HOW MUCH PROTEIN?

THE SHOCKING ANSWER TO THE QUESTION

"HOW MUCH PROTEIN DO I NEED TO BUILD MUSCLE?"

BY: BRAD PILON, AUTHOR OF EAT STOP EAT

How Much Protein?

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The information in this book is for educational purposes only. The information in this book is based on my own personal experiences and my own interpretation of available research. It is not medical advice and I am not a medical doctor.

The information within this book is meant for healthy adult individuals. You should consult with your physician to make sure it is appropriate for your individual circumstances. Keep in mind that nutritional needs vary from person to person, depending on age, sex, health status and total diet.

If you have any health issues or concerns please consult with your physician. Always consult your physician before beginning or making any changes in your diet or exercise program, for diagnosis and treatment of illness and injuries, and for advice regarding medications.

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Introduction

Introduction

As you begin reading this book, you may be thinking to yourself *"does the world really need another book on protein?"* The truth is this book is not really about protein *per se*, but rather it is about building muscle. However, over the last 50 years 'protein' has become synonymous with 'muscle'. When people think of bodybuilders, they think of protein shakes – lots of them.

So the purpose of this book is to examine the relationship between the protein you eat and your ability to build muscle. In other words, I am trying to answer the question – Can nutrition – specifically the amount of protein you eat – help you build muscle?

Protein is one of the most popular and controversial topics in all of nutrition. It has become the 'nutritional golden child' of muscle building and fat loss. Some people may try to avoid eating carbohydrates, and others may avoid fat, but nobody avoids protein.

It may be hard to believe, but protein hasn't always been considered the nutrient that can do no wrong. Throughout history each of the major macronutrients (protein, fat and carbohydrates) has taken its turn as the evil stepchild in the trio.

In the early 1900's diet gurus such as John Harvey Kellogg (the creator of the modern cereal food giant Kellogg's) and Horace Fletcher rallied against the intake of dietary protein due to its "negative effects on digestion and health". [Polland M, 2008]

In the 1950's Ancel Keys lead the charge against fat, saturated fat and cholesterol as he proclaimed they were the major cause of heart disease. His campaigning was so successful that even to this day we all live in fear of dietary fat even though there are hundreds of research papers that have since proven that different kinds of fat have different properties in the body (including some that are beneficial) and that dietary cholesterol may not have a cause-and-effect relationship with the cholesterol in our bodies.

In the late 90's and early 2000's Dr. Robert Atkins lead the low carb revolution claiming carbohydrates were the cause of all of our ills.

We are now living in the wake of the low carb AND 'fat is bad for you' era's. Both ideas are firmly rooted in the nutrition and fitness industries as well as in the mind of the markets.

Protein has had enough time to get off the 'bad guy' list and is perfectly positioned to take top spot on the podium of healthy nutrients. It has been almost 100 years since Kellogg and Fletcher were trying to convince the population that protein was the bad guy. By default protein is the only macronutrient left that could possibly be good for us. So the stage is set once again for protein to be the cure for all of our ills.

Fitness magazines constantly repeat the pro-protein message: "If you want to build big muscles you have to eat your protein", "If you want to lose fat and look like a fitness model, then you have to eat your protein". Browse the pages of any popular fitness magazine and you will find the following two golden rules of dietary protein:

1. Eat a minimum of 30 grams of protein every two to three hours.
2. Always drink your post-workout protein shake!

When I first started working in the sports supplement industry I was a sales person at a local supplement shop. I believed in these protein recommendations and followed them with almost fanatical dedication. I drank my protein shakes and ate my protein bars. In fact, it wasn't unusual for me to drink 4 to 5 shakes per day. I would constantly keep my protein intake up around 250 grams per day. Why? Because I thought it was scientifically PROVEN that more protein meant more muscle, and more muscle was what I wanted.

When a customer came into the store, it didn't matter what they were shopping for, I knew that I could convince them to buy protein. It wasn't because I was an amazing sales person, or that I was sinister or deceitful, rather it was because I believed in protein so much that my enthusiasm became contagious. I would get people so worked up about how great protein was for them that they would end up buying two sometimes three tubs of the stuff!

Nowadays, I realize that much of what I was led to believe was fact was really just very clever (and powerful) marketing, combined with my inability to truly understand the available research.

However, I'm not embarrassed by my mistakes. After all, if you've ever seen a protein supplement advertisement you know how convincing they can be. The protein supplement industry is massive, with projected sales of over 6 billion dollars by 2011 [Packaged Facts, 2008].

With this much money on the line, I'm sure you can imagine why so much time and effort is spent on the marketing of protein supplements. But the sports supplement industry isn't the only one that stands to profit from the new golden era of protein. Beef, poultry, pork, dairy and eggs are the major sources of protein in the North American diet and you can bet these industries are capitalizing big time on the new found love affair we have with protein.

These food industries dwarf the supplement industry so they have even more money to spend on advertising to make sure you are reminded that protein is the critical piece of your diet and fitness puzzle.

As an example of the food industry's interest in promoting protein as healthy we can look to the fact that the funding for the scientific meeting *"Protein Summit 2007: Exploring the Impact of High-Quality Protein on Optimal Health"* was supplied by the following industries: Egg Nutrition Center, National Dairy Council, National Pork Board, and The Beef Checkoff through the National Cattlemen's Beef Association [Fulgoni VL, 2008].

The pro-protein message doesn't just come from the industry side. According to the mass media, there are many different reasons why we should eat more protein, from improved overall health, to fat burning, to muscle building. On any given day you could find an article that says eating more protein will fix any and all of your diet and fitness shortcomings.

The theory is simple: by eating more protein you can force your body to an improved level of function, including larger muscles, less fat, and a host of other health benefits. The question is whether or not the scientific research actually supports these theories.

Protein has been given so many benefits by the media that it is hard to find a health benefit that protein does NOT have. From preventing diabetes to building muscle, protein seems to be able to do it all. These are some pretty big claims, and it would be amazing if even half of these claims were true. The prospect of curing many of the world's health issues by simply increasing the amount of protein we eat is definitely a very exciting concept, but again, we need to know if it is indeed backed by scientific research.

In order to get to the bottom of this story and figure out just how much protein we really need, it makes sense for us to start at the beginning.

Of all the claims about protein, the one that almost everyone simply accepts as fact is that eating protein builds more muscle. It is this one simple assumption that leads to so many of the additional benefits of protein. Surprisingly, this assumption has never been fully proven.

I can still remember the time when I first realized that protein may not be the iron-clad muscle builder it was made out to be. It was during very exclusive dinner in Glasgow Scotland, where I had just put the finishing touches on a new research contract examining the muscle building and ergogenic (performance enhancing) effects of a new supplement.

It was a night of firsts for me. It was my first time to Scotland, my first time trying scotch and blood pudding (and later in my trip, Hagus), and it was the first time I had ever had a world renowned scientist openly question my belief in protein, in front of a table full of academics no less.

Charged As a True Believer

It was during the closing comments of the dinner, when the pointed comments about protein came up. I had made a suggestion that adding protein to the new formula may in fact increase the muscle building effects. The lead scientist looked at me and said "Brad, if you BELIEVE in protein, then we will add it into the formula". As soon as I heard this exact statement I realized they understood and knew something about protein and muscle building that I did not.

At this moment I realized I was missing some vital information about the connection between protein and building muscle and that everyone else at the table had this information. I felt as though my understanding was wholly inadequate, as the concept of 'belief' has no place in a conversation about known scientific facts. And if a scientist needed to caudle my feelings of belief about consuming protein then they also recognized that I simply had not done enough research to bring a sound scientific argument to this dinner table. At that moment I felt like I was in my first year of university all over again.

In the world of science you do not ‘believe’ in anything, you either understand the facts or you do not.

In science, to believe in something means to have a certain amount of blind optimism that you use to fill in the gaps where you are missing the facts, which is really a kind way of saying you are already biased towards an outcome (not a good allegation if you are in science).

Afterwards, when I had arrived back in my hotel room, I started to think about that statement “If you BELIEVE in protein”. Was I the only person at the table who believed in protein? And what did they mean by ‘believe’ – I thought it was a scientifically proven fact? I thought they knew this to be true as well. An uncomfortable feeling starting gnawing at me as I contemplated the very real possibility that I was dead wrong about how much protein I or anyone else really needed to eat to build muscle.

This was accompanied by another feeling of betrayal and shame as I started to feel like I was summarily lied to and made to be a fool all these years. After this trip I decided to get to the bottom of the story about dietary protein and find the true scientific answer to the question “how much protein do I need to build muscle”.

The purpose then of this book is to review the current body of scientific research and find out if there is any truth to the alleged muscle building benefits of protein. Specifically, it will examine the benefits of eating high protein diets (In excess of the 90 grams per day that is the average intake in North America [Fulgoni VL, 2008]), and it will also examine the muscle building benefits of post-workout protein intake.

I would like to take this time to point out that I do agree that some of us need to eat a little more protein than we typically do, (some people still consume less than the recommended amounts).

I also recognize that protein malnutrition is a serious and documented health condition (albeit mostly occurring in very young children), and that protein supplementation may possibly improve the health of hospitalized adult patients [Potter J, 1998].

The actual recommended amounts for daily protein intake vary from country to country, but generally fall into the range of 40-60 grams of protein per day. Therefore, I will review the evidence that supports the theory that we need “super-mega” amounts of protein that are well in excess (triple or even quadruple amounts) of the recommended 40-60 grams per day in order to pack on muscle. I will also review the research that supports the necessity of post-workout protein meals (whether from foods or protein supplements) for the purpose of muscle growth.

Along the way I will show you the difference between a real scientific end point like “Increased Muscle Mass” and a **surrogate** end point like “Increased Protein synthesis” and how these two very different measurements end up being confused and lumped together as the same thing for marketing purposes.

I also will share with you the exact amount of protein, or range of protein intakes that an adult human needs to eat to allow for measureable increases in skeletal muscle mass.

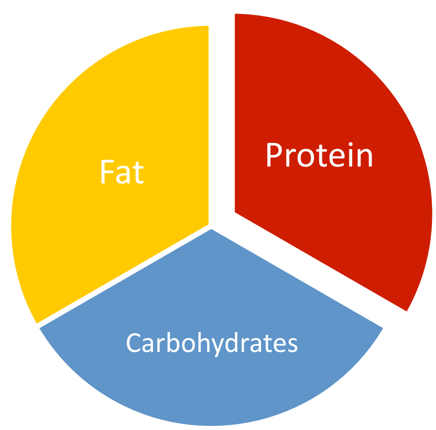
Finally I will explain where the fitness industry gets its information about the effects of protein and how this information can be and usually is misinterpreted.

Protein Basics

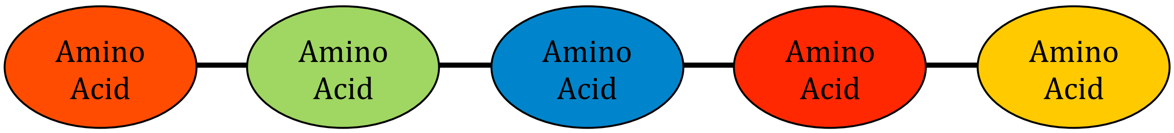
Protein Basics

In order to keep this book to a reasonable length I am going to quickly review the basics of protein and protein digestion. Keep in mind that there are massive textbooks on this topic. Protein metabolism is much more complicated than my simplified explanation.

Along with fat and carbohydrates, protein is a "macronutrient," meaning that the body needs relatively large amounts of it. Vitamins and minerals, which are needed in only small quantities, are called "micronutrients." For example: think of macronutrients like the wood, drywall and concrete needed to build your house, and think of your micronutrients as the screws and nails. They are both essential, one is just much bigger than the other.



Protein is made up of amino acids. It could be argued that the very reason we eat protein is for the amino acids that become available once protein is digested. Amino acids are the building blocks of all the protein in your body and are found in all of the protein that you eat. Think of amino acids like lego blocks that fit together to build a bigger block of protein.



When you eat protein it is broken down into smaller fragments of di-, tri- and oligopeptides (short chains of amino acids) as part of the digestion process. These small fragments along with individual amino acids are then absorbed through the gastro-intestinal tract and enter the blood stream. From there they are transported throughout the body ultimately being re-incorporated into new proteins (including muscle, organs, blood proteins, etc.) or used in various metabolic pathways.

It is important to note that the function of amino acids in the body involves much more than just muscle tissue repair and growth. It also includes repair and development of red blood cells, hair and fingernail growth, regulation of hormone secretion, movement (muscle contraction), digestion, maintenance of the body's water balance, protection against disease, transport of nutrients to and from cells, the carrying of oxygen and regulation of blood clotting. Simply put, amino acids play a much bigger role than solely being building blocks for muscle.

There are twenty-two different amino acids that combine in various arrangements to make up all the proteins in your body, including hormones, enzymes, your internal organs and muscle tissue. Your body can produce the majority of the amino acids by itself, however there are nine amino acids that the body cannot manufacture, and thus it is essential to consume these amino acids from your diet – hence why they are called the 'Essential Amino Acids'.

The Nine Essential Amino Acids:

- **Phenylalanine**
- **Isoleucine**
- **Leucine**
- **Lysine**
- **Threonine**
- **Methionine**
- **Tryptophan**
- **Valine**
- **Histidine**

In order for muscle and organ tissue to be built by the body, these nine amino acids must be present in sufficient amounts.

It is the definition of 'sufficient amounts' that is the center of the 'protein builds muscle' controversy. To date, we have never had a scientific consensus on the amount of protein we should eat that everyone would agree is sufficient.

In the late 1800's researchers by the name of Carl Voit and Wilbur Atwater recommended a dietary protein intake of 118 grams per day for adult humans doing moderate muscular work.

In 1905 a scientist named Chittenden concluded "one-half of the 118 grams of protein food called for daily by the ordinary standards is quite sufficient to meet all the real physiologic needs of the body" [Chittenden RH, 1905]. Obviously this was a very controversial recommendation – suggesting that the accepted 118 grams was DOUBLE what was actually required by the human body.

Even today, this seemingly basic argument of 'how much protein' still rages on, with differing recommendations coming from different nutrition authorities.

Even government regulations within the same country do not agree on the topic of protein. In fact, two such regulations, the DRI and RDA, are quite possibly the two most confusing and misunderstood guidelines in all of nutrition policy.

DRI stands for *Dietary Reference Intakes* and it is meant to be the supporting research and recommendations for governments and related health associations for setting things like the *Recommended Dietary Allowance* (RDA). The development of the DRI was a joint initiative by the United States and Canada to expand and replace both the RNI (Recommended Nutrient Intakes) for Canadians and the RDA (Recommended Dietary Allowances) for Americans.

The process of establishing the DRI's was managed by the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes of the Food and Nutrition Board, the Institute of Medicine, and The National Academies in the United States, in collaboration with Health Canada. The results appeared as a series of reports from a panel of American and Canadian scientists starting in 1997 with the final report being released in 2004.

The DRI's include recommendations for total daily energy (in calories), carbohydrates, fiber, fat, fatty acids, cholesterol, protein and amino acids. This DRI document is the supportive data for all the following recommendations; Recommended Daily Allowance (RDA) in America, the tolerable upper intake limit (UL), and adequate intake (AI).

The Recommended Daily Allowance (RDA) is the most widely recognized term and has the greatest influence in daily nutrition practice. An American committee known as the Food and Nutrition Board developed the RDA in 1941 and it has updated consistently every 5 – 10 years thereafter. The current RDA uses the DRI as its foundation and is defined as follows:

The Recommended Daily Allowance is an estimate of the minimum daily average dietary intake level that meets the nutrient requirements of nearly all (97-98%) healthy individuals.

The RDA for protein for adults (18 years or older) is 0.8 grams of protein per kilogram of bodyweight per day (about 64 grams for a 175 pound person). The RDA for protein was based on the results of all the available research that estimate the minimum protein intake necessary to avoid a progressive loss of lean body mass as reflected by a measurement called nitrogen balance.

In order to determine if you need more or less protein, scientists first have to determine a way of measuring the effect protein is having on your body. In the case of the RDA scientists chose nitrogen balance as their measurement marker.

While Nitrogen Balance is a scientifically valid measurement of the amount of nitrogen moving in and out of your body, it does contain once small flaw - There is no scientific evidence to date that nitrogen balance is an accurate measure of any relevant physiological end point other than the amount of nitrogen moving in and out of the body.

In other words, some scientists speculate that nitrogen balance might have the ability to predict muscle gain or loss, but to date this theory has not been proven.

While this may sound like a very controversial statement, keep in mind that even the Food and Nutrition Board acknowledge that using Nitrogen Balance to set the RDA for protein was a major limitation due to its lack of accuracy and applicability. Or, in their own words – “Because this method does not measure any relevant physiological end point” [Wolfe RR, 2008].

If that isn’t enough to raise your skeptical eyebrow, then you may be interested to know that almost all of the research data used to come up with the RDA for protein was calculated using college-aged men. Few, if any, studies were done on men of middle-age or older, and almost no research exists on women.

So the current RDA for protein is simply a guess (based on the measurement of nitrogen balance) at how much protein a healthy young man in college might need. That’s it.

In reality we do have a general idea how much protein a person needs, but it is also true that this idea is based on a lot of broad assumptions and estimates.

In non-scientific terms, we're just sort of guessing.

If you're not confused enough with all of these acronyms and terms, I'm going to introduce you to one more – The AMDR.

The AMDR stands for The Acceptable Macronutrient Distribution Range (established by the Institute of Medicine in 2005). The AMDR is similar to the other forms of recommendations, except that it is slightly more vague and allows for a much larger range of protein intakes.

The major difference is that the RDA is a strict hard and fast number for protein – 0.8g of protein for every kilogram (2.2 pounds) of bodyweight per day, whereas the AMDR is a range with the RDA presumably as its lower end (but not necessarily).

The AMDR for protein has been recommended at between 10%-35% of a person's daily caloric energy intake. This recommendation is dependent upon how many calories you eat in a day, and how much lean body mass you have.

Total daily calorie requirements by their definition change based on activity level as well, so there is a huge amount of variation to this recommendation.

This still doesn't help us answer the now seemingly not so simple question, "how much protein?" The AMDR is a rather large range (10%-35% of total daily calories) and it doesn't necessarily account for total activity level (sleeping all day vs a marathon run), type of activity (a 2-hour run vs. a 2-hour power lifting workout), and the specific goals of the activity (weight loss, muscle gain or fitness).

At this point you can see that the RDA is set as a minimum and might end up being too low on high activity days. It therefore doesn't give us any information about what is optimum, and gives us absolutely no information about what is needed to build muscle beyond what you naturally have with no weight training.

On the other hand the AMDR gives us a wide range that could have us consuming two or three times as much protein from one day to the next.

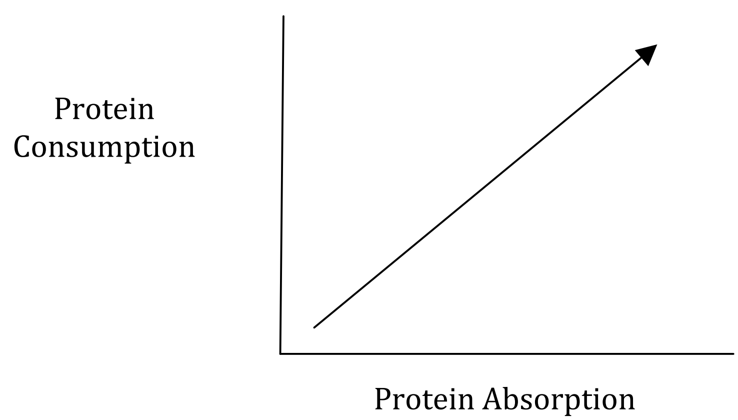
It makes sense physiologically (and economically) to avoid chronically eating excessive protein if we know it isn't necessary, especially considering protein food sources are typically the most expensive of the macronutrients and most forms require energy for storage (i.e. fridges) and can spoil easily (meats, fish, eggs, dairy). However, it is also counter productive to eat so little protein that we hinder our ability to build muscle mass.

Therefore, my goal for the rest of this book is to determine how much protein is needed to build muscle and achieve your fitness goals without grossly under or overestimating as the RDA and AMDR seem to do.

This brings us all the way back to the current scientific view of the amount of protein that constitutes 'sufficient amounts'. Some researchers argue that 'sufficient amounts' means 2 grams of protein per pound of bodyweight. That is about 350 grams per day for a man who weighs 175 pounds. Others will argue that a single dose of as little as 3.5 grams of essential amino acids may be enough to allow your muscles to grow. This is roughly the amount of essential amino acids found in one single glass of milk. That is a huge difference from 350 grams of protein. So which one is the right answer? Well it's not that simple.

A very interesting point about protein digestion is that your body's ability to digest protein can be up-regulated or down-regulated depending on the amount of protein that you normally eat.

In other words, if you constantly eat high amounts of protein at every meal, your body will be able to absorb high amounts of protein at every meal. If you are not used to eating large amounts of protein and you suddenly start eating double or triple the amount of protein you typically would eat, your body will have a difficult time digesting the extra protein. This typically results in some very bad gastrointestinal (aka: stomach and gut) upset and some rather pungent flatulence.

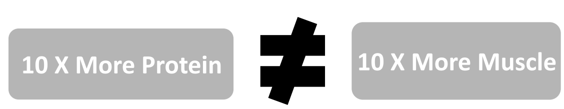


If you were to suddenly double your protein intake, it would only take your body a couple days to get used to all the extra protein. Some people make the mistake of thinking this is proof that their body has started to build more muscle once it has adapted to the new higher protein intake, but this is not the case.

From examining the protein intake of many different cultures around the world we are able to see that humans can survive on a wide range of protein intakes. From levels as low as around 0.3 grams of protein per pound of body mass (about 50 grams per day for a 180 pound man) all the way up to ten times this amount in people who survive eating a diet that consists almost exclusively of meat. Obviously, even though our protein intake can vary by a factor of ten times, our muscle mass cannot.

There is no culture of people on earth who have ten times more muscle than another culture.

Even the current champion bodybuilder, with all the amazing genetic potential and anabolic steroid abuse, still does not have anywhere near ten times the muscle of an extremely skinny Olympic long distance runner. So while people can chronically eat massively different amounts of protein, this drastic difference is not reflected in their muscle mass.



This is a very important point. One of the major ways we prove cause-and-effect relationships in science is with something called a ‘dose response’. Meaning if eating extra protein truly caused you to build extra muscle, then the more protein you eat, the more muscle you should have. Since we now have evidence that this does not occur, we need to examine the reasons why this relationship doesn't exist.

Our bodies compensate easily to extreme variations in protein intake in a number of different ways. As stated earlier your body can up-regulate and down-regulate the amount of protein that is absorbed from the intestinal tract after a meal. It can also up- and down-regulate the amount of amino acids that get oxidized as fuel (burned for energy).

Research from Robinson et al, published in 1990 has shown that when you suddenly start eating high protein your body starts to burn more amino acids as fuel [Robinson et al, 1990]. This adaptation is logical if you consider it from a supply and demand point of view. Your body can only get energy from the protein, fat and carbohydrates (and sometimes alcohol) that you consume. If you choose to eat more protein and less fat and carbohydrates, your body will adjust to what you are doing and burn more of that protein for fuel.

> The answer to the age-old question of '*how much protein can you digest in one meal?*' is:
>
> Your body can learn to digest very large amounts of protein, if given the proper amount of time to adapt

So our bodies can adapt and digest varying amounts of protein, as well as absorbing varying amounts of amino acids. It can also handle large or small intakes of protein by increasing or decreasing the amount of amino acids that it burns for energy. This is a beautiful example of how our bodies are constantly adapting to maintain a state of equilibrium or balance (aka homeostasis).

There are many other ‘facts’ about protein that simply do not make sense. For instance, I have always found it interesting that bodybuilders and athletes have accepted the goal of using ultra-high amounts of protein to try and force muscle growth, rather than try to teach the body to be more efficient by attempting to force muscle growth using normal or even slightly less than normal protein intakes.

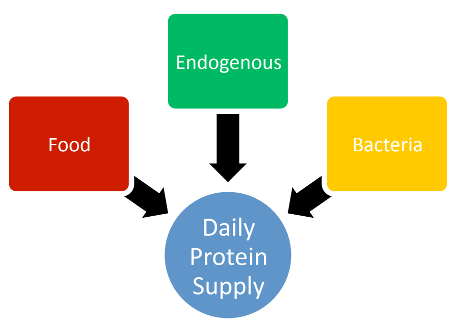
When I worked in the supplement industry, product development was all about more protein. If a competitor had 40 grams of protein in their protein shake, we HAD to have 42 grams. If they had 23 grams of protein in their protein bar, we HAD to have 25 grams.

It is funny how we strive for creating a very inefficient process rather than trying to optimize an efficient one. This is just one of the nonsensical points about protein.

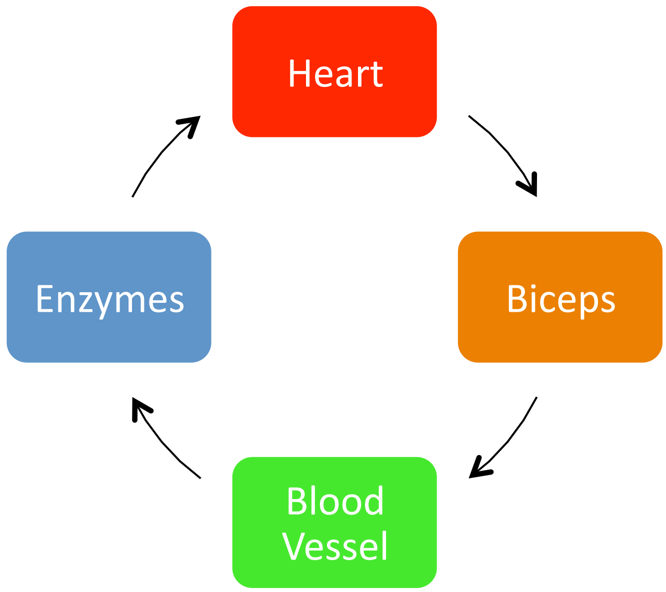
Here is some more little known information about protein. If you were to eat 50 grams of protein on any given day, you would actually be digesting between 100 and 150 grams of protein! This is because your body also digests an additional 50 to 100 grams of endogenous protein every single day that is secreted into your gastrointestinal tract by your body (endogenous means that your body produced it without getting it from your diet).

These proteins come from saliva, gastric juice, pancreatic enzymes and other secretions as well as intestinal cells and proteins that have leaked into the intestine from the blood.

Here is another piece of astonishing protein information. We may also absorb amino acids from our colon that are created by our microflora (the bacteria in our gastrointestinal system). In other words, there may be yet another, previously unknown way that our bodies are supplied with the amino acids that we require.



These facts make it clear that your body is in a constant state of cycling and reusing its own proteins. Some of the amino acids in your right biceps may have at one time been part of your heart, or part of an enzyme system in your saliva.



The proteins and amino acids in your body are almost like interchangeable lego blocks. They can be built up and stored in one part of your body, then taken apart and built up and reused in another part of your body. As long as you have enough Lego blocks available, your body will decide the best place to use them. The same 20 different Lego block types (the amino acids) can be used everywhere throughout your body to make millions of different proteins, cells and structures.

So as you can see, not only is your body incredibly efficient at adapting to different levels of protein intake, it is also very efficient at making use of its own amino acids, by recycling them in and out of different body systems and tissues when it has to.

Now that we know the basics of protein digestion and absorption we will answer the more pointed questions of “how much protein (or more specifically, how much EXTRA protein) is needed to fuel the muscle building process?” and “Do I need to eat protein immediately after my workouts in order to gain muscle?” However, before we answer these questions, we must first examine the effects that resistance training (weight lifting) has on muscle mass.

An important note on ‘Research’

An Important Note on Research

Before we dive into the research there are some very important things you need to know. First, you need to know that not all research is great. In fact, not all research is even good.

Research is a lot like a term paper. Some is A+ work, most is B level work, and some is C and D level work. Unfortunately the C and D level work gets published just as often (if not more) than the A and B level work.

Another thing you need to know is that the majority of research on building muscle is funded by supplement companies. Now, there is nothing wrong with this per se, except for the rather odd fact that if a study is funded by a supplement company, it's chances of finding significant results are greatly increased, (as are the amount of lean mass added by the subjects).

Not only does funding from a supplement company seem to be associated with better gains in lean mass but the placebo group almost always seems puts on very little lean muscle mass. Typically, it's not that the supplement performed better than the expected average increase in lean mass of approximately 5 pounds without supplements, but that the placebo group performed worse than average, sometimes gaining less than a pound over the course of 2 or 3 months of resistance training.

Unfortunately I can't simply exclude all of the studies funded by supplement companies because I would have nothing left to write about! What I can do is simply use their data, with the reminder that we must take all of this information with the proverbial "grain of salt". Where possible I have listed the funding source for all the papers that I reference in this book.

You may also notice that the numbers I quote in this book are far lower than what you would expect. This is due to one of two reasons. Either our ability to gain muscle is greatly over hyped in fitness magazines and websites, or research scientists are very poor at designing studies that build muscle mass. It may be a combination of the two, but I'm warning you now, the numbers may shock you.

Part of the reason for this is that the numbers are reported as averages. If out of a group of 10 men the average weight gain was 5 pounds, this does not mean that every man gained exactly 5 pounds. It was simply an average. The actual group of men probably gained between 2 and 8 pounds, with the average being 5. So its best to always think of the number quoted in a study as a rough average.

The last thing we need to discuss about research is the jigsaw analogy. Studying research is a lot like putting together a thousand piece jigsaw puzzle without having the picture on the front of the box to guide you. You simply cannot tell what the outcome will be just by looking at one or two pieces of the puzzle. This is why you should never take the results of one single study as being proof of a concept. It is the total body of evidence (or the whole puzzle) that will lead us to the best conclusions, in this case we're talking about how to build muscle mass, and how much protein we need to eat.

With this in mind, it's time to review the evidence surrounding protein and it's ability to help us build muscle mass.

What you need to know: Not all research is well conducted. Much of the research on building muscle is supported by supplement companies or food companies who sell 'protein' foods. The results of most studies are only an average of the results found, and you should always remember the 'jigsaw' analogy when reading about research.

The Effect of Resistance Training on Muscle Mass

The Effect of Resistance Training on Muscle Mass

I think just about everyone will agree that working out with weights (or any other form of resistance) will result in increased muscle mass given that the weight used is high enough and the rest and recovery is adequate.

It was more than 30 years ago that a group of experts scientifically proved that the amount you use your muscles is the main factor in influencing how big they are (other than genetics and height). In other words, how much and how often you stress your muscles dictates how big your muscles will become [Goldeberg AL, 1975].

For example, a muscle that is consistently worked out with heavy weights gets bigger and stronger, conversely a muscle that is in a cast and cannot move gets smaller and weaker (just think of any time you or anyone you know has had a cast on an arm or leg for any length of time – I'm sure once the cast came off you noticed that limb had become significantly smaller and weaker while it was immobilized in the cast).

If you read through all the research on resistance training and muscle growth, you would find the average amount of muscle mass that is typically gained by a healthy adult man or woman through resistance training is about 2 to 5 pounds over the course of 8-16 weeks [Cureton KJ, 1988; Abe T, 2000; Abe T

2003; Hartman 2006; Bhasin S, 1996; Treuth MS, 1994; Kraemer WJ, 2003; Hartman JW, 2006; Hartman JW, 2007].

Therefore, from this research we see that (in healthy people) a really good resistance training program alone can cause gains in muscle mass between 2-5 pounds in 2 to 4 months, regardless of any extra nutrition or supplements.

> As a rule of thumb, a really good resistance-training program should be able to cause a fully grown adult to gain 2-5 pounds of muscle mass in 2 to 4 months, regardless of any extra nutrition or supplements

Based on this finding, 2-5 pounds is what we can call the baseline increase in lean mass we can expect from a good weight-training program. This baseline depends on a number of factors including but not limited to age, sex, height, training background, workout intensity and workout design.

Supplement ads and magazine headlines may tell you that you can gain 15-20 pounds of muscle in a single month, however actual scientific research suggests that this simply is not possible in healthy adult humans without the aid of anabolic steroids.

It may very well be that the supplement and fitness industry is setting an unrealistic expectation for the ability of resistance training to increase muscle mass (without the use of anabolic steroids). Nevertheless, research does support the anabolic effects of resistance training alone.

Based on these findings we can now ask the question “If working out alone can cause a person to gain 2-5 pounds of muscle, what happens if they increase their daily protein intake above normal amounts?”

**In all graphs I will put a red dashed line at 5 pounds to illustrate our pre-established base line. This will help you compare the results of single studies with our average gain from weight training alone.

The Muscle Building Effects of Protein

The Muscle Building Benefits of Protein

High protein diet advocates would like you to believe there are literally thousands of research studies proving the effectiveness of high protein diets for building muscle. The truth is that there are relatively few studies done on high protein diets and muscle building.

Now, I'll be the first to admit that there is a very strong theoretical basis for expecting a beneficial effect from an increased protein intake. I believed this was true for many years and I've even helped formulate several different protein powder supplements in the hopes of helping people put on more muscle.

I can also tell you that nobody wants protein to work for muscle building more than I do. If all it takes to build extra pounds of muscle is drinking an extra whey protein shake or two then I am all for it.

Unfortunately, the research that actually measures increases in muscle mass (as opposed to measuring markers of protein synthesis or nitrogen retention) just does not support this theory.

My life experiences tend to support this research. When I was working out diligently in my early twenties I did a two month experiment where I drank a protein shake every three hours, including waking up in the middle of the night to make a shake, yet at the end of this experiment I did not put on any measureable amount of muscle (Remember, I had access to an exercise physiology lab, so my measurements were made using a BodPod and were accurate and consistent).

I have also experimented with starting every day with a breakfast that consisted of 100 grams of protein (A protein shake, egg white omelet and two cups of whole milk). During this experiment, I didn’t change my workout regimen at all; therefore I could conclude that the extra protein did not result in any measurable increases in muscle mass.

However, to truly determine if there is a muscle building effect of protein I had to ignore my own personal experiences and attempt to use scientific research to answer the question “Can eating extra protein build muscle”.

To accomplish this I reviewed research that studied changes in muscle mass using advanced techniques like Dual energy X-ray absorptiometry (DXA), Magnetic resonance imaging (MRI), air displacement (BodPod) or water displacement (underwater weighing). These are some of the most advanced measurement techniques science has to offer that actually measures true changes in muscle mass. If any research was going to show a benefit, this would be it.

My goal was to find research that used healthy individuals (men and women) between the ages of 18-55 and examine how much change they could see in their muscle mass, and how long it took for that change to occur.

Using these search criteria I was able to find several examples of significant muscle growth without the intake of extra protein. I will review some of the better research studies over the next few pages.

Testosterone and Muscle Growth Studies

One of the most interesting studies showing the effect of working out without any extra protein was published back in 1996. 43 men who were experienced weight lifters took part in research that involved exercise and weekly injections of anabolic steroids (testosterone enanthate) for 10 weeks [Bhasin S, 1996].

The men in the study were divided into 4 groups; working out or not working out, and receiving weekly steroid injections or not receiving them.

* Group 1: NO EXERCISE + NO STERIODS
* Group 2: EXERCISE + NO STERIODS
* Group 3: NO EXERCISE + WEEKLY STEROID INJECTION

* Group 4: EXERCISE + WEEKLY STEROID INJECTION.

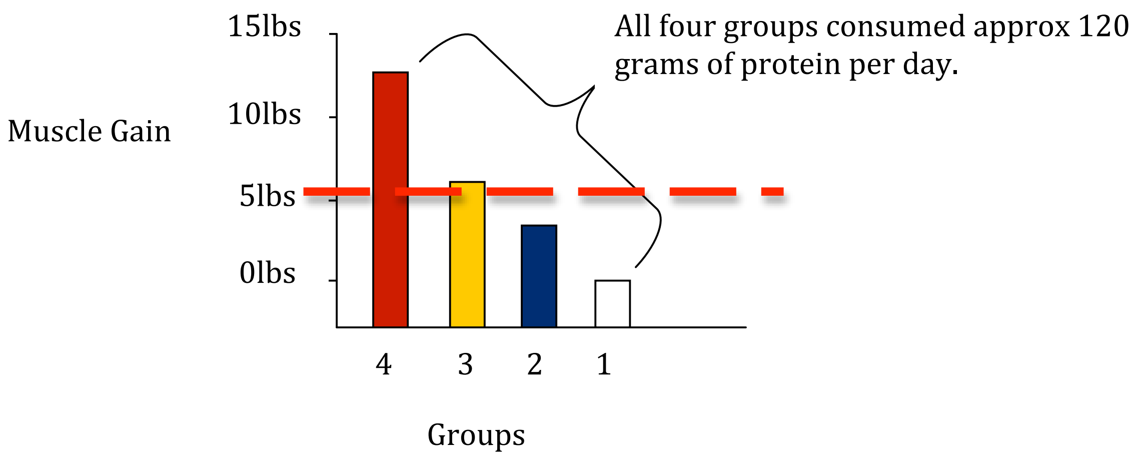
It is probably no surprise that after 10 weeks of lifting weights 3 times per week, the group that was receiving the steroid injections gained a very impressive amount of muscle (over 13 pounds!).

It is also not surprising that Group 2, (the group who were working out but didn’t get any steroids) also increased their muscle mass, packing on almost 4.5 pounds of muscle in only ten weeks.

What was surprising is that the men who were injected with steroids and then sat around doing nothing for 10 weeks amazingly saw an increase in lean mass that exceeded what the guys working out without steroids gained. Imagine gaining over 6 pounds of lean mass just by sitting around on your couch all day not lifting a finger!

Obviously, the group who did not receive any steroids and didn't workout did not see any change in their lean mass.

So what does a study on steroids have to do with protein? Well, all four groups were on the same diet. They were all consuming about 0.7 grams of protein per pound of body weight (roughly 120 grams of protein per day) and about 16 Calories per pound of body weight.



This research clearly shows that approximately 120 grams of protein per day was enough for a group of men taking steroids and lifting weights to gain 13.5 pounds of lean mass! Even in their steroid-heightened anabolic state, 120 grams was enough to supply all of the necessary building blocks for a 13.5-pound gain in lean mass.

Interestingly, it was also the same amount of protein that Group 2 the exercise–only group ate to gain 4.5 pounds of lean mass. So even though we know that these men consumed enough protein to provide for a 13.5-pound increase in lean mass, they only saw a third of this increase. The difference was obviously due to the anabolic effects of the steroids and NOT due to the protein intake.

Since the 120 grams was also the same amount of protein that the control group ate (who not surprisingly saw no change). It seems apparent the protein ITSELF did not have any growth promoting effect.

This study shows us that you can gain an impressive amount of muscle without increasing your protein intake (albeit, through the use of anabolic steroids). It also shows that protein alone does not cause the body to increase muscle mass. In fact, resistance training and the combination of resistance training and steroids can have dramatically different effects on lean body mass without any change in protein intake at all.

In 2005, a similar research paper was published examining the connection between testosterone and muscle growth. 52 men in their sixties received varying doses of the anabolic steroid testosterone enanthate in doses ranging from 25 mg, 50 mg, 125 mg, 300 mg and 600 mg weekly for 20 weeks [Bashin S, 2005].

During this time frame, the men were instructed to ***avoid*** any resistance training or heavy endurance exercise.

The men ate about 90 to 110 grams of protein per day and about 2,400 to 2,700 Calories per day.

At the end of the 20 weeks, without working out or eating massive amounts of protein, these men put on a very impressive amount of fat-free mass. The group getting the highest dose of testosterone gained 16 pounds of fat free mass in 20 weeks without any exercise. Even the group getting 125 mg of testosterone per day gained 9.5 pounds of fat free mass in 5 months.

Therefore, in these studies on steroids, as long as testosterone levels are elevated, men can gain muscle while eating typical amounts of protein.

In both of these studies, slightly above average protein intake in the 70-120 gram range (depending on bodyweight) was enough to allow for very large increases in lean mass.

> From these studies we can see that slightly above average protein intake in the 70-120 gram range was enough to provide the building blocks needed for very large increases in lean mass.

At this point you might be thinking, “But these guys were on steroids!” Well there is also research that shows muscle growth can occur without eating extra protein and that does not involve taking steroids.

Muscle Growth and Weight Training In Vegetarians

We can look at the research that explored the effect of resistance training on vegetarians as another way to assess the need for protein. Not only do vegetarians eat somewhat below average intakes of protein, they also obviously do not eat any animal meat, which in the sports nutrition world are largely considered to be the most "anabolic" of all protein sources.

In a study published in the scientific journal '*Medicine Science, Sports and Exercise'*, 2 groups of people were asked to follow weight-training programs [Burke DG, 2003].

Both groups followed the exact same high volume, heavy load resistance training workout program for 8 full weeks.

The only difference between the groups was that one group consisted of people who have all been vegetarians for at least the last 3 years of their lives. They were either lacto-ovo (milk and eggs only) or even stricter forms of vegetarians. The other group consisted of people who ate the traditional North American diet consisting of all forms of meat.

The vegetarian group ate almost 450 less calories per day than the non-vegetarian subjects, while the non-veggie group ate around 1.75 times more protein than the veggie subjects (79 grams per day versus 138.5 grams per day). Neither group took any form of post-workout supplement other than creatine.

From there, the two groups were each divided in two again. This time with people either taking creatine or not taking any form of supplement.

So the study design ended up looking like this:

* Group 1: VEGETERIAN + NO CREATINE
* Group 2: VEGETRAIAN + CREATINE
* Group 3: NON-VEGETARIAN + NO CREATINE
* Group 4: NON-VEGETARIAN + CREATINE

By the end of this study all four groups had gained similar amounts of lean mass (between roughly 2-5 pounds, the exact amount we would expect from a resistance training program of this length). The only group that was significantly different was the vegetarian plus creatine group, who gained slightly more muscle than the non-vegetarian plus creatine group.

This research illustrates that muscle growth is possible without eating high amounts of protein, and also suggests that once minimum protein (and calorie) requirements are met, adding more protein and more calories does not seem to increase the total amount of lean mass that is gained from a resistance training program.

From this research we can see that while 79 grams of protein per day was enough to allow for muscle growth, 138.5 grams of protein per day did not promote any ADDITIONAL muscle growth. This evidence is in keeping with the previous studies, in which 70-120 grams of protein was enough to allow for an impressive amount of muscle growth.

What you need to know about this study: Eating 140 grams of protein seemed to promote no greater muscle growth than eating 90 grams of protein. This study was funded by MuscleTech Research and Development, Inc.

Muscle Growth and Low Protein Diets

Now that we have seen a couple different examples of muscle growth with normal protein intakes, we can also look at the research examining what happens when people follow a resistance training program while eating a low protein diet.

People with chronic renal insufficiency must eat a very low protein diet as this disease impairs their ability to process protein. For these people eating even a normal amount of protein would be dangerous. So any research showing that these people could gain muscle would prove that muscle growth is possible with a very low protein intake. It can also show us if eating small amounts of protein can actually CAUSE losses in muscle mass.

A group of scientists decided to study the effect of resistance training on people with chronic renal insufficiency [Castaneda C, 2001]. The scientists postulated that these people would be at risk for losing muscle mass because of their inability to eat enough protein. These scientists were working under the assumption that weight training would be the best way for these people to maintain their lean body mass and build their muscles.

The people in this study were all over 50 years of age and were eating a very low protein diet. On average these subjects were eating under 0.3 grams of protein per pound of body weight. To put that into perspective, a 180-pound man would be eating about 50 grams of protein per day, for 12 weeks. According to the current fitness industry dogma, this amount of protein is probably 3 times lower than the amount of protein needed for building muscle.

At the end of the study, the subject working out 3 times per week maintained their body weight, while the group that was not lifting weights lost about 7 pounds. This type of weight loss is very typical with this disease (to be clear, a low protein diet alone will not cause this kind of rapid weight loss).

The group lifting weights also saw increases in muscle strength and muscle size. Meanwhile the group that was not weight training lost some muscle and a little bit of strength.

This study is a great example of people actually maintaining and possibly even gaining muscle size as a direct result of resistance training while on a low protein diet.

I realize the study was done on people who were over 50, and had a medical condition, and who were eating a diet much lower in protein than I would ever recommend. Despite these facts, this research does show that weight training alone can build muscle even in these people who for medical reasons can barely reach the minimum daily requirement of protein.

From this collection of research it seems that the range of 70-120 grams of protein per day was enough to allow for substantial muscle growth. Going below this range did not cause muscle loss, but it also did not result in large increases in muscle mass.

While we did see evidence that going above this range did not improve the subjects' ability to gain muscle mass, it is logical to suggest that the doses of protein in the research I have reviewed so far were all too low to see any result.

Maybe we need 'super massive' doses of protein to cause muscle growth. Well, this approach doesn't seem to be any more effective either.

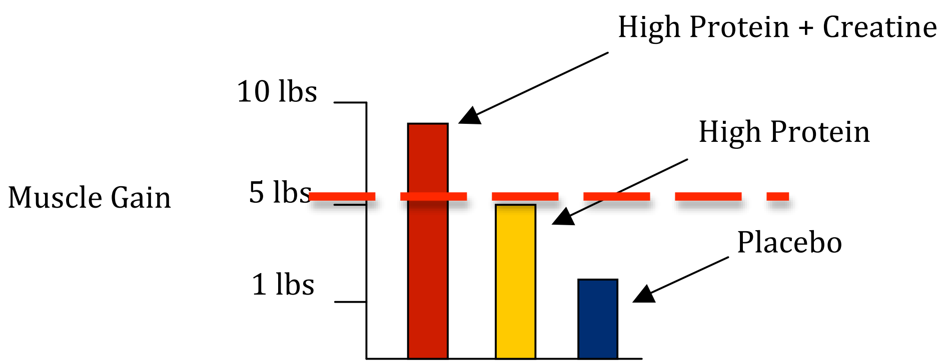
Muscle Growth and Very High Protein Diets

One of highest doses of protein I could find was in a study published by Burke et al in 2001. In this study Forty-two men between the ages of 18 and 31 were divided into 3 groups. The first group supplemented their diet with an additional 0.54 grams of protein per pound of body weight.

To put this into perspective, for a 180-pound man that's almost an EXTRA 100 grams of protein per day from protein powder. This is the equivalent of taking about 5 extra scoops of protein powder every day in addition to your normal protein intake!

The second group took the same amount of extra protein plus an additional 0.045 grams of creatine per pound body weight (about 10 grams of creatine per day for a 180 pound man). The third group received 0.54 grams of maltodextrin (a simple carbohydrate) per pound of body weight as their supplement (the placebo group).

The whey protein group gained about 5 pounds in six weeks, while the placebo group somehow managed to gain an insignificant 2 pounds. Impressively, the group taking creatine gained 8.8 pounds of lean tissue mass! (We will discuss how creatine works later) [Burke DG, 2001].



> What you need to know: The high protein groups drank their shakes in 4 equal servings throughout the day (this was not a post-workout trial). This research was funded by MuscleTech Research and Development Inc..

These findings agree with that of other studies that have shown that protein intakes above 120 grams of protein per day do not increase muscle mass [Hoffman JR, 2006].

So if massive amounts of protein (well above the 70-120 gram per day range) do not cause muscle building above the 2-5 pounds we can expect from a resistance training workout, maybe we need to eat a huge amount of calories with our protein to make it work?

High Protein + High Calorie Diet and Muscle Growth

In a research study published in 2002 by Rozenek et al, 73 healthy men were assigned to an 8-week workout program and divided into three diet groups.

- Group 1 consumed an extra 2010 Calories per day that included an extra 106 grams of protein.
- Group 2 consumed an extra 2010 Calories but only 24 extra grams of protein.
- Group 3 did the same 8 week long workout program, but didn't have to drink the extra 2010 calories.

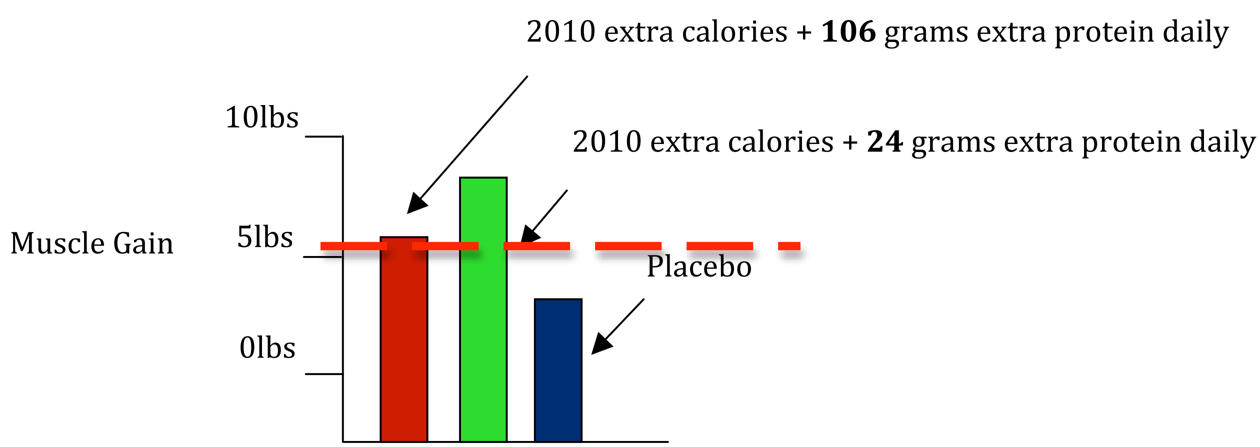
I don't know if you've ever tried this, but drinking an extra 2010 calories per day is actually very difficult to do. Not only is this an incredibly large, incredibly thick shake, but it also makes you feel full for hours.

I once designed a Mass Gaining shake that contained roughly 2000 calories per serving, and I can distinctly remember trying to avoid doing any of the flavor testing for this product, because after about 2 servings, I was too full to eat for the rest of the day! To put this into perspective, it was like downing 2 extra large fast food style milkshakes every day and then trying to eat your normal food.

Luckily the people in this specific trial managed to drink all of their shakes AND eat their normal meals. After 8 weeks all 3 groups made significant gains in fat-free mass. The high protein group gained a little over 6 pounds, the Carbohydrate group that only received an extra 24 g of protein gained almost 7.5 pounds of lean mass and the group who did not receive any supplements still gained over 3 pounds of fat free mass.

Let's say that again.

Between the two groups who took extra protein, the group who took LESS extra protein gained MORE muscle.



What you need to know: The high calorie groups drank their shakes in the morning and at night (this was not a post-workout trial). The group with the best gains (green bar) still consumed roughly 120 grams of protein per day. There was no mention of the funding source or the source of the supplements studied.

To put it into perspective, the group getting no supplements gained a little over 3 pounds of fat-free mass and dropped about 2 pounds of fat while eating roughly 2,400 Calories every day. The other two groups gained between 6 and 7 pounds of fat-free mass, didn't lose any fat, and were eating roughly 4,500 Calories every day. The amount of protein clearly had nothing to do with the weight gain as the lower protein group gained more mass than the high protein group.

Hopefully by now you are starting to see a trend. No matter how the story is spun, if you are working out, taking a little protein, a lot of protein, protein with carbs, protein with over 2000 extra total calories per day, or no protein at all you should expect to gain about 2-7 pounds of lean mass after roughly 2-4 months of working out.

Considering our 'baseline' muscle gain from working out alone was 2-5 pounds of muscle, these results hardly seem to support the need for post-workout protein, or high protein diets.

There seems to be evidence to suggest that a slightly higher range of protein intake (in the 70-120 grams per day range) is beneficial, but anything above this amount does not seem to increase the muscle building effects of a weight-training program.

The range of 70-120 grams of protein per day was also enough to allow women involved in a weight loss experiment to actually increase the cross sectional area of their muscle fibers while on a weight reducing diet – These women actually gained muscle size while losing over 30 pounds of bodyweight. [Donnelly JE, 1993].

It was also the amount that allowed women to gain lean body mass while following a resistance-training program, even though they were also on a severely calorically restricted diet. [Hunter GR, 2008].

In fact, if we look through actual scientific research what we find is that to scientists the words 'high protein' generally refer to a range of 1.2 to 1.5 grams of protein per kilogram of body weight – an amount higher than the current government recommendations but certainly much lower that the 1-2 grams per POUND of bodyweight that we see in most of the fitness magazines.

In scientific studies 'High Protein' = 0.55 to 0.7 grams of protein per pound of body weight.

In advertising 'High Protein' = 2 to 3 grams of protein per pound of body weight.

When we consider this range to be ‘high’ then it is true that there is an abundance of research which seems to suggest that for muscle building purposes there may be an advantage to consuming protein slightly above the recommended levels [Haub MD, 2002].

What you need to know about this study: The purpose of this study was to see whether eating protein from meat caused a greater increase in lean mass than eating protein from milk and eggs. They found no difference between the two diets. This study was funded by the National Cattlemen’s Beef Association

If we look at our current recommendation of 70-120 grams of protein per day (on average) we see that we could meet the needs of a 220 pound man (100 kg*1.2 g protein =120 grams per day) and the needs of a 110 pound woman (50 kg*1.4 grams of protein = 70 grams of protein per day) while still falling within the ranges of what scientists consider to be ‘high’ protein.

To answer the question, ‘how much protein do we need to build muscle?’, it seems that the original recommendations from the late 1800’s of around 100 grams per day seem to be enough to meet the muscle building needs of adult men and women who are not using anabolic steroids. Not only this, but even in people who are using steroids it is enough protein to allow for considerable muscle growth!

Protein and Meal Timing

Another common belief with protein is that it has to be consumed every 2-3 hours, otherwise your body will become catabolic and begin eating away at your muscle mass.

While this recommendation is certainly effective at increasing the amount of protein you need to buy in a given day, it does not seem to be supported by scientific evidence.

In a research paper published in the American Journal of Clinical Nutrition a group of healthy men and women were asked to eat all of their daily calories in either 1 meal or 3 meals for a period of 8 weeks [Stote KS, 2007].

Both experimental diets contained a slightly higher than normal protein content, consisting of roughly 85 grams of protein, (which lands them right in the 70-120 gram range I recommended earlier).

These people either consumed all of their protein in one big meal or ate the traditional breakfast, lunch, dinner, with each meal containing between 25-30 grams of protein.

At the end of the study, the researchers noted no difference in the lean body mass of the subjects, illustrating that eating protein only once in a 24-hour period for 8 weeks straight does not cause you to lose muscle mass (as long as the protein content is high enough to meet your daily needs).

> What you need to know about this study: Eating protein only once in a 24 hour period does not cause you to lose muscle mass (as long as the protein content is high enough to meet your daily needs).

Post-workout Protein

When it comes to protein and muscle mass, one of the most commonly held beliefs in the sport nutrition industry is that you need to eat protein after your workouts to fuel the muscle building process. Even people who do not believe in the merits of a high protein diet will still be sure to eat protein immediately after their workouts.

On the surface this theory seems to make sense. Since weight-training workouts can stimulate muscle growth, and muscles are built of protein, and you want more muscle, I can see why some people think that adding more protein to the mix might enhance the muscle building effect.

The idea that there is a magical window of time immediately after the workout where protein MUST be taken is what doesn't make sense to me. Somehow, people have been lead to believe that they will lose the muscle building benefits of the workout if they don't take a protein supplement immediately after their workout.

It is this belief that leads me to my next question "Do I need to eat (or drink) protein immediately after my workout to make my muscles grow", but to answer this, I must first answer the question "Can my muscles grow without taking protein immediately after my workout", and the answer to this second question seems to be "yes".

In a study published in 2007, people performed weight-training exercises for 12 weeks while taking one of the following four supplements immediately after their workout

a) Protein

b) Protein plus colostrum

c) Protein plus creatine

d) Creatine plus colostrum

The two groups of people who were taking post-workout protein only gained 2 pounds of muscle in 12 weeks, while the creatine groups gained about five pounds in 12 weeks. So in this trial, creatine had a much more potent muscle building effect then a post-workout protein supplement, but none of the results were outside of our 2 to 5 pound baseline we came up with at the beginning of this book [Kerksick CM, 2007].

What you need to know about this study: The average protein intake for all groups combined was 165 grams of protein per day, well above our range of 70-120 grams. This study was funded by General Nutrition Centers Inc. (GNC)

In another trial published in 2000, scientists studied men who took part in a resistance-training program for 10 weeks. During the study these men also took a post-workout supplement containing either 40 grams of whey protein or 40 grams of whey protein with an added 5grams of L-glutamine and an extra 3 grams of Branched Chain Amino Acids (BCAAs).

Eating protein only once in a 24 hour period does not cause you to lose muscle mass (as long as the protein content is high enough to meet your daily needs).

Note: l-glutamine and BCAA's are popular muscle building supplements that have been theorized to be beneficial for gaining muscle but have failed to show any measurable results in research studies.

At the end of the trial the whey protein group gained an insignificant half-pound of muscle, and the protein plus extras (BCAA's and Glutamine) gained an uninspiring pound and a half. Considering that the people in this study were weight training for 10 weeks, these were not very impressive results [Colker CM, 2000].

The Infamous "Research" That Started All the Confusion

When it comes to the importance of 'nutrient timing' it seems that this popular notion started with a research paper that as published in 2001 that showed that when it comes to protein – 'timing is everything'.

If you read any popular fitness/nutrition publications or websites, you'll see this research quoted everywhere! Most of the articles you read in magazines or online usually quote the same study published in the Journal of Physiology. The journal of Physiology is very reputable journal, so I figured this study must be a pretty solid piece of evidence supporting all the chatter about the specific timing of post workout protein supplementation. Obviously I had to see this research paper myself and see what it said.

When I finally tracked this study down I was surprised to learn that the subjects in this trial were elderly men in their 70's, and the post-workout protein supplement only contained 10 grams of protein! This is a far cry from the protein mega doses that are currently being promoted by all the latest nutrition and fitness gurus. But the inconsistencies between the study and the current fitness industry dogma didn't stop there.

In this study, the elderly men participated in a weight-training program 3 days a week, for 12 weeks. After their weight training they drank a supplement containing 10 grams of protein and 7 grams of carbs either immediately or 2 hours after their workout.

After 12 weeks the group consuming their protein immediately after their exercise gained two pounds of lean mass, while the group who took their protein 2 hours after their workout somehow managed to lose two pounds of lean mass [Esmarck B, 2001].

In my personal opinion, 70-year-old men gaining two pounds of lean mass after 12 weeks of working out is hardly reason enough for me to start recommending post-workout protein. Not to mention that this is only a significant finding because the other group somehow managed to lose 2 pounds of lean mass, which is very surprising given their weight-training program.

Most likely, these findings are due to either poor study designs (all of their data was rounded to the nearest whole pound) or data collection errors. In fact, I am willing to bet that if this study were to be redone using our target population of people aged 18 to 55, we would not find any significant results at all.

What you need to know about this study: The supplement in this study was 'JogMate Protein' and is produced by a company called Otsuka Pharmaceuticals. The study was funded by Otsuka Pharmaceuticals.

Protein Fails to Impress Again

In yet another research study examining the effects of protein post-workout, young healthy men were placed in one of two groups. One group received 10 grams of creatine with 75 grams of dextrose (dextrose is a form of sugar) immediately post-workout, while the other group received 10 grams of milk protein plus 75 grams of sugar.

After 8 weeks of a very impressive weight training program the protein group gained just under 6 pound of lean mass (again, just a bit above our baseline of 2-5 pounds).

Interestingly, in this research the creatine group gained almost 9 pounds, which was much more than the protein group. It is also important to note that because of the way the statistics were run in this trial the difference between 5 pounds and 9 pounds was not significant.

What this research shows is that even without any post-workout protein, the group taking creatine after their workouts gained more lean mass than the group taking protein after their workouts. [Tarnopolsky MA, 2001] *(Another example of creatine performing much better than protein as a post-workout supplement).*

What you need to know about this study: Both groups consumed an average amount of protein daily that was slightly more than 120 grams (125 and 131 grams). This study was funded by MuscleTech Research and Development, Inc.

So as you can see, when we investigate research on post-workout protein that measures changes in muscle size and weight (as opposed to surrogate endpoints like Amino acids movement) we see very little evidence to support the idea that post-workout protein is essential to muscle growth.

Building Muscle, Nitrogen Balance and Protein Synthesis

Building Muscle, Nitrogen Balance & Protein Synthesis, is there a difference?

To understand where the story of protein and muscle began, we need to move away from all the research that actually measured changes in muscle mass and take a look at all of the tracer studies that show a post workout increase in something called “protein synthesis”.

You’re probably asking yourself “what is a tracer and why would anybody use it to study changes in muscle mass? Why not just measure actual changes in muscle mass?”

Well skeletal muscle turns over very slowly – at a rate of 1.5-2% per day. This means that even at its absolute fastest, muscle growth is an incredibly slow process. In fact, it is so slow that it is simply impossible to detect any changes in muscle mass during a short period like hours or days no matter how advanced and sensitive the measuring devices are that the scientists are using.

This fact posed a significant problem as scientists became very interested in how, when and why muscles grew. Specifically, they wanted to know what caused muscle growth during or after only one workout.

Therefore, since scientists do not yet have the tools to measure what they actually want to measure (changes in muscle mass) they have to look for something else that might be an indication or “marker” for what they want to measure.

In research we call this a *surrogate endpoint*. We use something we can measure and assume it tells us something about what we cannot measure. In this case, we measure markers of protein synthesis assuming they are an indicator of muscle growth. In other words, muscle mass growth is the true end point we want to measure but cannot.

So if we assume that muscles need amino acids to grow, and we can measure the amount of amino acids going into and out of muscles, we could guess that if more amino acids are going into and less coming out of a muscle, it must be growing.

So instead of measuring actual changes in muscle mass scientists use the incorporation of amino acids into a muscle as the surrogate end point that we can measure and use as a marker of possible muscle growth.

Definition:

> *Surrogate endpoints are often physiological or biochemical markers that can be **quickly and easily measured**, and that are **thought** to be predictive of a true clinical end point.*

Tracers, or labeled amino acids are amino acids that have been labeled with stable, non-radioactive heavy isotopes. Most often this is with carbon-13 atoms. This just means they can see where this exact amino acid goes anywhere in your body because it will show up on their computer scans. They can also take muscle samples and see how much of this special amino acid ends up in whatever muscle they choose to test.

Through careful measurements and a number of scientific assumptions scientists use tracer amino acids to measure the net balance of amino acids as they move in and out of an area of muscle [Smith K, 1998]. If, during a given period of time more amino acids move into a muscle than moved out of a muscle, that muscle is said to be undergoing protein synthesis.

If more amino acids are moving out than are moving in, the muscle is said to be undergoing protein breakdown, or protein catabolism.

These however are both assumptions. The net flux of amino acids in or out of a muscle does not, and has not been shown to equal true long-term muscle growth; it is still a scientific assumption, based on extrapolating information over a small period of time, and assuming it remains constant over a much larger period of time.

These are the studies that are typically referenced by the people who advocate high protein diets and post-workout protein, while stating things like "high protein after your workout is PROVEN to increase protein synthesis"

Unfortunately, we do not know whether acute measurements of protein synthesis are PROVEN to indicate long-term increases in muscle mass. And as we have just discussed, we don't even know if tracer studies are actually showing protein synthesis at all, or just a lot of amino acid movement in and out of muscles. Remember what we said about how your body uses amino acids like lego blocks and reuses them constantly all over your body.

The important thing to remember with these research trials is that they are *acute*. In other words, they examine what happens during a very short period of time.

If you were a subject in one of these studies, your day would have gone something like this...

You would be asked not to workout for 3 days, after which you would show up at a research lab around 10 PM, and you would go to sleep (no eating). The researchers would wake you up around 6 AM and start poking and probing you (again no eating). After a bunch of weighing and measurements, you would start working out around 9 AM...you still haven't eaten yet.

This would be one of the toughest workouts of your life. Most likely you would do 10 sets of 8 reps on the leg press machine, followed by 8 sets of 8 reps on the leg extension machine. All of your reps would be done at close to 80% of your one rep max. Like I said, a brutal workout.

By the time you finished you would be exhausted and it would be about 10 am. It would then finally be time to eat.

After your workout you would be given a drink that contains 3 to 6 grams of essential amino acids (the same amount of amino acids found in a glass of milk).

After that, the researchers would take measurements for the next 4 hours and measure your rate of 'protein synthesis'.

This is pretty much the standard protocol for these types of studies, and in these studies researchers almost always find an increase in protein synthesis over the two to four hours that they measure after your workout. (And remember when I say ‘protein synthesis’ we are actually talking about the movement of amino acids in and out of muscles that is assumed, but not proven, to mean protein synthesis)

So what does this prove? It proves that if you haven't worked out in 3 days, and you have eaten since 10 PM the night before, and you do a brutal workout at 9 AM the next morning, and drink the equivalent of a glass of milk, you will increase your protein synthesis for four hours.

In other words, more amino acids would be going into your muscle then would be coming out of your muscle during the 4 hour testing period! That’s it.

So if this is, in fact, a true measure of muscle growth then it definitely disagrees with the idea of needing at least 30 grams of protein every 2-3 hours. As we have just seen the people in these studies haven’t eaten in approximately 15 hours when they are supposedly ‘building muscle’.

Furthermore, the only reason I say protein synthesis increases for 4 hours is because the researchers stopped taking measurements after 4 hours. Who knows how long you would have stayed in a muscle building state. Some researchers have estimated that a single workout can put you into 'muscle building mode' for as long as 48 hours after your workout [Phillips SM, 1997].

Even more interesting is that researchers have found similar results when they made people drink the amino acids before their workout, and even when they made them wait and drink the amino acids a couple hours after their workout [Tipton KD, 2001; Rasmussen BB, 2000].

While this research does point to a connection between amino acid intake after either fasting or a single workout and amino acid incorporation into a muscle, it does not show muscle growth. It does show that amino acids from protein can stimulate protein synthesis [Bennet WM, 1989] and that they are able to do so in a 'dose dependent manner' – meaning the more amino acids you consume, the higher this measurement becomes [Bohe J, 2003], but again, it doesn't prove actual muscle growth.

However we also know that massive changes in the amount of protein you eat does NOT create proportionately massive changes in muscle mass, leading to further speculation that the measure of changes in protein synthesis to suggest changes in muscle mass may be flawed.

In fact, because these are acute trials that only measure a couple of hour's worth of markers, they actually can not show muscle growth. They can only show the results of a marker that if interpreted incorrectly could make you *assume* that the muscle was growing.

Even then, the doses of protein used are very small (typically the amount of amino acids found in a glass of milk) and the timing doesn't seem to be overly important (before workouts, after workouts or 2 hours after a workout all significantly increased these markers). But again, it is essential to remember that none of these research studies actually found a measurable increase in muscle mass. And isn't that what we're interested in anyway?

This leads me to a very interesting study published in 1992 that provided some startling evidence that illustrated the problems with these acute measurements.

Since proteins contain about 16% nitrogen (just a rough average), scientists can make estimates of the amount of nitrogen consumed in food and the amount of nitrogen we lose on a daily basis and use this estimate to calculate our "nitrogen balance".

The scientific assumption is as follows: if our nitrogen balance is positive we are using protein to synthesize new tissues, such as enzymes, cell structures, and structural proteins like organs and muscle. If our balance is negative we are losing protein in the form of energy or nitrogen containing waste products like urea.

Using these basic principles, researchers measured both the nitrogen balance (one of those markers I was telling you about) and gains in muscle mass in young men who were eating either a high-protein or low-protein diet while following a resistance training workout program. These subjects were performing an intensive hour and a half of resistance training 6 days a week for 4 weeks. This research is very important because it measured both acute markers measurements (nitrogen balance) AND actual long-term gains in muscle mass.

After 4 weeks the people on the high protein diet (1.2 grams per pound of bodyweight) had a significantly higher nitrogen balance than the people on the lower protein diet (0.61 grams of protein per pound of bodyweight). Based on our scientific interpretation of nitrogen balance measurements, these people should have gained muscle mass.

The low-protein diet resulted in a nitrogen balance that was actually NEGATIVE, suggesting losses in muscle mass.

Incredibly, despite these nitrogen balance findings neither the high or low protein diet made a significant difference on the amount of muscle mass increase.

Even the researchers called these findings surprising, stating that if the nitrogen balance measurements were an accurate measure of increases in muscle mass, then over the one month period the high protein diet should have caused a 17 pound increase in muscle mass!

Obviously the massive effects noted in these acute measurements of nitrogen balance simply do not add up long term, as a 17 pound increase in muscle mass would have been an absolutely tremendous increase.

Research using nitrogen balance does show us that increases in protein intake will cause a measureable but transient retention of nitrogen in the body. But unfortunately that is all they seem to show us.

What we do not know for sure is whether this nitrogen retention is a true marker of muscle growth (it is just another surrogate endpoint).

Many scientists agree that the use of nitrogen balance as a surrogate endpoint to show increases in skeletal muscle mass is very flawed [Jackson AA, 1999]. There are many other explanations for positive nitrogen balance, which include use by other nitrogen sources in the body that turn over much more quickly than muscle, or even an unrecognized error in the scientific methods of studying nitrogen balance.

The bottom line is that to date we have little proof that any of these surrogate endpoints such as nitrogen balance or tracer studies actually indicate long-term muscle growth.

This makes sense for a number of reasons. Firstly these trials are done almost exclusively in acute situations. Only the metabolic effects of the few hours following one single workout are measured and then these results are used to guess at what happens after a series of workouts.

Secondly, most researchers are very quick to point out that their findings indicate *transient* increases in protein synthesis. Transient is another way of saying that something is only happening for a very short period of time, and is most likely going to change or return to existing levels very quickly.

Even newer, more sophisticated surrogate endpoints like the phosphorylation of anabolic signaling proteins are still causing scientists to be even more confused. It has recently been shown that an increase in the phosphorylation of the anabolic signaling proteins 'PKB' and 'p70S6K' can occur without any changes in protein synthesis [Greenhaff PL, 2008].

> What you need to know about this study: At the time of writing, this study is considered groundbreaking due to its findings and I know that Dr. Greenhaff will be published more of his findings in the near future. This study was funded by Iovate Health Sciences Inc.

So now we have evidence that 'key' anabolic pathways can be activated without causing any changes in protein synthesis, and that protein synthesis can change without causing any measurable changes in actual muscle mass!

> While this is bad news for people who market things like mTOR activators, it does not mean that studying these pathways is a waste of time – It simply means the relationship is more complicated than we thought!

With all of the available research it seems evident that the findings in acute trials simply do not translate long term. Not only this, but is also seems apparent that neither high protein diets, nor post-workout protein can dramatically speed up the muscle building effects of resistance training.

What DOES build muscle?

If Post-workout protein and ultra-high protein diets don't help me Build Muscle, What Does?

I won't hit you with any more protein studies as I'm sure your head is spinning right now, but what I would like to show you is some very interesting research on good old creatine monohydrate.

Many people think that it was the passing of the Dietary Supplement Health and Education Act (DSHEA) back in 1994 that allowed the nutritional supplement industry to become the juggernaut that it is today, but in my opinion, the discovery of the muscle building effect of creatine monohydrate played just as large a role. In fact, my opinion is that there would be no supplement industry without creatine.

From the pioneering research conducted by Dr. Eric Hultman and Dr. Roger Harris, to the ongoing work being conducted by Dr. Paul Greenhaff and many others, the scientific research behind the muscle building effects of creatine is very impressive. So impressive that I believe the effectiveness of creatine created a belief that all supplements could work this well with no side effects and be safe and inexpensive.

Creatine is truly the poster child for the supplement industry and how amazingly effective a product could be. Unfortunately 14 years later it is still one of the only supplements that can make this claim.

There are hundreds of scientific papers on creatine, and easily over a dozen published books, and for good reason - In almost every creatine trial I have ever reviewed, the men (and women) taking creatine always gain impressive amounts of lean mass.

Interestingly, these people do this without any other post-workout supplements or changes to their normal diets. So people in creatine research trials gained muscle WITHOUT high protein diets or post-workout protein meals.

If you measure the surrogate endpoints like amino acid flux or nitrogen balance, creatine has no effect [Louis M, 2003]. But, when you measure the true endpoint of muscle weight, creatine does very well. In fact creatine performs so well that people in creatine research trials typically gain much more muscle than people in research trials who take protein after their workouts.

For instance, in a trial published in 2000, 23 men taking creatine gained over 3.5 pounds of lean mass over 6 weeks. The impressive part is that they only worked out on their arms! That's right, 6 weeks of only blasting their biceps and the men in this study still gained 3.5 pounds of lean mass! In a measure of upper arm muscle area they gained over 2 square inches of muscle size! [Becque DM, 200]

What you need to know about this study: The subjects performed preacher curls twice a week for six weeks. No funding source was disclosed for this study, nor was the source of the creatine used.

In a trial published in 2001, researchers gave creatine to a group of football players for 9 weeks. During this time these red-shirt freshmen were weight training 4 times per week. At the end of the 9 weeks, the creatine group gained over 8 pounds of lean mass [Bemben MG 2001].

What you need to know about this study: This study was funded by the National Strength and Conditioning Association.

In another trial using creatine combined with resistance training (this time in older men in their 70's), after 12 weeks of resistance training and taking creatine (no post-workout protein) the creatine group gained over 7 pounds of lean tissue mass! [Chrusch MJ 2001].

What you need to know about this study: It's important to note that in this study the subjects were of advanced age (70's). This study was funded by MuscleTech Research and Development, Inc.

So to put it all into perspective, from what I can tell from reviewing clinical research, working out alone should cause you to gain between 2-5 pounds of lean mass (remember our baseline with no supplemental protein).

Adding a protein shake after your workout won’t provide any extra benefit and you should still expect to gain only 2-5 pounds. If you take creatine in conjunction with your workout program you can expect to gain as much as 9 pounds of muscle mass.

The variation in these numbers (whether you gain 2 or 9 pounds) is most likely dependant on your training status and the design of your workout program. Simply put, the better the workout program design, the better the weight gain. This has even been shown in research where better-designed workout programs have caused larger increases in lean mass [Kraemer WJ, 2003].

The interesting thing with creatine research is that it doesn’t matter whether you take your creatine alone, in combination with carbs or protein, or a combination of the two. The research suggests you will still end up gaining around 7-9 pounds. The protein and carbs simply don’t make a difference.

In the conclusion section of a research paper published in 2004, the authors stated, "*It is likely that a significant portion of any increases in fat free mass that occurs with a supplement containing creatine, protein, amino acids and carbohydrates is due to the creatine.*" [Chromiak, J. 2004]

> What you need to know about this study: The quote from Chromiak comes from a 2004 study that was funded by Numico USA. During the Early 2000's Numico owned Met-Rx and GNC.

Based on my findings, I couldn't agree more. In fact, Here's a quick 'insider tip' for you – if a protein powder has a claim on its label that it 'builds muscle' look in its ingredient list – chances are, you will find creatine monohydrate as an ingredient.

As far as I am aware, creatine is one of the only ingredients that has enough evidence behind it to make this strong claim.

Based on this evidence it seems logical to say that if you are interested in gaining muscle mass simply taking creatine monohydrate would be your best option. After all, why eat all those extra calories if they don't make a difference (and increase your risk of gaining body fat)?

With regards to the use of creatine for muscle building I have one word of caution – It is very important to remember that we have not seen any evidence that these dramatic muscle-building effects are repeatable.

In other words, in almost every research paper studying the benefits of creatine, the subjects were using creatine for the very first time. If the people in a creatine trial were to enroll in a second research study examining the effects of creatine on muscle building I would be very surprised if they were able to gain the same amount of muscle.

So while creatine has been shown to be effective in many different research studies, it is always important to remember that it has not been shown to be continually effective – the results may lessen over time.

Conclusions

Conclusions

When you look at all the available research, instead of one single study you begin to see the big picture. Realistically, you can expect to gain between 2 to 5 pounds of lean mass in 2 to 4 months by working out. There is evidence to suggest that you might be able to gain about 7 pounds of muscle by working out and upping your calorie intake by 2000 calories. Of course, you could get the exact same result by taking creatine, without any potential for gaining body fat.

These results lead me to say that protein still has a role in everyone's nutrition plan, and is an essential nutrient that is obviously important for building and repairing muscles. In fact, from my understanding of the research I think it makes sense to try and consume SLIGHTLY ABOVE the recommended amounts, aiming for around 70-120 grams of protein per day, depending on your body weight and current calorie intake. I suggest bigger men aim for the upper end of this scale, and women aim for the lower end of this scale.

But despite all the hype I just don't think we need to be paying good money for massive amounts of protein powder, jumbo-sized packages of chicken breasts or consuming 6 dozen eggs per week. Nor do I think we need to be obsessing over eating our protein right after our workouts, if the amount we get in our diets will serve our purposes just fine.

After all, gyms around the nations are full of young men who regularly consume thousands of dollars worth of protein supplements. Take a look at the ones who aren't secretly on steroids (you probably know who they are) are they really any bigger than they were two months ago? For that matter even 2 years ago?

Professional bodybuilders regularly consume massive amounts of protein and are on doses of steroids so high they would stop a horse's heart, but they are extremely happy if they are able to put on 10 pounds of muscle over an entire year. This is a great reminder that even when using steroids muscle growth is a slow process.

Finally, look at your own progress. Have your muscle gains exploded since you started counting the grams of protein you eat? My guess is probably not.

In fact, your greatest gains in muscle mass probably occurred when you first started lifting weights. When you didn't even care about how much or type of protein went into your body. You probably ate when you were hungry, lifted when you needed to, and your muscles grew like a weed.

The bottom line is as long as you consistently consume an adequate amount of protein on a regular basis, whether its 1 large serving or 5 to 6 small servings per day, you will have all the protein you need for your muscles to grow.

It's important to note that I am not condemning protein supplements. I'm talking about ALL sources of protein. Whether it's a chocolate flavored whey protein shake or a skinless chicken breast, neither one seems to be overly effective at causing you to build massive amounts of muscle mass.

The super massive amounts of protein that bodybuilders eat might work in conjunction with steroid use, but no scientists have been able to prove it in a properly conducted research study. Safety concerns and ethical issues prohibit research on people taking mega-doses of illegal anabolic steroids, so no scientist on earth can actually tell you what is going on in the bodies of those 300 pound behemoths you see in bodybuilding contests and on the cover of 'fitness' magazines.

Furthermore, the research that supports the necessity of post-workout protein just isn't there yet. Acute research tends to show an improvement in markers of protein synthesis, but this has not yet translated into measureable improvements in muscle mass.

Right now, I feel confident in saying *'if you want to build muscle, workout and possibly take your creatine'*, but that's about it. I cannot find a scientifically valid reason to tell you to take protein after your workouts nor can I find a reason to eat any more than 70-120 grams of protein in a 24-hour period.

The good news is that this means that if you are interested in gaining muscle, you can concentrate on the real hero behind your muscle gaining, and that is you and your workouts. The amount of protein you eat should not concern you any longer.

Outside of your height and genetics it is the quality of your workouts that will determine how much muscle you are able to add and keep on your body.

My Best Recommendation

Probably the very best recommendations I can give you are to eat a variety of protein containing foods. As long as you are eating meals with a wide variety of foods you should be able to reach the 70-120 gram target very easily (the average intake in North America is already around 90 grams).

What I DO NOT Recommend

Please note that I have not given recommendations as a percentage of your daily calories or as a percentage of your body weight. This is because neither of these equations have ever made any sense to me.

Take for instance, the idea of eating 1 gram of protein per pound of body weight. If a man weighs 180 pounds at 15% body fat when you exclude the weight of his fat he actually has 153 pounds of lean mass. If he eats 180 grams of protein, then he is actually eating 1.17 grams per pound lean body mass assuming your fat cells do not need any measurable amounts of protein.

Now if over the next year or two this particular man happens to gain weight at a rate of 20 pounds per year (difficult, but not impossible to do) then after two years he would weigh 220 pounds. So now he should be eating 220 grams of protein per day by this logic.

But what if the weight he gained was entirely body fat? He would be 220 pounds with approx 30% body fat and would still have 153 pounds of LEAN mass. So now he is eating 1.43 grams of protein per pound of lean body mass.

It doesn't make sense that his protein requirements increased by 40 grams per day if the only thing that changed was the amount of fat on his body.

Another example of a confusing protein recommendation is eating a certain percentage of your calories as protein. If a person who eats 2000 calories follows the recommendation of eating 15% of their calories as protein this would mean they would eat 300 calories from protein, or about 75 grams of protein (each gram of protein contains approximately 4 calories).

Now if this same person starts to eat 4000 calories per day, and still follows the recommendation of eating 15% of calories from protein they are now eating 150 grams of protein per day. Again, I see no logical reason why doubling your calorie intake would cause a need for a doubling of protein intake.

Final thoughts on Protein

For the purpose of building muscle mass I think the goal should be a general recommendation of 70-120 grams of protein per day, and this should be an **average** intake. As long as you average around 70-120 grams per day you could be lower on some days and slightly higher on others, but muscle growth will still occur.

There is no magic to the strict time period of 24 hours. We live our lives in 24 hour chunks out of convenience with the sun's schedule, but we tend to assume our nutritional and metabolic needs work this way as well, but this isn't the case. There is no reason to stress over the amount of protein you have eaten over a 24 hour period, some days you'll be a bit higher, some days you'll be a bit lower, it's the average over weeks and months that matters not hours and days.

Finally, since the average protein intake in North America is roughly 90 grams per day the vast majority of us are already eating enough protein to support muscle growth. Therefore, we don't need to obsess over our protein intake the way fitness magazines and nutrition experts suggest we should.

Based on all of this research it seems clear to me that there is a very good chance that you don't need to change anything in your diet and can enjoy the foods you like knowing that you are not hindering your muscle growth.

You don't need to worry about eating a certain proportion of your diet as protein, or use special protein sources every couple of hours. In fact, I would even argue that you do not have to think of foods as protein containing and non-protein containing foods. Eggs contain an average of 6 grams of protein and are largely considered to be a protein food. A piece of bread contains roughly 5 grams of protein and is NOT considered a protein food. This type of obsessive compulsive eating and extreme focus on the individual nutrients contained within foods is simply not required in order to increase your muscle mass.

Eat Stop Eat, Protein Intake and Building Muscle

Eat Stop Eat, Protein Intake and Building Muscle

The reason why I wrote this book is twofold. First, I really wanted to know if I could increase my muscle mass by taking protein after my workouts and secondly, the necessity of post-workout nutrition was the most asked question by people who have read my book "Eat Stop Eat".

It may strike you as odd that the number one question I get about a fat loss program is about muscle building, but it does make sense. After all, the goal of losing weight is not to lose weight, rather it is to lose weight as body fat exclusively. Therefore following a nutrition strategy like Eat Stop Eat along with a weight training program for muscle mass naturally leads to the question of protein and building or maintaining muscle mass.

Eat Stop Eat is a nutrition program that promotes the use of flexible periods of intermittent fasting combined with resistance training. My philosophy is that your nutrition habits will be the driving force behind your ability to lose body fat, and your exercise habits will be the driving force behind your ability to gain and maintain muscle mass.

Since the current belief is that post-workout protein is vital to the muscle building process, many people are concerned about lifting weights while in the fasted state for fear of losing muscle. The fear of muscle loss is especially important because losing muscle will in turn lower ‘metabolism’.

So ironically the concern about the ability of dietary protein to build muscle is equally fueled by the desire to build muscle as it is a desire to burn body fat without *losing* muscle.

From the findings in this book I feel confident saying that you can follow Eat Stop Eat, fast once or twice a week, lift weights and effectively build muscle mass while still losing body fat.

With the Eat Stop Eat program you never go a day without eating, so you should be able to eat enough protein to support muscle growth. On some days you may eat slightly less protein than other days, but on average you should be able to maintain an adequate protein intake over the course of a week. You should also be able to work out during your fast and still stimulate your muscles to grow.

If on the days when you are eating normally you still feel you need to consume extra protein after your workouts, by all means go ahead. I cannot find a good scientific reason to do so, but I definitely don’t think it is going to hurt you in any way (besides maybe hurting your wallet a bit).

If you are not gaining the amount of muscle mass that you would like to, then there is no need to increase the amount of protein you are eating. More than likely, the problem lies within your workout program, not your protein intake.

In fact, there is a strong and growing body of scientific evidence that suggests that weight training provides stimulus to promote greater recycling of amino acids within your body, the end result of which is that weight training can actually lower, not raise, your protein requirements. [Phillips SM, 1999; Phillips SM, 2002; Hartman JW, 2006]. In other words the longer you have been working out, the less likely you are to need extra amounts of protein.

The bottom line is your workouts are what cause you to build muscle. Daily protein intake does play a part, as does adequate rest and recovery. There does not seem to be much of a benefit from added post-workout protein, but there is good evidence to warrant the use of creatine after your workout (If you are following Eat Stop Eat you can take creatine on your fasting days). Most importantly, missing a post-workout meal because you are fasting will not prevent you from gaining muscle.

And we can add that there is even research to suggest that the more experienced you are at lifting weights the less likely you are to need extra protein, as you are teaching your body to become more and more efficient at building muscle.

So the final answer to “how much protein do I need to eat to build muscle” is the very answer that was first recommended in the late 1800s:

Eat between 70-120 grams of protein per day in one or multiple meals.

I hope that this book has helped you understand protein and the muscle building process. I also hope that you’ve learned not to stress about your protein intake and that you probably already eat enough protein to build all the muscle you’ll ever want. Now get to the gym, enjoy your workout and enjoy your food.

Frequently Asked Questions

Frequently asked Protein Questions

Q: I saw in a bodybuilding magazine somewhere that my body can't absorb More Than 30 grams of protein at Time, is this true?

A: No. Your body does not have a defined upper limit to the amount of protein it can absorb at a given meal. Your body absorbs and uses all of the protein you ingest at each meal. The protein you eat is first used to replenish amino acid pools that are used for a number of cellular processes and are quite literally the building blocks of all your body's cells. Any excess protein above this gets converted into glycogen and stored in your liver or muscle cells.

Q: Do incomplete proteins count in my total protein amount for the day?

A: Yes incomplete protein sources also count in your daily protein amount because they are still adding to the total amount of protein and amino acid your body is absorbing. Also, most people will be ingesting an incomplete protein with some other protein source therefore each meal is still delivering all the essential amino acids.

For example, corn is missing the amino acid Leucine, whereas rice is missing the amino acid Isoleucine. If you eat both of these foods together the meal would provide a source of complete protein even though each individual food source was incomplete.

Q: Does it matter where I get my protein from?

A: Not really. As long as you are eating mixed meals you will almost always be getting all the amino acids in every meal.

Q: Are some food sources of protein better than others?

A: There are two things to consider when looking at the protein in any food source.

1) Is the protein complete? A complete protein supplies all of the amino acids that your body needs for growth and survival. An incomplete protein is missing at least one of the amino acids your body requires and therefore you would need to mix an incomplete protein with another source that provides the rest of the amino acids for proper growth and survival.

2) How much protein does the food have per gram of total foodstuff? For example, 100 grams of chicken breast has much more protein compared to 100 grams of pasta. Both food sources have complete protein; however, one has much more protein per gram.

Q: I'm a vegetarian, does this mean I need to eat tofu or take protein powders?

No. You might not realize it but there is lots of protein in foods like multigrain bread, pasta, grains, nuts, legumes and beans. Be sure to make mixed meals that include a variety of vegetarian foods, this will ensure that each meal provides the full spectrum of amino acids.

Q: Most bodybuilding magazines say that glutamine is 'conditionally essential' is this true?

A: Glutamine is not one of the essential amino acids. No matter what the supplement companies tell you, glutamine is not essential, or 'conditionally essential' to bodybuilders. It's only essential to supplement companies because it is cheap, tasteless, and mixes easily with water. It makes great 'filler' in a product, and because it is so cheap, you can make a huge profit with it.

Q: Do you destroy the protein in eggs or meat by cooking them?

A: No. Cooking meat, eggs or any protein source does not destroy the protein. It simply changes the way it is shaped at a molecular level. This change in the molecular shape of the protein is what causes it to have a different appearance such as cooked eggs becoming white instead of semi translucent when they are raw. The actual amino acid content of the protein remains the same after cooking. We typically cook protein sources because it makes them taste better and it kills bacteria that grows on raw foods.

Q: Do protein powders really contain as much protein as they say they do?

A: I would say most quality brands have the real amount of protein that is stated on the label. However, it is possible to make a product appear as though it has a higher protein content that is actually does. The standard protein test measures nitrogen content because protein is the only macronutrient that contains nitrogen; fat and carbohydrates do not.

There are a few inexpensive ingredients that can be added to a protein powder that also contain nitrogen which will make it appear as though there is more protein in the product. This is not a very common practice; however, it is possible.

For the most part I would say you get what you pay for with protein. Stick with a reputable brand and don't always go for the cheapest protein on the shelf. If the product gives you gas or bloating or other stomach upset it is probably a low quality product and you should try a different brand.

Q: What about fast and slow digesting proteins?

A: Each protein source will have a characteristic rate of absorption. Protein powders based with whey will absorb somewhat quicker than casein based proteins. The rate each protein absorbs doesn't have any measureable effect on muscle building or fat burning.

Protein manufacturers use the fast and slow absorbing protein story as a marketing angle, but I don't think you will ever notice a difference between the two.

Q: I heard that your body can't turn protein into fat. Is this true?

It doesn't really matter whether or not your body can turn protein INTO fat. What matters is that no matter what you eat (protein, carbs or fat) if you eat more calories than you burning, your body will GAIN body fat.

Q: What about all those popular diets that advocate a super high protein diet?

Believe it or not, even some of the most popular high protein diets DO NOT advocate super high protein intakes. In fact, two of the most popular diets "Protein Power" by Dr. Michael Eades and "The Paleo Diet" by Loren Cordain both recommend protein amounts that are in-line with my suggested intake.

In “The Paleo Diet for Athletes”, it is recommended that a 200 pound person who trains with intense exercise for 5 or less hours per week should eat roughly120 grams of protein.

In “Protein Power” Dr. Eades recommends that we should consume 0.6 grams of protein per pounds of LEAN body mass. Even someone who is VERY ACTIVE (an hour or more of VIGOROUS activity five or more times per week) is recommended to consume 0.7 grams of protein per pound Lean body mass.

To put this into perspective, a 175 pound man with less than 15% body fat who trains with vigorous exercise for more than an hour per day, 6 days per week, still falls into the range of 70-120 grams of protein.

Truly, it is only really the bodybuilding subculture that recommends super high protein diets. Even diets named “Protein Power” still don’t advocate diets that contain 200-300 grams of protein per day.

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