

HUMAN GROWTH HORMONE IN BODYBUILDING

From Its Discovery to the Mass-Monster Era
and Modern Bodybuilding

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Chapter 1: The Discovery and Evolution of Human Growth Hormone

The scientific history of human growth hormone began in the nineteenth century, when physicians started recognising the relationship between the pituitary gland and abnormal physical growth. In 1886, French neurologist Pierre Marie described acromegaly, a condition characterised by enlargement of the hands, feet, jaw and facial structures, helping establish the connection between pituitary abnormalities and excessive tissue growth.

In 1921, Herbert Evans and Joseph Long demonstrated that extracts from the anterior pituitary gland could stimulate growth in experimental animals. Subsequent research, including the work of Choh Hao Li, advanced the isolation and characterisation of pituitary growth hormone.

A major breakthrough came in 1958 when Maurice Raben successfully treated a child with growth hormone deficiency using HGH extracted from human pituitary tissue (Raben, 1958). However, obtaining the hormone was difficult because it could only be collected from pituitary glands donated after death. This made HGH extremely expensive and largely restricted its availability to specialist medical treatment.

During the same period, researchers were beginning to understand that HGH did not produce all its growth-related effects independently. In 1957, William Salmon and William Daughaday identified a serum factor that stimulated cartilage growth, contributing to the eventual discovery of insulin-like growth factor-1 (IGF-1). HGH stimulates IGF-1 production, particularly in the liver, while IGF-1 also acts locally within tissues to influence growth and cellular development (Salmon & Daughaday, 1957).

Between 1958 and 1985, medical HGH was obtained primarily from human cadavers. This practice ended after recipients developed Creutzfeldt–Jakob disease, a fatal neurological condition linked to contaminated pituitary-derived preparations.

The introduction of recombinant DNA technology transformed HGH manufacturing. In 1985, Genentech's Protropin became the first recombinant human growth hormone approved by the US FDA. Two years later, Eli Lilly introduced Humatrope, containing the 191-amino-acid somatropin sequence corresponding to naturally occurring human growth hormone.

Recombinant manufacturing allowed HGH to be produced in much larger quantities, improved consistency and eliminated the need for cadaver-derived material. It also marked a turning point for competitive bodybuilding, making HGH increasingly accessible to athletes seeking additional growth-related effects beyond those provided by anabolic steroids.

Chapter 2: HGH and the Transformation of Competitive Bodybuilding

2.1 Bodybuilding Before HGH Became Widely Available

During the 1960s and 1970s, bodybuilders such as Arnold Schwarzenegger, Sergio Oliva and Lou Ferrigno developed exceptional physiques through progressive resistance training, structured nutrition and anabolic-androgenic steroids.

However, HGH was not widely accessible during this period. Cadaver-derived preparations were scarce, expensive and largely restricted to medical treatment.

The introduction of recombinant HGH during the 1980s changed the landscape of bodybuilding pharmacology. HGH gradually became more accessible, and advanced competitors began combining it with anabolic steroids and, increasingly, insulin.

2.2 HGH and the Mass-Monster Era

The 1990s marked one of the most dramatic transformations in competitive bodybuilding.

Competitors such as Dorian Yates, Nasser El Sonbaty, Paul Dillett and Ronnie Coleman showcased substantially greater muscular development than the bodybuilders of previous generations. HGH became an important contributor to this transformation, alongside increasingly sophisticated anabolic-steroid protocols, insulin, higher food intake and advanced training practices.

The significance of HGH should not be understated. Its influence on IGF-1 signalling, tissue growth and body composition provided additional physiological pathways through which competitors could pursue greater muscular development.

The combination of HGH, anabolic steroids and insulin became closely associated with the extreme muscular mass that defined the professional bodybuilding scene throughout the 1990s and early 2000s.

2.3 Abdominal Distension and the Rise of the Bubble Gut

One of the more controversial physical changes associated with the mass-monster era was the increasingly prominent abdominal distension seen in some professional bodybuilders.

Commonly referred to as bubble gut, this appearance involved a protruding abdomen despite relatively low levels of body fat and substantial muscular development.

HGH and insulin have frequently been implicated in this phenomenon, particularly when used at high quantities over extended periods. The proposed explanations include growth-related changes in internal tissues, enlargement of abdominal structures, increased abdominal muscle mass and the effects of substantial food intake.

However, abdominal distension is not necessarily caused by one factor. Digestive contents, abdominal-wall control, visceral fat, organ size and the overall demands of maintaining extreme body mass can all influence appearance.

Although the precise contribution of each factor varies, the association between the mass-monster era, extensive performance-enhancing drug use and abdominal distension became an important topic of discussion among competitors, judges and bodybuilding audiences.

2.4 Why Men's Physique and Classic Physique Were Introduced

As Open Bodybuilding increasingly prioritised extreme muscular size, the IFBB Pro League and NPC introduced alternative divisions that placed greater emphasis on aesthetics, symmetry, proportions and a smaller waistline.

Men's Physique was introduced in 2011, followed by Classic Physique in 2016. Men's Physique emphasised an athletic upper-body shape, broad shoulders, a narrow waist and overall presentation, while Classic Physique sought to revive the balanced proportions and traditional aesthetics associated with bodybuilding's earlier generations.

These divisions offered competitors an alternative to the extreme muscular development required in Open Bodybuilding. The increasing prevalence of abdominal distension among some Open competitors also contributed to wider discussions about the direction of the sport and the importance of maintaining aesthetic proportions.

Importantly, HGH continues to be used in Men's Physique and Classic Physique, but the tighter waistlines and generally lower levels of abdominal distension suggest a different approach to overall physique development. This may include lower HGH and insulin exposure compared with some Open Bodybuilders, alongside less extreme food intake, lower total body mass and greater emphasis on abdominal control. However, abdominal appearance alone cannot establish the doses of HGH or insulin being used. The key difference is that excessive abdominal distension is particularly detrimental in divisions where a narrow waist and strong shoulder-to-waist ratio are central to judging.

Men's Physique and Classic Physique have since become highly popular divisions, attracting substantial competitor participation and audience interest. Their appeal reflects a preference for muscular, well-conditioned physiques that retain symmetry and proportion, rather than pursuing maximum muscular size at the expense of aesthetics.

2.5 HGH's Continuing Influence

HGH remains established within modern competitive bodybuilding, particularly among advanced competitors seeking maximum muscular development.

Its popularity reflects its effects on fat mobilisation, IGF-1 signalling, connective tissue and body composition, as well as decades of practical experience among athletes and coaches.

The modern HGH market has also expanded considerably. Pharmaceutical products remain available, while generic and underground preparations have made HGH more accessible than during its earlier years.

Beyond competitive bodybuilding, HGH has also gained increasing attention among men and women over 30 who are interested in maintaining their physical condition, improving body composition, supporting recovery and addressing age-related changes. Once primarily associated with medical treatment and elite athletes, HGH is now increasingly discussed within longevity, wellness and anti-ageing circles.

This growing interest reflects the natural decline in growth hormone secretion with age, alongside the perception that restoring HGH levels may help counter some aspects of ageing. Consequently, HGH has become more mainstream within certain private wellness and hormone-optimisation clinics, particularly among individuals who do not compete in bodybuilding.

However, there is an important distinction between medically prescribed HGH for diagnosed growth hormone deficiency and its use as an anti-ageing intervention in otherwise healthy adults. While HGH can influence body composition, its ability to meaningfully slow biological ageing or extend lifespan has not been established, and its metabolic side effects remain relevant.

HGH is therefore no longer discussed exclusively as a bodybuilding compound. Its expanding presence in longevity medicine and hormone optimisation reflects a broader interest in its potential applications beyond competitive sport.

Nevertheless, HGH continues to influence bodybuilding across Open Bodybuilding, Classic Physique and Men's Physique, although the desired degree of muscularity, conditioning and overall presentation differs between divisions.

Chapter 3: HGH in the 1980s and 1990s — Early Bodybuilding Practices

3.1 HGH Becomes Part of Bodybuilding Pharmacology

The introduction of recombinant HGH in 1985 marked an important turning point in competitive bodybuilding. Previously, growth hormone was difficult to obtain because it had to be extracted from human pituitary glands, making it scarce and expensive.

Recombinant manufacturing gradually improved availability, allowing more advanced competitors to incorporate HGH into their performance-enhancing drug protocols.

Unlike anabolic steroids, which directly stimulate androgen receptors, HGH influences additional pathways involving IGF-1 production, fat metabolism and tissue growth. This made it particularly attractive to bodybuilders seeking greater muscular development beyond what they were achieving through anabolic steroids alone.

3.2 The Evolution of HGH Use During the 1990s

As HGH became more accessible, its use expanded among professional bodybuilders pursuing increasingly extreme muscular development.

During the 1990s, competitors began incorporating HGH into longer-term gaining phases rather than viewing it exclusively as a compound for contest preparation.

Its growing popularity coincided with substantial increases in food intake, more advanced anabolic-steroid protocols and increasingly sophisticated approaches to training and recovery.

HGH became an important component of the pharmacological environment associated with the mass-monster era, contributing to the dramatic increase in muscular size seen among professional competitors.

3.3 The Introduction of Insulin

Another significant development during this period was the increasing use of insulin alongside HGH and anabolic steroids.

Insulin promotes glucose uptake, glycogen storage and nutrient utilisation, while HGH influences growth-related signalling and fat metabolism.

Bodybuilders began combining these hormones during gaining phases to support greater muscular development, particularly as calorie and carbohydrate intake increased.

This combination became closely associated with the extreme muscular development of the 1990s and early 2000s. It also introduced additional metabolic considerations, particularly because HGH can

reduce insulin sensitivity while exogenous insulin can cause significant reductions in blood glucose.

3.4 HGH's Lasting Influence

By the end of the 1990s, HGH had become an established component of advanced bodybuilding pharmacology.

Its use continued into subsequent decades, supported by greater product availability, growing practical experience among competitors and coaches, and its perceived contribution to muscular development and body composition.

The approaches developed during this period helped shape modern HGH use, which is examined in Chapter 4.

Chapter 4: HGH in Modern Bodybuilding — Applications and Physique Development

4.1 HGH During a Gaining Phase

During gaining phases, HGH is commonly combined with progressive resistance training, a calorie surplus and anabolic steroids.

Bodybuilders frequently describe gradual improvements in muscular fullness, overall size and body composition rather than the rapid increases in strength associated with some anabolic steroids.

The physiological explanation involves HGH's influence on IGF-1 signalling, protein metabolism and tissue growth. Anabolic steroids stimulate androgen receptors, while HGH influences additional growth-related pathways.

Adequate nutrition and insulin signalling support the storage and utilisation of nutrients, creating an environment favourable to muscular development.

This interaction explains why HGH has remained particularly relevant to advanced competitors attempting to add substantial muscle over successive gaining phases.

4.2 HGH During Cutting Phases

HGH is also widely used during contest preparation because of its ability to stimulate lipolysis.

Growth hormone increases the breakdown of stored triglycerides, releasing fatty acids into circulation for potential energy use. During a calorie deficit, this can complement the body's increasing reliance on stored energy.

HGH may also influence protein metabolism, although its contribution to muscle retention depends on the wider nutritional, training and hormonal environment.

Fluid retention is another consideration during contest preparation. Additional extracellular water can affect muscular definition, particularly as a competitor approaches stage condition.

HGH therefore influences both fat metabolism and physical appearance, making the relationship between these effects particularly relevant during cutting phases.

4.3 HGH and Insulin During Gaining Phases

Some advanced bodybuilders combine HGH with exogenous insulin because of their different metabolic actions.

HGH increases fat mobilisation and influences growth-related signalling, while insulin promotes glucose uptake, glycogen storage and suppresses muscle protein breakdown.

Together with anabolic steroids and substantial food intake, these actions are believed to support greater muscular development.

However, HGH can reduce insulin sensitivity, meaning the body may require more insulin to maintain normal glucose levels. Administering exogenous insulin can lower blood glucose without necessarily correcting the underlying resistance.

This distinction is important because the anabolic role of insulin and its ability to lower blood glucose are related but separate considerations. Excessive insulin exposure can cause severe hypoglycaemia.

4.4 Year-Round HGH Use

Some bodybuilders use HGH during selected gaining or cutting phases, while others maintain exposure for extended periods.

The reasoning behind longer-term use is that its effects on body composition and tissue development may accumulate gradually.

Some competitors favour moderate exposure maintained consistently, while others report more pronounced short-term changes in muscular fullness and size with higher exposure.

Both approaches reflect the importance of considering the amount administered alongside the length of time it is used.

4.5 Does More HGH Produce More Muscle?

Many experienced bodybuilders report noticeable increases in muscular fullness, size and overall development when HGH exposure increases.

These observations are consistent with HGH's ability to influence IGF-1 signalling, tissue metabolism and body composition.

However, increases in physical size can involve several components, including contractile muscle, connective tissue, extracellular water and glycogen-associated fullness.

This does not mean that the additional size reported by bodybuilders is simply water. It means HGH influences multiple components of physique development, and the response will vary according to the athlete's training, nutrition, anabolic-steroid exposure and individual physiology.

Higher HGH quantities can produce stronger physiological effects, but greater exposure also increases the potential for fluid retention, insulin resistance and other unwanted effects.

Chapter 5: How HGH Works — Muscle Growth, IGF-1 and Fat Metabolism

5.1 Growth Hormone Receptors

HGH is a 191-amino-acid protein hormone that binds to growth hormone receptors throughout the body, including in skeletal muscle, the liver, adipose tissue and connective tissue.

Receptor activation stimulates intracellular signalling pathways, particularly JAK2–STAT5, which influence gene expression, protein metabolism and tissue growth.

HGH therefore affects several physiological systems rather than acting exclusively on skeletal muscle.

5.2 HGH and IGF-1

One of HGH's principal growth-related actions is stimulating the production of insulin-like growth factor-1.

The liver produces much of the circulating IGF-1, while skeletal muscle and other tissues also produce IGF-1 locally.

IGF-1 activates pathways including PI3K–AKT–mTOR, which contribute to protein synthesis, cellular growth and tissue adaptation.

This relationship helps explain HGH's relevance to muscular development. However, HGH also produces direct metabolic effects, particularly on fat mobilisation and glucose regulation, that are not simply interchangeable with IGF-1 activity.

5.3 HGH and Muscle Growth

HGH influences muscle development through growth-related signalling, IGF-1 production and changes in tissue metabolism.

Its effects differ from anabolic steroids, which directly activate androgen receptors and strongly influence muscular hypertrophy.

Research by Yarasheski et al. (1992) demonstrated increases in fat-free mass following HGH administration without corresponding additional improvements in strength or muscle protein synthesis during the study.

Doessing et al. (2010) demonstrated increased collagen synthesis in tendon and skeletal muscle without an increase in myofibrillar protein synthesis during the short study period.

These findings show that HGH influences different components of lean tissue, including connective tissue and extracellular water.

In advanced bodybuilding, HGH is generally used within a broader anabolic environment involving resistance training, adequate nutrition and anabolic steroids. The interaction between these factors is important when interpreting the muscular development reported by competitive bodybuilders.

5.4 HGH and Fat Metabolism

One of HGH's most established effects is stimulating lipolysis.

HGH increases the breakdown of stored triglycerides, releasing free fatty acids that can be used for energy production.

This effect becomes particularly relevant during fasting and calorie restriction, when the body increasingly relies on stored energy.

Møller and Jørgensen (2009) describe HGH as an important regulator of fat, carbohydrate and protein metabolism, including its role in increasing fatty-acid availability.

This provides the physiological basis for HGH's popularity during cutting phases.

5.5 HGH, Insulin and Glucose Regulation

HGH and insulin influence energy metabolism in different ways.

Insulin promotes glucose uptake, glycogen storage and nutrient utilisation while suppressing fat breakdown. HGH increases fatty-acid mobilisation and can reduce insulin sensitivity.

As circulating fatty acids increase, skeletal muscle may become less responsive to insulin. HGH can also influence glucose production by the liver.

The pancreas may compensate by releasing additional insulin, allowing fasting glucose to remain normal despite reduced insulin sensitivity.

This is why a lean, muscular bodybuilder can develop insulin resistance even when training regularly and maintaining relatively low body fat.

The relationship becomes particularly relevant during high-carbohydrate gaining phases, when food intake and insulin demand are already elevated.

5.6 HGH and Connective Tissue

HGH influences collagen synthesis and extracellular matrix metabolism, making it relevant to tendons, ligaments and the structural components of skeletal muscle.

Doessing et al. (2010) demonstrated increased collagen synthesis following HGH administration, supporting its role in connective tissue metabolism.

However, increased collagen production does not automatically translate into faster recovery from every injury. Tissue adaptation also depends on mechanical loading, rehabilitation and the organisation of newly formed collagen.

5.7 HGH and Anabolic Steroids

HGH and anabolic steroids activate different primary receptors.

Anabolic steroids act through androgen receptors, while HGH activates growth hormone receptors and influences IGF-1 production, fat metabolism and connective tissue.

This explains why HGH is commonly viewed as a complementary compound rather than a direct replacement for anabolic steroids.

Sattler et al. (2009) demonstrated that combined testosterone and HGH administration improved body composition and aspects of muscle performance in older men.

The findings support the physiological relevance of interacting hormonal pathways, although the degree of muscular development in competitive bodybuilding also depends heavily on training, nutrition and individual response.

Chapter 6: Pharmaceutical-Grade HGH vs Underground Laboratory HGH

6.1 Pharmaceutical-Grade HGH

Pharmaceutical HGH is produced using recombinant biotechnology under regulated manufacturing conditions. Recognised brands include Pfizer's Genotropin, Novo Nordisk's Norditropin and Eli Lilly's Humatrope.

These products contain recombinant somatropin and are manufactured according to established standards for identity, potency, purity and stability.

The primary advantage of genuine pharmaceutical HGH is consistency. Manufacturers must demonstrate that their products contain the expected biologically active hormone and meet quality requirements.

6.2 Underground Laboratory HGH

Underground laboratory HGH refers to products distributed outside regulated pharmaceutical supply chains.

Some preparations contain genuine recombinant somatropin and produce the expected physiological effects. Others may vary in hormone content, manufacturing quality or stability.

Not every UGL product is necessarily manufactured in a small underground facility. Some brands obtain HGH from third-party manufacturers and distribute it under their own labels.

The important distinction is the degree to which the product's origin, manufacturing standards and quality can be established.

6.3 Purity, Potency and Actual Hormone Content

HGH quality involves several characteristics.

Identity establishes whether a preparation contains genuine somatropin. Potency concerns its biological activity. Purity relates to unwanted proteins, degradation products and other impurities, while sterility concerns microbial contamination.

A vial labelled 10 IU conventionally corresponds to approximately 3.33 mg of somatropin, but the label alone does not establish the actual quantity of active hormone.

Protein degradation and aggregation can also affect product quality.

These factors help explain why two HGH products carrying identical labels may produce different responses.

6.4 Storage and Transportation

HGH is a protein-based medicine, making storage and handling important.

Many preparations are supplied as lyophilised powder, which improves stability before reconstitution. Others are supplied as liquid formulations.

Storage requirements differ between products. Refrigeration is important for many pharmaceutical preparations, particularly after reconstitution or first use.

Transportation conditions can also affect quality, especially when products pass through multiple distributors without a controlled supply chain.

6.5 Assessing HGH Quality

Bodybuilders commonly assess HGH through subjective response, blood measurements and independent laboratory testing.

Water retention, hand tingling and increased muscular fullness may indicate biological activity, but these effects do not establish exact potency or purity.

IGF-1 measurements provide information about the body's downstream response to HGH. However, individual responses vary, and a blood result cannot independently establish the precise hormone content of a vial.

Analytical testing can provide more direct information about identity and composition, although separate procedures may be required to assess biological potency, impurities and sterility.

6.6 Does Pharmaceutical HGH Produce Better Results?

Experienced bodybuilders frequently report differences when switching between pharmaceutical and underground HGH.

If two products contain equivalent biologically active somatropin and deliver comparable exposure, their fundamental hormonal effects should be similar.

The principal advantage of pharmaceutical HGH is consistent manufacturing and verified quality rather than a fundamentally different anabolic mechanism.

Differences in reported results may reflect actual potency, storage conditions, product degradation or individual response.

6.7 Conclusion

Pharmaceutical HGH and correctly manufactured underground HGH contain the same active hormone.

The meaningful differences concern consistency, potency, purity, storage and product authenticity. Pharmaceutical HGH provides greater manufacturing assurance, while the quality of underground products depends on their manufacturer and supply chain.

Chapter 7: HGH in Bodybuilding — Dosing, Timing, Side Effects and Management

7.1 HGH Dosing in Modern Bodybuilding

Human growth hormone is used across different levels of competitive bodybuilding, from Men's Physique and Classic Physique to Open Bodybuilding.

The amount used varies according to the athlete's competitive goals, body weight, experience, financial resources and individual response.

The following quantities are commonly discussed within bodybuilding:

Daily HGH	Bodybuilding context
2–4 IU	Moderate exposure; fat loss and general physique development
4–6 IU	Higher exposure during gaining and contest preparation
6–10 IU	Advanced competitive bodybuilding
Above 10 IU	High-dose exposure reported among some professional and super-heavyweight bodybuilders

These ranges describe bodybuilding practices rather than recommended quantities.

Some competitors prefer moderate HGH exposure maintained over extended periods, while others report greater muscular fullness, size and body composition changes at higher quantities.

HGH's effects depend on both the amount administered and the duration of exposure. Increasing the amount can intensify growth hormone signalling, but it can also increase extracellular water retention and reduce insulin sensitivity.

Importantly, not every increase in lean body mass represents an equivalent increase in contractile muscle. HGH also influences connective tissue, fluid balance and other components of lean tissue.

7.2 HGH Injection Timing

Bodybuilders commonly administer HGH in the morning, around training or before bedtime. Each approach reflects a different rationale.

Bedtime Administration

Bedtime administration is a popular approach among bodybuilders because subcutaneously injected HGH typically reaches peak blood concentrations approximately 3–6 hours after administration, depending on the formulation and individual absorption. This allows HGH exposure to increase during the overnight period, when the body is resting and recovering.

Another important consideration is meal timing. A common bodybuilding practice is to avoid eating for approximately three hours after an HGH injection, particularly meals containing substantial carbohydrates. The reasoning is that HGH stimulates lipolysis, while insulin suppresses the release of stored fatty acids. Maintaining lower insulin concentrations during this period may therefore favour HGH's fat-mobilising effects.

This is one reason bedtime administration is attractive: HGH can be injected several hours after the final meal, followed by an uninterrupted overnight fast. It also avoids the inconvenience of delaying meals during the day, particularly for bodybuilders consuming five or six meals during a gaining phase.

Although this fasting strategy has a physiological rationale, the three-hour interval is a bodybuilding practice rather than a demonstrated threshold for superior fat loss or muscle growth.

Morning Administration — Fasted

Morning administration, particularly before breakfast, is another common approach during cutting phases.

HGH stimulates lipolysis, increasing the release of free fatty acids from stored triglycerides. During fasting, insulin concentrations are generally lower, favouring fat mobilisation.

Some bodybuilders combine fasted morning HGH administration with cardiovascular exercise.

However, increasing fatty-acid mobilisation during a particular period does not necessarily produce greater total fat loss unless the athlete's overall energy balance supports it.

Pre-Workout Administration

Some bodybuilders administer HGH before resistance training or cardiovascular exercise.

The reasoning is that HGH's effects on fat mobilisation and growth-related signalling may complement the metabolic demands of training.

However, HGH does not function like a conventional pre-workout stimulant. Its downstream effects, including IGF-1 signalling, develop over a longer period.

Post-Workout Administration

Post-workout HGH administration is discussed in relation to recovery, tissue development and nutrient utilisation.

HGH influences connective tissue metabolism and IGF-1 signalling, while post-workout nutrition supports glycogen replenishment and recovery.

However, the biological effects of HGH are not restricted to the period immediately following training.

7.3 Once-Daily vs Divided HGH Administration

Both once-daily and divided administration are used within competitive bodybuilding.

Once-daily administration is simpler and produces a more concentrated period of elevated circulating HGH.

Divided administration spreads the total amount across multiple periods of the day. Some advanced competitors favour this approach when using larger daily quantities.

However, circulating HGH concentrations are only one component of its biological activity. IGF-1 signalling and downstream metabolic effects continue after circulating HGH levels decline.

Dividing the daily quantity does not automatically produce greater muscular hypertrophy or eliminate fluid retention and insulin resistance.

7.4 Five Days vs Seven Days Per Week

The traditional five-days-on, two-days-off approach has been part of bodybuilding practice for decades.

Historically, it appealed to athletes because it reduced the cost of pharmaceutical HGH and often aligned with a five-day training schedule.

Seven-day administration is also common, particularly among competitors maintaining HGH exposure throughout extended gaining or cutting phases.

At an unchanged daily quantity, seven-day administration provides 40% more total HGH per week than five-day administration.

The primary differences therefore concern total weekly exposure, cost and convenience.

Neither schedule eliminates the physiological side effects associated with HGH.

7.5 HGH During Gaining and Cutting Phases

HGH During Gaining

During gaining phases, HGH is commonly combined with progressive resistance training, increased calorie intake and anabolic steroids.

Its appeal comes from its influence on IGF-1 signalling, tissue metabolism and body composition.

Some advanced competitors also combine HGH with insulin because insulin promotes glucose uptake, glycogen storage and nutrient utilisation.

The interaction between HGH, anabolic steroids, insulin and nutrition helps explain why growth hormone became particularly prominent during bodybuilding's mass-monster era.

HGH During Cutting

During cutting phases, HGH's ability to stimulate lipolysis becomes particularly relevant.

Growth hormone increases fatty-acid mobilisation, which can support the use of stored fat for energy during a calorie deficit.

HGH may also influence protein metabolism, although muscle retention during contest preparation depends on training, nutrition and the broader hormonal environment.

Fluid retention is another consideration because additional extracellular water can affect muscular definition and the appearance of conditioning.

7.6 Why HGH Causes Side Effects

The most commonly reported HGH side effects in bodybuilding include water retention, hand tingling, fatigue and changes in insulin sensitivity.

These effects are influenced by actual hormone exposure, individual sensitivity and how rapidly exposure increases.

Higher HGH exposure can produce more pronounced physiological effects, but tolerance varies considerably between individuals.

The absence of noticeable side effects does not necessarily mean HGH is ineffective, just as stronger side effects do not automatically indicate a better product.

7.7 Water Retention and Facial Puffiness

One of HGH's most recognisable side effects is extracellular water retention.

HGH increases sodium retention through its effects on the kidneys. Water follows sodium, increasing extracellular fluid volume.

Bodybuilders may notice fuller muscles, facial puffiness, swollen fingers, tighter rings or rapid increases in body weight.

These effects can become more noticeable after increases in HGH exposure.

Management

Maintaining consistent sodium, carbohydrate and fluid intake can help distinguish HGH-related fluid retention from ordinary dietary fluctuations.

When swelling becomes excessive, reducing or temporarily interrupting HGH exposure may improve symptoms.

Attempting to counteract HGH-related swelling through aggressive dehydration or diuretic use can introduce additional electrolyte and cardiovascular risks.

Persistent swelling, particularly when accompanied by elevated blood pressure, should be assessed rather than dismissed as normal bodybuilding water retention.

7.8 Hand Tingling, Numbness and Carpal Tunnel Symptoms

Tingling and numbness in the hands are among the most frequently discussed HGH side effects.

HGH-related fluid retention can increase pressure around the median nerve as it passes through the carpal tunnel at the wrist.

Symptoms may include tingling in the thumb, index and middle fingers, numbness during sleep, discomfort upon waking and reduced grip comfort.

These effects may become more noticeable as HGH exposure increases.

Management

Avoiding further increases in HGH exposure when symptoms develop is an important first step.

Reducing or interrupting HGH may improve fluid-related nerve compression.

A neutral-position wrist splint worn during sleep can also help relieve mild carpal tunnel symptoms.

Persistent numbness, weakness or loss of grip strength requires assessment because prolonged nerve compression can cause lasting damage.

7.9 HGH, Insulin Resistance and Blood Glucose

One of HGH's most important metabolic effects is its ability to reduce insulin sensitivity.

This occurs through several interacting mechanisms.

First, HGH stimulates lipolysis, increasing the release of free fatty acids from stored body fat.

As circulating fatty acids increase, skeletal muscle may become less responsive to insulin, reducing insulin-mediated glucose uptake.

HGH can also increase glucose production by the liver.

The pancreas compensates by producing additional insulin to maintain blood glucose within the normal range.

This explains why a lean, muscular bodybuilder can develop insulin resistance despite regular training, cardiovascular exercise and relatively low body fat.

It also explains why normal fasting glucose does not necessarily indicate normal insulin sensitivity. The pancreas may simply be producing more insulin to maintain glucose control.

HGH and Insulin During Gaining Phases

Some advanced bodybuilders combine HGH with exogenous insulin during high-calorie gaining phases.

The rationale is that HGH stimulates growth-related pathways and fat mobilisation, while insulin promotes glucose uptake, glycogen storage and reduces muscle protein breakdown.

When combined with anabolic steroids and substantial food intake, these actions are believed to support greater muscular development.

However, exogenous insulin does not necessarily reverse HGH-induced insulin resistance. It can lower blood glucose while underlying insulin resistance remains.

Excessive insulin exposure can also cause severe hypoglycaemia, including seizures and loss of consciousness.

Management

Several factors can support insulin sensitivity: regular resistance training and cardiovascular exercise; avoiding unnecessarily large calorie surpluses; maintaining adequate sleep; monitoring fasting glucose, HbA1c and, where appropriate, fasting insulin; and reassessing HGH exposure if glucose regulation deteriorates.

Metformin and berberine are also discussed within bodybuilding for glucose management.

Metformin primarily reduces hepatic glucose production and improves aspects of insulin sensitivity, while berberine has demonstrated glucose-lowering effects through several metabolic pathways.

However, neither eliminates the underlying metabolic effects of excessive HGH exposure.

7.10 Fatigue and Lethargy

Although HGH is associated with recovery and growth, some bodybuilders report increased fatigue or lethargy, particularly with higher exposure.

Possible contributing factors include changes in glucose regulation, fluid retention, sleep disruption and the combined demands of heavy training and substantial food intake.

Fatigue may also be influenced by other performance-enhancing compounds used during gaining or cutting phases.

Management

Reviewing sleep quality, glucose measurements, blood pressure and the timing of symptom onset can help identify contributing factors.

If fatigue becomes pronounced after increasing HGH exposure, reducing or interrupting exposure may help establish whether HGH is contributing.

Persistent fatigue should not automatically be attributed to HGH because training demands, nutritional factors and other health conditions can produce similar symptoms.

7.11 Gradual Titration and Individual Tolerance

Individual tolerance to HGH varies considerably.

Gradual titration is used in medical growth hormone replacement because it allows the response to be assessed before further increases in exposure.

The same physiological principle helps explain why sudden increases may produce more noticeable fluid retention and nerve-compression symptoms.

Within bodybuilding, facial puffiness, swollen fingers and hand tingling are commonly recognised as signs that further increases may be poorly tolerated.

However, side effects are not always visible. Changes in insulin sensitivity and blood glucose regulation can develop without obvious swelling or discomfort.

This makes objective monitoring particularly important.

7.12 Monitoring HGH Use

Measurement	What it helps assess
IGF-1	Downstream response to HGH
Fasting glucose	Changes in blood glucose regulation
HbA1c	Longer-term glucose exposure
Fasting insulin	Additional context for insulin sensitivity
Blood pressure	Fluid-related and cardiovascular changes
Body weight and swelling	Extracellular fluid retention
Hand numbness and grip strength	Possible median nerve compression

Trends over time are generally more informative than isolated measurements, particularly when HGH exposure, food intake, body weight or training changes.

7.13 Conclusion

HGH dosing and administration practices vary considerably across competitive bodybuilding. Athletes use different quantities, injection times and weekly schedules depending on their objectives, experience and individual response.

Bedtime administration is particularly popular because subcutaneous HGH concentrations can peak several hours after injection, while the overnight fast makes it easier to maintain lower insulin concentrations without disrupting daytime meals.

Its effects on fat mobilisation, IGF-1 signalling and body composition explain its popularity during both gaining and cutting phases.

However, HGH can also influence extracellular fluid retention, nerve compression and glucose regulation.

Understanding the relationship between HGH exposure, administration timing, individual tolerance and metabolic response is important. Increasing the quantity may produce stronger physiological effects, but it can also introduce side effects that compromise training, conditioning and overall health.

Chapter 8: Conclusion — HGH in Modern Bodybuilding

Human growth hormone has played an important role in the evolution of competitive bodybuilding, particularly since the mass-monster era of the 1990s.

Its increasing availability allowed competitors to influence growth-related pathways beyond those activated by anabolic steroids. Combined with insulin, substantial food intake and increasingly sophisticated training practices, HGH contributed to the dramatic increase in muscular size that transformed professional bodybuilding.

However, this evolution also changed the appearance of the sport. Extreme muscular development and the abdominal distension seen in some Open competitors contributed to wider debates about aesthetics, proportions and the direction of competitive bodybuilding.

The introduction and growth of Men's Physique and Classic Physique reflected demand for alternative physique standards, placing greater emphasis on symmetry, shoulder-to-waist ratio and balanced muscular development.

Today, HGH remains an established part of advanced bodybuilding pharmacology across different competitive divisions. Its effects on fat mobilisation, IGF-1 signalling, tissue growth and body composition continue to make it relevant during both gaining and cutting phases.

The experience of competitive bodybuilders and coaches demonstrates that HGH is not approached identically by every athlete. Some favour moderate exposure over longer periods, while others report pronounced changes in size and fullness at higher quantities.

Product quality, nutrition, training, anabolic-steroid exposure and individual response all influence the outcome.

HGH can make a meaningful contribution to physique development, but its value lies in understanding how it fits into the complete bodybuilding environment rather than treating it as an isolated muscle-building compound.

Chapter 9: Want to Discuss Your Own Situation?

If you're looking to build more muscle, improve your physique, prepare for a bodybuilding competition or better understand how training, nutrition, bloodwork and performance-enhancing compounds interact, I offer personalised coaching and one-on-one consultations through KG Physique.

My approach draws on over a decade of competitive bodybuilding experience, including two IFBB Masters National titles, alongside research and practical experience in physique development.

Visit www.kgphysique.com.au to enquire about coaching or book a consultation.

You can also follow my content on Instagram @kg.physique and YouTube KG Physique.

Stay strong. Stay brown.

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