to the aforementioned difficulty of hGH detection. Several groups, such as the International Olympics Committee and the NCAA, have placed bans on the use of hGH since the early

#### Prevalence of Teen Steroid / Synthetic hGH Abuse

% Used at least once in lifetime (n=3705)



“In your lifetime, how many times, if any, have you done each of the following... used (steroids/human growth hormone) for athletic performance or physical appearance when a doctor did not prescribe them for you?  
A-E indicates a significant difference at the 95% confidence level.

2000s. However, the difficulty of detecting its use has prevented these from being thoroughly enforced by either organization. This trend is most definitely concerning and one that will have to be dealt with soon to prevent health issues in teens (Goodes).

#### Why is this trend occurring?

As mentioned before, the trend of youth taking hGH and other performance enhancing drugs is growing at a rapid pace. In order to understand why teens are taking the substance, one must understand the motivation to do so. There are several reasons that teens choose to take hGH, the most prevalent being that they feel that there is an expectation for them to perform (Goode). This pertains primarily to athletics, and proves to be the main driving force for taking hGH and other performance enhancing drugs. Sports have become such a driving force in our society that teens feel pressure to perform in every game, match, and meet (Goode). They often see hGH as a way to ensure their success and give them an advantage that will help them perform better than the everyone else.

#### Where do we go from here?

In the end, the use of performance enhancing drugs is a concern that has to be recognized and addressed. While hGH is only one example, it provides evidence of why performance enhancing substances can be dangerous. Their widespread use to increase athletic skills and physical condition is growing at an alarming rate, especially in today's youth. The side effects of hGH can be very detrimental to a person's health, especially young people. While the effects of the use of this substance are grim, there is a chance for squandering its dangers. With the improvement of testing strategies, the future is positive for the regulation of hGH and other substances. Hopefully new testing capabilities will reverse the trend, and the young athletes of our generation will realize the dangers of taking performance enhancing substances.

#### **Works Cited**

Bidlingmaier, M., and CJ Strasburger. "Growth Hormone." In *Doping in Sports: Biochemical Principles, Effects and*

*Analysis*, 187-200. Vol. 195. Springer Berlin Heidelberg, 2009.

Dallas, Mary. "Dangerous Use of Growth Hormone Surges Among U.S. Teens." *Consumer HealthDay*. July 23, 2014. Accessed November 16, 2015.;

"HGH (Human Growth Hormone): Uses and Side Effects." *WebMD*. WebMD, n.d. Web. 10 Nov. 2015.

Goodes, Jeanne. "Doping: A Growing Problem for Youth Athletes?" *Breaking Muscle*.

Saugy, M., N. Robinson, C. Saudan, N. Baume, L. Avois, and P. Mangin. "Human Growth Hormone Doping in Sport.;" "Technische Universität München." *Doping Prevention: Doping Definition*. N.p., n.d. Web. 10 Nov. 2015.

Sports, Brent. "First Year of HGH Testing in NFL Catches No One." *USA Today*. February 2, 2015.