

# Bodybuilding

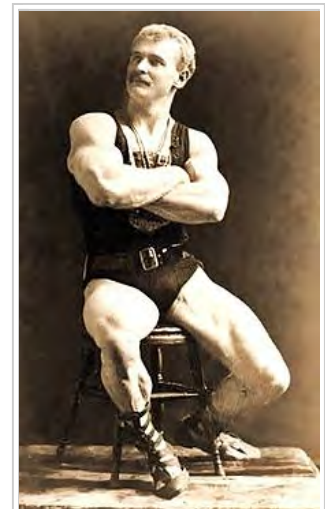
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**Bodybuilding** is the use of progressive resistance exercise to control and develop one's musculature.<sup>[1]</sup> An individual who engages in this activity is referred to as a **bodybuilder**. In competitive bodybuilding, bodybuilders appear in lineups doing specified poses, and later perform individual posing routines, for a panel of judges who rank the competitors based on criteria such as symmetry, muscularity and conditioning. Bodybuilders prepare for competitions through a combination of intentional dehydration, elimination of nonessential body fat and carbohydrate loading to achieve maximum vascularity, as well as tanning to accentuate muscular definition.

The winner of the annual IFBB Mr. Olympia contest is generally recognized as the world's top male professional bodybuilder. The title is currently held by Phil Heath. The winner of the Women's Physique portion of the competition is widely regarded as the world's top female professional bodybuilder. The title is currently held by Juliana Malacarne. Since 1950, the NABBA Universe Championships has been considered the top amateur bodybuilding contest with many notable winners such as Steve Reeves, Reg Park, Arnold Schwarzenegger and Lee Priest.



Arnold Schwarzenegger is one of the most notable figures in bodybuilding



Eugen Sandow, "The father of modern bodybuilding".

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## History

### Early years

Stone-lifting traditions were practiced in ancient Greece and Egypt. Western weight lifting developed in Europe around 1880 to 1953, with strongmen displaying feats of strength for the public, and challenging each other. The focus was not on the make up of their physique, and these strongmen often had a large stomach and fatty limbs.<sup>[2]</sup>



Sandow in 1894

### Eugen Sandow

Bodybuilding developed in the late 19th century, promoted in England by the 'Father of Modern Bodybuilding', German-born Eugen Sandow. He allowed audiences to enjoy viewing his physique in "muscle display performances". Although audiences were thrilled to see a well-developed physique, the men simply displayed their bodies as part of strength demonstrations or wrestling matches. Sandow had a stage show built around these displays through his manager, Florenz Ziegfeld. The Oscar-winning 1936 musical film *The Great Ziegfeld*, depicts this beginning of modern bodybuilding, when Sandow began to display his body for carnivals.

Sandow was so successful at flexing and posing his physique that he later created several businesses around his fame, and was among the first to market products branded with his name. He was credited with inventing and selling the first exercise equipment for the masses: machined dumbbells, spring pulleys and tension bands. Even his image was sold by the thousands in "cabinet cards" and other prints.

Sandow was a perfect "gracilian". This was a standard of ideal body proportions close to those of ancient Greek and Roman statues – see Golden Mean. Men were judged by how closely they matched these proportions,*The Golden One* represents some of these statues.

### First large-scale bodybuilding competition

Sandow organised the first bodybuilding contest on September 14, 1901 called the "Great Competition" which was held in the Royal Albert Hall, London, UK. Judged by himself, Sir Charles Lawes, and Sir Arthur Conan Doyle, the contest was a great success and with a capacity crowd many bodybuilding enthusiasts were turned away.<sup>[3]</sup> The trophy presented to the winner was a gold statue of Sandow sculpted by Frederick Pomeroy. The winner was William L. Murray of Nottingham, England. The silver or spelter Sandow Trophy was presented to the second-place winner, D. Cooper. The Bronze Sandow Trophy, the most famous of all, was presented to the third-place winner, A.C. Smythe. In 1950 this same bronze trophy was presented to Steve Reeves for winning the inaugural

NABBA Mr. Universe. It would not resurface again until 1977 when the winner of the IFBB Mr. Olympia contest, Frank Zane, was presented with the Bronze Sandow Trophy, or at least a replica of it. Since then, Mr. Olympia winners have been awarded a replica of the bronze trophy.

On January 16, 1904, the first large-scale bodybuilding competition in America took place at Madison Square Garden in New York City. The competition was promoted by Bernarr Macfadden, the father of physical culture and publisher of the original bodybuilding magazines including *Health & Strength*. The winner was Al Treloar and he was declared "The Most Perfectly Developed Man in the World".<sup>[4]</sup> Treloar won a \$1,000 cash prize, a substantial sum at that time. Two weeks later, Thomas Edison made a film of Al Treloar's posing routine. Edison also made two films of Sandow a few years before. Those were the first three motion pictures featuring a bodybuilder. In the early 20th century, Bernarr Macfadden and Charles Atlas, continued to promote bodybuilding across the world. Alois P. Swoboda was an early pioneer in America.

### Notable early bodybuilders

Many other important bodybuilders in the early history of bodybuilding prior to 1930 include: Bernarr Macfadden, Earle Liederman (writer of some of the earliest bodybuilding instruction books), Zishe Breitbart, Georg Hackenschmidt, Emy Nkemena, George F. Jowett, Finn Hateral (a pioneer in the art of posing), Frank Saldo, Monte Saldo, William Bankier, Launceston Elliot, Sig Klein, Sgt. Alfred Moss, Joe Nordquist, Lionel Strongfort (Strongfortism),<sup>[5]</sup> Gustav Frištenský (the Czech champion), Ralph Parcaut, a champion wrestler who also authored an early book on "physical culture," and Alan P. Mead, who became an impressive muscle champion despite the fact that he lost a leg in World War I. Actor Francis X. Bushman started his career as a bodybuilder and sculptor's model before beginning his famous silent movie career. Bushman was a disciple of Eugen Sandow.



Model Jackie Coey with Mr. Los Angeles contestant Ed Holovchik (also known as Ed Fury), 1953

### 1950s and 1960s

Bodybuilding became more popular in the 1950s and 1960s with the emergence of strength and gymnastics champions joining the culture, and the simultaneous popularization of bodybuilding magazines, training principles, nutrition for gaining bulk and reducing weight, the use of protein and other food supplements, and the opportunity to enter physique contests. Simultaneously, the number of bodybuilding organizations grew, most notably the International Federation of Bodybuilders (IFBB), founded by Joe and Ben Weider. Other bodybuilding organizations included the Amateur Athletic Union (AAU), National Amateur Bodybuilding Association (NABBA), and the World Bodybuilding Guild (WBBG). Consequently, the number of male-dominated physique/bodybuilding contests grew both in number and in size. Besides the countless number of "Mr. (insert town, city, state, or regional)" titles, the most prestigious titles were Mr. America, Mr. World, Mr. Universe, Mr. Galaxy, and (ultimately) Mr. Olympia (which began in 1965 by the IFBB, and continues to this day). During the 1950s, the most famous competing bodybuilders were Bill Pearl, Reg Park, Leroy Colbert, and Clarence Ross. Certain

bodybuilders rose to fame thanks to the relatively new medium known as TV, as well as the movies. The most notable were Jack LaLanne, Steve Reeves, Reg Park, and Mickey Hargitay. And while there were well-known gyms throughout the country during the '50s (such as Vince's Gym in North Hollywood, CA and Vic Tanny's chain gyms), there were still segments of the United States that had no "hardcore" bodybuilding gyms until the advent of Gold's Gym in the mid-sixties. Finally, the famed Muscle Beach in Santa Monica, CA would continue its popularity as the place to be for witnessing acrobatic acts, feats of strength, and the like. The 1960s grew more in TV and movie exposure, as bodybuilders were typecasted in popular shows and movies.

### 1970s onwards

## New organizations

In the 1970s, bodybuilding had major publicity thanks to Arnold Schwarzenegger, Franco Columbu, Lou Ferrigno and others in the 1977 film *Pumping Iron*. By this time the International Federation of BodyBuilding & Fitness (IFBB) dominated the competitive bodybuilding landscape and the Amateur Athletic Union (AAU) took a back seat.

The National Physique Committee (NPC) was formed in 1981 by Jim Manion,<sup>[6]</sup> who had just stepped down as chairman of the AAU Physique Committee. The NPC has gone on to become the most successful bodybuilding organization in the U.S., and is the amateur division of the IFBB in the United States. The late 1980s and early 1990s saw the decline of AAU sponsored bodybuilding contests. In 1999, the AAU voted to discontinue its bodybuilding events.

## Anabolic/androgenic steroid use

This period also saw the rise of anabolic steroids used both in bodybuilding and many other sports. In bodybuilding lore, this is partly attributed to the rise of "mass monsters", beginning with Arnold Schwarzenegger, Sergio Oliva and Lou Ferrigno in the late 1960s and early 1970s and continuing in the 1980s, 1990s and 2000s with Lee Haney, Dorian Yates, Ronnie Coleman and Markus Ruhl. Also the emergence of bodybuilders such as Greg Kovacs, Paul DeMayo and Victor Richards who, while not being particularly successful at the pro level, attained mass and size at levels that were not seen previously.

Arnold Schwarzenegger, at the time of shooting *Pumping Iron*, while never stating he used steroids, did say "you have to do anything you can to get the advantage in competition". But in later interviews acknowledged steroid use, saying he does not regret using anything. At the time Schwarzenegger was the face of bodybuilding, so this had a large impact.<sup>[7]</sup>

To combat this, and in the hopes of becoming a member of the IOC, the IFBB introduced doping tests for both steroids and other banned substances. Although doping tests occurred, the majority of professional bodybuilders still used anabolic steroids for competition. During the 1970s the use of anabolic steroids was openly discussed partly due to the fact they were legal.<sup>[8]</sup> However the U.S. Congress in the Anabolic Steroid Control Act of 1990 placed anabolic steroids into Schedule III of the Controlled substance act (CSA). Similarly in Canada, steroids were added to the Canadian Criminal Code as a Class IV controlled substance (that class was created expressly for steroids).

## World Bodybuilding Federation

In 1990, wrestling promoter Vince McMahon announced he was forming a new bodybuilding organization, the World Bodybuilding Federation (WBF). McMahon wanted to bring WWF-style showmanship and bigger prize money to the sport of bodybuilding. A number of IFBB stars were recruited but the roster was never very large, with the same athletes competing; the most notable winner and first WBF champion was Gary Strydom. McMahon formally dissolved the WBF in July 1992. Reasons for this probably included lack of income from the pay-per-view broadcasts of the WBF contests, slow sales of the WBF's magazine *Bodybuilding Lifestyles* (which later became *WBF Magazine*), and the expense of paying multiple 6-figure contracts as well as producing two TV shows and a monthly magazine.

## Olympic sport discussion



Ronnie Coleman, eight times Mr. Olympia – 2009

In the early 2000s, the IFBB was attempting to make bodybuilding an Olympic sport. It obtained full IOC membership in 2000 and was attempting to get approved as a demonstration event at the Olympics which would hopefully lead to it being added as a full contest. This did not happen. Olympic recognition for bodybuilding remains controversial since many argue that bodybuilding is not a sport.<sup>[9]</sup>

## Recent developments

In 2003, Joe Weider sold Weider Publications to AMI, which owns *The National Enquirer*. The position of president of the IFBB was filled by Rafael Santonja following the death of Ben Weider in October 2008. In 2004, contest promoter Wayne DeMilia broke ranks with the IFBB and AMI took over the promotion of the Mr. Olympia contest. Other professional contests emerged in this period, such as the Arnold Classic, Night of Champions, and the European Grand Prix of Bodybuilding.

In the 1990s and the early 21st century, patterns of consumption and recreation similar to those of the United States became more widespread in Europe and especially in Eastern Europe following the collapse of the Soviet Union. This resulted in the emergence of whole new populations of bodybuilders emerged from former Eastern bloc states. In 2014 the FTM Fitness Conference hosted the FTM Fitness World Bodybuilding Competition, which was the first bodybuilding competition for transgender men.<sup>[10]</sup>

## Areas

### Professional bodybuilding

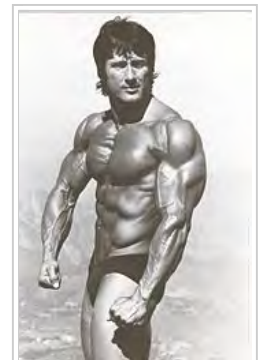
In the modern bodybuilding industry, "professional" generally means a bodybuilder who has won qualifying competitions as an amateur and has earned a "pro card" from their respective organization. Professionals earn the right to compete in competitions that include monetary prizes. A pro card also prohibits the athlete from competing in federations other than the one they have received the pro card in.<sup>[11]</sup> Depending on the level of success, these bodybuilders may receive monetary compensation from sponsors, much like athletes in other sports.

### Natural bodybuilding

Due to the growing concerns of the high cost, health consequences and illegal nature of steroids many organizations have formed in response and have deemed themselves "natural" bodybuilding competitions. In addition to the concerns noted, many promoters of bodybuilding have sought to shed the "freakish" reputation that the general public perceives of bodybuilding and have successfully introduced a more mainstream audience to the sport of bodybuilding by including competitors whose physiques appear much more attainable and realistic.

In natural contests the testing protocol ranges among organizations from polygraph testing (lie detection) to urinalysis. Penalties also range from organization to organization from suspensions to strict bans from competition. It is also important to note that natural organizations also have their own list of banned substances and it is important to refer to each organization's website for more information about which substances are banned from competition.

There are many natural bodybuilding organizations that exist. Some of the larger ones include MuscleMania, Ultimate Fitness Events (UFE), INBF/WNBF and INBA/PNBA. These organizations either have North American or worldwide presence and are not limited to the country in which they are headquartered.



Frank Zane, a former professional bodybuilder and three-time Mr. Olympia.

Other notable natural bodybuilding organization include the National Physique Committee (NPC) and the North American Natural Bodybuilding Federation (NANBF). NPC competitions screen competitors using a polygraph test to ensure fair practices. Though it is not fool-proof, competitors are selected at random and not all are tested. This is how the NPC differs from the NANBF. The NANBF takes a more direct approach by taking urine samples from all competitors that test for steroids and any other substances on the banned list. The NANBF differs from the NPC also when it comes to judging. The criteria of certain poses differs from organization to organization. The NANBF even has an elevated calf pose which is specifically unique for their competitions.

## Female bodybuilding

The first U.S. Women's National Physique Championship, promoted by Henry McGhee and held in Canton, Ohio in 1978, is generally regarded as the first true female bodybuilding contest – that is, the first contest where the entrants were judged solely on muscularity.<sup>[12]</sup> In 1980 the first Ms. Olympia (initially known as the "Miss" Olympia), the most prestigious contest for professionals, was held. The first winner was Rachel McLish who had also won the NPC's USA Championship earlier in the year. The contest was a major turning point for the sport of women's bodybuilding. McLish inspired many future competitors to start training and competing. In 1985, a movie called *Pumping Iron II: The Women* was released. This film documented the preparation of several women for the 1983 Caesars Palace World Cup Championship. Competitors prominently featured in the film were Kris Alexander, Lori Bowen, Lydia Cheng, Carla Dunlap, Bev Francis, and Rachel McLish. At the time, Francis was actually a powerlifter, though she soon made a successful transition to bodybuilding, becoming one of the leading competitors of the late 1980s and early 1990s.



Pro female bodybuilder Nikki Fuller performs a side chest pose.

In recent years, the related areas of fitness and figure competition have gained in popularity, surpassing that of female bodybuilding, and have provided an alternative for women who choose not to develop the level of muscularity necessary for bodybuilding. Rachel McLish would closely resemble what is thought of today as a fitness and figure competitor instead of what is now considered a female bodybuilder. Fitness competitions also have a gymnastic element to them.

A recent study by the Clinical Journal of Sport Medicine has found that female bodybuilders who are taking anabolic steroids are more likely to have qualified for substance-dependence disorder and have been diagnosed with a psychiatric illness and have a history of sexual abuse.<sup>[13]</sup>

E Wilma Conner competed in the 2011 NPC Armbrust Pro Gym Warrior Classic Championships in Loveland, Colorado, USA, at the age of 75 years 349 days.<sup>[14]</sup>

## Competition

In competitive bodybuilding, bodybuilders aspire to develop and maintain an aesthetically pleasing body and balanced physique.<sup>[15][16]</sup> In prejudging, competitors do a series of mandatory poses – the front lat spread, the rear lat spread, the front double biceps, the back double biceps, the side chest, the side triceps, the Most Muscular (men only), and the thigh-abdominal pose. Each competitor also performs a routine to display the physique. A posedown is usually held at the end of a posing round, while judges are finishing their scoring. Bodybuilders spend time practicing their posing, since they are judged on it.

In contrast to strongman or powerlifting competitions where physical strength is important, or to Olympic weightlifting, where the main point is equally split between strength and technique, bodybuilding competitions typically emphasize condition, size and symmetry. Different organizations emphasize particular aspects of competition, and sometimes have different categories in which to compete.

## Preparations

### Cutting and bulking

The general strategy adopted by most present-day competitive bodybuilders is to make muscle gains for most of the year (known as the "off-season") and approximately 12–14 weeks from competition attempt to lose body fat (referred to as "cutting"). The bulking phase entails remaining in a net positive energy balance (calorie surplus). The amount of a surplus that a person remains in is based on the person's goals, as a bigger surplus and longer bulking phase will create more fat tissue. The surplus of calories relative to one's energy balance will ensure that muscles remain in a state of anabolism. The cutting phase entails remaining in a net negative energy balance (calorie deficit). The main goal of cutting is to oxidize fat while preserving as much muscle as possible. The larger the calorie deficit, the faster one will lose weight. However, a large calorie deficit will also create the risk of losing muscle tissue.<sup>[17]</sup>

The precise effectiveness of the cutting and bulking strategy is unknown, with only limited observational case studies on the subject. No studies involving precise hypercaloric feeding combined with resistance exercise have been conducted.

### Clean bulking

Many non-competitive bodybuilders choose not to adopt the conventional strategy, as it often results in significant unwanted fat gain during the "bulking" phase. The attempt to increase muscle mass in one's body without any gain in fat is called clean bulking. Competitive bodybuilders focus their efforts to achieve a peak appearance during a brief "competition season".

### Dirty bulking

"Dirty bulking" is the process of eating at a caloric surplus, without finding the exact number of macronutrients (carbs, fats, and proteins). Weight lifters who are attempting to gain mass quickly often choose to use the "dirty bulk" method.<sup>[18]</sup>

### Pre-competition

In the week leading up to a contest, bodybuilders may decrease their consumption of water, sodium and carbohydrates, the former two to alter how water is retained by the body and the latter to reduce glycogen in the muscle. The day before the show, water is removed from the diet, and diuretics may be introduced, while carbohydrate loading to increase the size of the muscles through replenishment of their glycogen. The goal is to maximize leanness and increase the visibility of veins, or "vascularity." The appearance of veins is further enhanced immediately before appearing on stage by darkening the skin through tanning products, and applying oils to the skin to increase shine. Some competitors will eat sugar-rich foods to increase the visibility of their veins. A final step is the use of weights to fill the muscles with blood and further increase their size.



A bodybuilder, Lukas Osladil, posing onstage during a competition. The pose is a variation of the "most muscular".

## Muscle growth

Bodybuilders use three main strategies to maximize muscle hypertrophy:

- Strength training through weights or elastic/hydraulic resistance.
- Specialized nutrition, incorporating extra protein and supplements when necessary.
- Adequate rest, including sleep and recuperation between workouts.

## Weight training

Weight training causes micro-tears to the muscles being trained; this is generally known as microtrauma. These micro-tears in the muscle contribute to the soreness felt after exercise, called delayed onset muscle soreness (DOMS). It is the repair to these micro-trauma that result in muscle growth. Normally, this soreness becomes most apparent a day or two after a workout. However, as muscles become adapted to the exercises, soreness tends to decrease.<sup>[19]</sup>

Weight training aims to build muscle by prompting two different types of hypertrophy: sarcoplasmic hypertrophy and myofibrillar hypertrophy. Sarcoplasmic hypertrophy leads to larger muscles and so is favored by bodybuilders more than myofibrillar hypertrophy which builds athletic strength. Sarcoplasmic hypertrophy is triggered by increasing repetitions, whereas myofibrillar hypertrophy is triggered by lifting heavier weight.<sup>[20]</sup> In either case, there is an increase in size and strength of the muscles (compared to if that same individual does not lift weights at all). However, the emphasis is different.

Many trainees like to cycle between the two methods in order to prevent the body from adapting (maintaining a progressive overload), possibly emphasizing whichever method more suits their goals. I.e, a bodybuilder will use sarcoplasmic hypertrophy most of the time, but may change to myofibrillar hypertrophy temporarily in order to move past a plateau. However, no real evidence has been provided to show that trainees ever reach this plateau, and rather was more of a hype created from 'muscular confusion.'

## Nutrition

The high levels of muscle growth and repair achieved by bodybuilders require a specialized diet. Generally speaking, bodybuilders require more calories than the average person of the same weight to provide the protein and energy requirements needed to support their training and increase muscle mass. A sub-maintenance level of food energy is combined with cardiovascular exercise to lose body fat in preparation for a contest. The ratios of calories from carbohydrates, proteins, and fats vary depending on the goals of the bodybuilder.<sup>[21]</sup>

## Carbohydrates

Carbohydrates play an important role for bodybuilders. Carbohydrates give the body energy to deal with the rigors of training and recovery. Carbohydrates also promote secretion of insulin, a hormone enabling cells to get the glucose they need. Insulin also carries amino acids into cells and promotes protein synthesis.<sup>[22]</sup> Insulin has steroid-like effects in terms of muscle gains. It is impossible to promote protein synthesis without the existence of insulin, which means that without carbohydrates, it is impossible to add muscle mass.<sup>[23]</sup> Bodybuilders seek out low-glycemic polysaccharides and other slowly digesting carbohydrates, which release energy in a more stable fashion than high-glycemic sugars and starches. This is important as high-glycemic carbohydrates cause a sharp insulin response, which places the body in a state where it is likely to store additional food energy as fat. However, bodybuilders frequently do ingest some quickly digesting sugars (often in form of pure dextrose or maltodextrin) after a workout. This may help to replenish glycogen stores within the muscle, and to stimulate muscle protein synthesis.<sup>[24]</sup>



## Protein

The motor proteins actin and myosin generate the forces exerted by contracting muscles. Current advice says that bodybuilders should consume 25–30% of protein per total calorie intake to further their goal of maintaining and improving their body composition.<sup>[25]</sup> This is a widely debated topic, with many arguing that 1 gram of protein per pound of body weight per day is ideal, some suggesting that less is sufficient, while others recommending 1.5, 2, or more.<sup>[26]</sup> It is believed that protein needs to be consumed frequently throughout the day, especially during/after a workout, and before sleep.<sup>[27]</sup> There is also some debate concerning the best type of protein to take. Chicken, turkey, beef, pork, fish, eggs and dairy foods are high in protein, as are some nuts, seeds, beans and lentils. Casein or whey are often used to supplement the diet with additional protein. Whey protein is the type of protein contained in many popular brands of protein supplements, and is preferred by many bodybuilders because of its high Biological Value (BV) and quick absorption rates. However, whey has a bigger effect than Casein on insulin levels. Whey triggers about double the amount of insulin release.<sup>[28]</sup> That effect is somewhat overcome by combining Casein and whey. Bodybuilders are usually thought to require protein with a higher BV than that of soy, which is additionally avoided due to its claimed estrogenic properties. Still, some nutrition experts believe that soy, flax seeds and many other plants that contain the weak estrogen-like compounds or phytoestrogens can be used beneficially, as phytoestrogens compete with estrogens for receptor sites in the male body and can block its actions. This can also include some inhibition of pituitary functions while stimulating the P450 system (the system that eliminates hormones, drugs and metabolic waste product from the body) in the liver to more actively process and excrete excess estrogen.<sup>[29][30]</sup> Cortisol decreases amino acid uptake by muscle, and inhibits protein synthesis.<sup>[31]</sup>



Protein milkshakes, made from protein powder (center) and milk (left), are a common bodybuilding supplement.

Some bodybuilders, such as Patrik Baboumian and Robert Cheeke follow a strict vegan diet.

## Meals

Bodybuilders often split their food intake for the day into 5 to 7 meals of roughly equal nutritional content and attempt to eat at regular intervals (e.g. every 2 to 3 hours). This method can serve two purposes: to limit overindulging in the cutting phase, and to physically allow for the consumption of large volumes of food during the bulking phase. Contrary to popular belief, eating more frequently does not increase basal metabolic rate when compared to the traditional 3 meals a day. While food does have a metabolic cost to digest, absorb, and store, called the thermic effect of food, it depends on the quantity and type of food, not how the food is spread across the meals of the day. Well-controlled studies using whole-body calorimetry and doubly labeled water have demonstrated that there is no metabolic advantage to eating more frequently.<sup>[32][33][34]</sup>

## Dietary supplements

The important role of nutrition in building muscle and losing fat means bodybuilders may consume a wide variety of dietary supplements.<sup>[35]</sup> Various products are used in an attempt to augment muscle size, increase the rate of fat loss, improve joint health, increase natural testosterone production, enhance training performance and prevent potential nutrient deficiencies. There are three major macronutrients that the human body needs in order for muscle building. The major nutrients – protein, carbohydrate, and fat – provide the body with energy.<sup>[36]</sup>

## Performance-enhancing substances

Some bodybuilders use drugs such as anabolic steroids and precursor substances such as prohormones to increase muscle hypertrophy. Anabolic steroids cause muscle hypertrophy of both types (I and II) of muscle fibers caused likely by an increased synthesis of muscle proteins and are accompanied with undesired side effects including hepatotoxicity, gynecomastia, acne, early onset male pattern baldness and a decline in the body's own testosterone production, which can cause testicular atrophy.<sup>[37][38][39]</sup> Other performance-enhancing substances used by competitive bodybuilders include human growth hormone (HGH), which can cause acromegaly.

Muscle growth is more difficult to achieve in older adults than younger adults because of biological aging, which leads to many metabolic changes detrimental to muscle growth; for instance, by diminishing growth hormone and testosterone. Some recent clinical studies have shown that low-dose HGH treatment for adults with HGH deficiency changes the body composition by increasing muscle mass, decreasing fat mass, increasing bone density and muscle strength, improves cardiovascular parameters, and affects the quality of life without significant side effects.<sup>[40][41][42]</sup>

## Rest

Although muscle *stimulation* occurs in the gym (or home gym) when lifting weights, muscle *growth* occurs afterward during rest. Without adequate rest and sleep (7 to 8 hours), muscles do not have an opportunity to recover and build. About eight hours of sleep a night is desirable for the bodybuilder to be refreshed, although this varies from person to person.<sup>[43]</sup> Additionally, many athletes find a daytime nap further increases their body's ability to build muscles. Some individual bodybuilders add a massage, sometimes by professional masseuse, massager or masseur at the end of each workout to their routine as a method of recovering.<sup>[44]</sup>

## Overtraining

Overtraining occurs when a bodybuilder has trained to the point where his workload exceeds his recovery capacity. There are many reasons that overtraining occurs, including lack of adequate nutrition, lack of recovery time between workouts, insufficient sleep, and training at a high intensity for too long (a lack of splitting apart workouts). Training at a high intensity too frequently also stimulates the central nervous system (CNS) and can result in a hyper-adrenergic state that interferes with sleep patterns.<sup>[45]</sup> To avoid overtraining, intense frequent training must be met with at least an equal amount of purposeful recovery. Timely provision of carbohydrates, proteins, and various micronutrients such as vitamins, minerals, phytochemicals, even nutritional supplements are acutely critical.

It has been argued that overtraining can be beneficial. One article published by *Muscle & Fitness* magazine stated that you can "Overtrain for Big Gains". It suggested that if one is planning a restful holiday and they do not wish to inhibit their bodybuilding lifestyle too much, they should overtrain before taking the holiday, so the body can rest easily and recuperate and grow. Overtraining can be used advantageously, as when a bodybuilder is purposely overtrained for a brief period of time to super compensate during a regeneration phase. These are known as "shock micro-cycles" and were a key training technique used by Soviet athletes.<sup>[46]</sup>

## Non muscle-developing methods

Some bodybuilders, particularly at the professional level, inject substances such as "site enhancement oil", commonly known as **synthol**, to mimic the appearance of developed muscle where it may otherwise be disproportionate or lagging.<sup>[47]</sup> This is known as "fluffing".<sup>[48][49]</sup> Synthol is 85% oil, 7.5% lidocaine, and 7.5% alcohol.<sup>[48]</sup> It is not restricted, and many brands are available on the Internet.<sup>[50]</sup> The use of injected oil to enhance muscle appearance is common among bodybuilders,<sup>[51][52]</sup> despite the fact that synthol can cause pulmonary

embolisms, nerve damage, infections, sclerosing lipogranuloma,<sup>[53]</sup> stroke,<sup>[48]</sup> and the formation of oil-filled granulomas, cysts or ulcers in the muscle.<sup>[52][54][55]</sup> Sesame oil is often used, which can cause allergic reactions such as vasculitis.<sup>[56]</sup> An aesthetic issue is drooping of muscle under gravity.<sup>[50]</sup>

## See also

- Amazon feminism
- Athletic training
- Beefcake
- Body image
- Bodybuilding supplement
- Exercise equipment
- Exercise physiology
- Female bodybuilding
- Flex magazine
- Health club
- Muscle dysmorphia
- Muscle worship
- Physical culture
- Physical exercise
- Physical fitness
- Sports medicine
- Sports nutrition

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
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