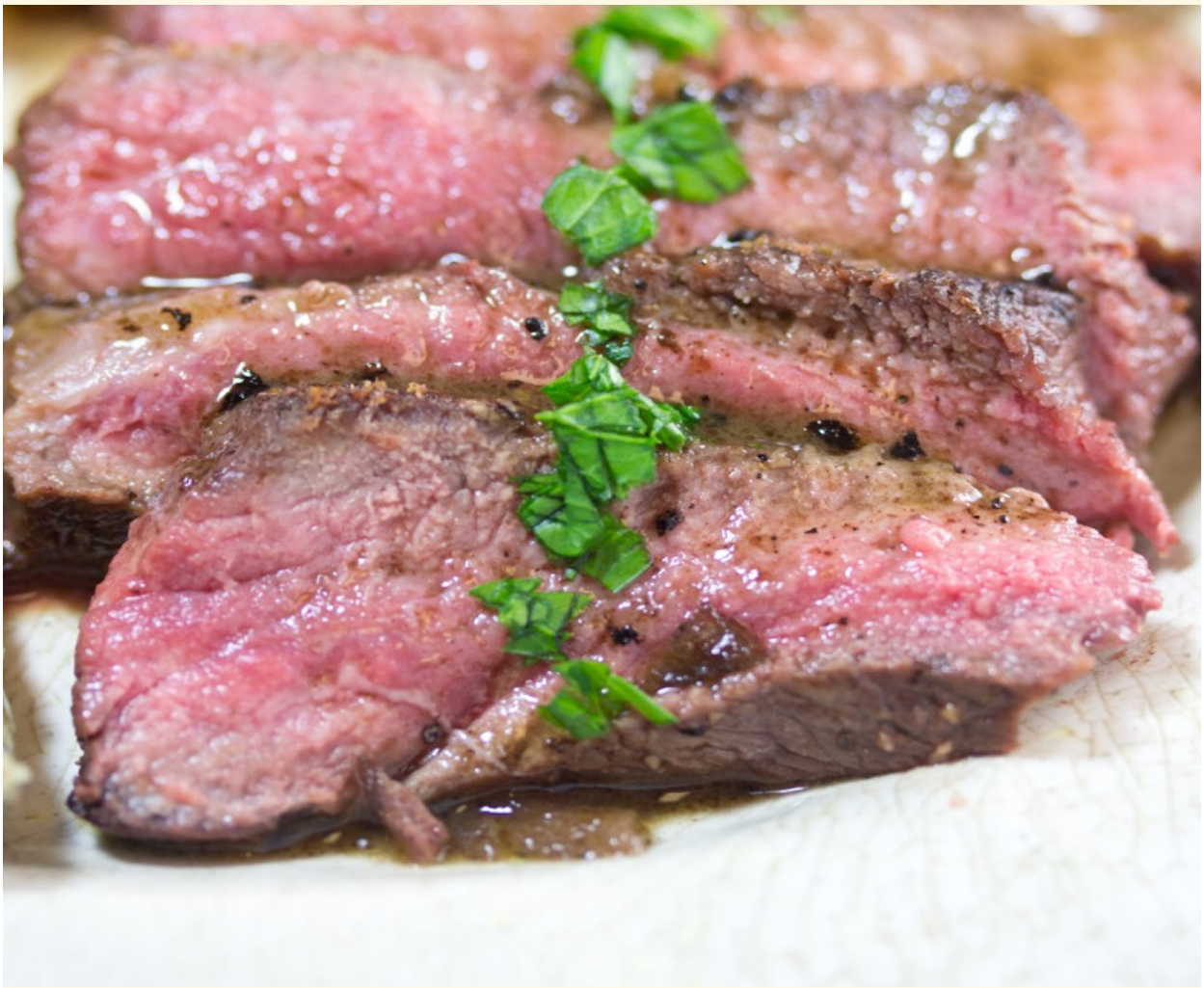
HOW MUCH PROTEIN DO YOU NEED TO STAY HEALTHY?

WHAT THE EXPERTS SAY



BY JOHN N. BIANCHI

❖Introduction

As you grow older, you begin to take more notice of your age and the age of those around you.

You once had a spring in your step as you climbed stairs. Carrying around something heavy was no problem. Getting off the floor after romping with your kids or pets was easy.

But now a flight of stairs seems to make your legs feel a bit more tired than they used to. Those packages from the grocery store seem to be getting heavier year after year. And as for rising from a squat. Well, let's not go there.

The fact is you're getting older, and your muscles are getting older as well.

But then another thing starts happening.

You start noticing older men and women who are unable to navigate the simple physical tasks of life without the help of an aide.

Maybe you've seen it amongst your loved ones. Your aging dad's once powerful arms and legs now have shrunk to what appears to be mere skin and bones. Your mom, now definitely well into her senior years, seems to be permanently attached to her walker.

You've never really paid much attention to aging before because it didn't affect you personally.

However, now you begin to take notice because you feel the effects of aging coming upon you. And you wonder if you may end up frail and weak one day as well.

You don't fret about it too much though. After all, don't we all grow older? Isn't weakness just part of that process?

Isn't that what aging is supposed to look like? That's what we generally see, right?

But does it have to be that way?

Well, not necessarily.

Often, what we interpret as “normal aging” is a result of the considerable loss of muscle mass experienced by older people. Unfortunately, most older people simply do not have enough muscle mass to maintain a good quality of life.

Health professionals now know that good muscle mass is necessary for maintaining good health and mobility.

Now, here’s the good news. The loss of muscle mass loss resulting in poor health and disability isn’t necessarily an inevitability of aging.

Today, there are scientifically proven ways to mitigate the loss of muscle as we age.

Studies have shown that the best way to maintain good muscle mass throughout our lives is through the use of resistance training (RT). RT has even proven to maintain and increase muscle mass in individuals in their eighties.

But there’s another way to attenuate the loss of muscle due to aging. That’s through the proper dietary intake of protein.

Since good muscle health is dependent on proper protein consumption, it’s vitally important you know how much protein you need to consume daily.

Are You Consuming Enough Protein To Maintain Healthy Muscle?

Unfortunately, many of us today, especially those who are over the age of 65, are simply not consuming enough protein to optimally maintain muscle mass and strength.

What’s especially concerning is that while most young adults are consuming more than the recommended daily allowance (RDA) of protein intake, about ⅓ of older people are not meeting that requirement.

Now, as if that wasn’t bad enough, the current RDA for protein might actually be underestimating our daily need of protein.

Many of today’s leading protein researchers have even become openly critical of the current RDA for protein. They suggest that the current RDA for protein is out of touch with the current scientific research and is woefully inadequate as a reference for older adult populations.

So, how much protein should we be consuming on a daily basis in order to keep our muscles healthy?

In the following chapters, I'll examine the current RDA for protein intake and then explore what current top protein researchers recommend for a daily optimal amount of protein. However, I'd first like to start by reviewing why maintaining good muscle mass is vital for maintaining good health.

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❖Chapter 1: The Importance Of Good Muscle Mass

You know your skeletal muscles are necessary for enabling you to move from here to there and for helping you lift things. When you suddenly can't do some of those things, you become acutely aware of how important your muscles really are.

But your muscles are much more important than simply being parts of your body that when contracting and relaxing allow you to be mobile.

Skeletal muscle is an organ that constitutes about 30% - 40% of your body mass.

It can act like an endocrine organ by secreting anti-inflammatory myokines. There is research to suggest that myokines released from muscle may play a role in tumor suppression.

Muscle is also the largest contributor to resting energy expenditure (REE). REE is the amount of calories you burn at rest. More muscle means you'll burn more calories. That's good for trying to maintain an optimal body weight.

The primary site for glucose metabolism in your body occurs in muscle. Therefore, better muscle mass means greater insulin sensitivity and a decreased risk of type 2 diabetes and metabolic syndrome.

There is also evidence that poor muscle strength is associated with dementia and cognitive decline. Researchers are, however, unsure of the exact link.

Studies have now shown that there is an inverse association between low muscle strength and increased mortality.

As I mentioned before, maintaining healthy muscle, therefore, is a key to healthy aging.

Unfortunately, aging is working against you in this respect. Everyone over 35 years old is probably losing muscle mass every year.

❖Chapter 2: Age-Related Sarcopenia

Muscle loss is a normal part of aging. The medical term for this is age-related sarcopenia. This is not to be confused with sarcopenia related to a serious illness like cancer.

The problem with age-related sarcopenia is that it's an insidious problem that is relentless if not checked. For example, sedentary individuals can expect to lose as much as 3% - 5% of their muscle mass per decade after the age of 30.

However, after the age of 50, muscle mass loss can be as great as ~0.8% annually. By the time you're 75, that can add up to a lot of muscle loss. This could result in a significant loss of mobility, strength and frailty.

Associated with age-related sarcopenia is dynapena. This is the loss of muscle strength. It can take place at a much more dramatic rate than sarcopenia. Some researchers estimate that strength loss could be as much as about 3 - 2% annually.

While age-related sarcopenia can be treated pharmacologically with testosterone therapy, the most potent treatment is resistance training.

However, protein researchers now know that proper protein intake can work synergistically with RT to better attenuate the effects of sarcopenia.

In some cases, the combination of the two strategies may even induce muscle hypertrophy in older individuals.

In order to understand why proper protein intake is important for maintaining healthy muscle, it's essential that we understand how muscle is synthesized and maintained.

❖Chapter 3: A Muscle Metabolism Primer

Muscle mass is regulated by two processes. These are muscle protein synthesis (MPS) and muscle protein breakdown (MPB). Let's look at MPS first.

Muscle Protein Synthesis

Protein is the major building block of muscle. To get a picture of how muscle is synthesized consider the analogy of building a brick wall.

As you add bricks to the end of a wall, it gets bigger. As protein (actually amino acids) is added to muscle, it's like adding bricks to a wall. It gets larger.

This is known as muscle protein synthesis (MPS). However, this is not the whole story. There is also something important going on at the other end of the wall.

Muscle Protein Breakdown

Protein is constantly being turned over by your body. This means that protein is constantly being removed from muscle. This process is known as muscle protein breakdown (MPB).

Getting back to the wall analogy: while bricks are being added to one end of the wall, bricks are constantly being removed from the other end.

Net Protein Balance

Now, in order for muscle hypertrophy (growth) to occur, MPS must be greater than MPB. When this is achieved, scientists say we have a positive net protein balance (NPB).

When MPS and MPB are equal, homeostasis is achieved, and muscle mass is maintained. However, if MPB > MPS, then there is a negative NPB. If this occurs, muscle mass will be lost.

Muscle Protein Synthesis: The Key To Preventing Muscle Loss

The key to mitigating muscle loss is to achieve muscle protein synthesis (MPS). The greater amount of MPS going on in your muscle, the less muscle you'll lose. [Since protein researchers are unsure of the exact role MPB plays in the process, we'll leave it out of our discussion.]

Outside of hormone therapy there are two ways to stimulate MPS. One is through RT. The other is through a sufficient intake of dietary protein. RT, though, appears to be a much more potent stimulus for triggering MPS than consuming protein.

However, when RT and optimized protein consumption are combined, there is a synergistic effect on MPS.

Now, let me put this all together to see how it affects age-related muscle loss and the building of muscle mass.

Preventing Muscle Loss and Increasing Muscle Mass

We know that if you engage in resistance training, you will significantly increase the MPS occurring in your body. RT during the post-absorptive state (when food has not been consumed prior to or after RT) stimulates MPS by more than 100% above basal levels.

However, it's uncertain whether RT alone (e.g. without the ingestion of protein after exercising) can induce muscle hypertrophy (Atherton, Biolo). So be careful not to confuse muscle growth with muscle protein synthesis.

Here's why growth may not occur. While RT also increases MPB, NPB may remain negative (some researchers believe the MPB associated with RT may not be that significant). Nonetheless, if NPB is negative, muscle hypertrophy will not result. Also see here.

However, and this is important, even though RT may not stimulate MPS enough to create a positive NPB, it will aid greatly in the sparing of muscle mass loss.

Now, our quest for muscle health is to achieve maximal muscle protein synthesis so that we can slow down muscle lost as much as possible or even achieve muscle growth.

The way to do this is by combining RT with the optimal amount of protein consumption. Remember that adequate protein was the third way to stimulate muscle protein synthesis.

If you're not somebody who engages in RT (though you should be), then the only other practical way to attenuate muscle loss is through adequate protein consumption.

❖Chapter 4: Protein Consumption And Muscle Protein Synthesis (MPS)

Protein researchers know that protein ingestion will stimulate MPS. This though is dependent on the amount of protein consumed, the type of protein, and when it's consumed. I'll get more into those specifics later on.

However, even though sufficient protein ingestion can stimulate MPS (independent of RT) and thus limit muscle breakdown, it will not induce muscle hypertrophy. Again, this is because NPB remains negative.

You simply cannot eat enough protein to counteract the amount of muscle that is being broken down. But if you do eat enough protein to stimulate MPS, you will be slowing down the progression of muscle loss.

So, even though both RT and sufficient protein ingestion independently increase MPS, muscle mass may still be decreasing but not as fast if neither was employed.

Now, here's the really good news!

Repetitive bouts of RT in combination with sufficient protein intake after exercising can optimally increase MPS so that NPB moves to a positive state whereby muscle protein accretion will be promoted over time.

Therefore, in terms of mitigating muscle loss due to age-related declines, the best strategy is the combination of RT and proper protein ingestion.

Both strategies will attenuate the loss of muscle due to sarcopenia. However, when combined, they can produce a maximal MPS that can cause a positive NPB and thus muscle hypertrophy (growth).

Okay, this is the third time I'm going to mention this. But I really want to drive home this point. This strategy will even create muscle hypertrophy in eighty-year-olds.

That's great news. But there are several questions that have to be answered. You may be asking them already.

What kind of RT are we talking about? My intention is not to focus on RT in this article. You can read about RT here and here.

I’ve already hinted at the other question. If protein consumption is an important factor in achieving MPS and preserving muscle mass, then how much should we consume on a daily basis?

❖Chapter 5: The Current Recommended Daily Allowance of Protein

The current recommended daily allowance (RDA) of protein for adults is 0.8 grams of protein per kilogram of body weight per day (designated as 0.8 g/kg/d).

So, according to the RDA, if you weigh 150 Lbs (68 kg), regardless of age or gender, you would need a minimum of (68 x 0.8) 54.4 grams of protein per day to stay healthy.

Hopefully, “healthy” would include maintaining good muscle and fulfilling other protein requirements of your body. But it may not. That’ll become evident later on.

If you were to do a quick google search for the RDA for daily protein consumption, the results probably wouldn’t specify what kind of protein meets the 0.8 g/kg/d requirement.

In some places, the RDA specifies high quality-protein, but it doesn’t define what high-quality means. More on this as well a little later.

However, the important thing to understand is that the RDA for protein is not the amount you’re allowed to eat daily. It’s the minimum amount of protein needed to meet the basic nutritional requirements of a healthy person.

Recently, however, the RDA for protein has come under criticism by leading protein researchers.

One criticism is that the method used to determine the RDA might be flawed.

Another is that the RDA may significantly underestimate protein requirements for older people because it neglects the fact that the ability of protein to stimulate MPS is blunted in older adults.

Let’s take a look at the first criticism. Is the RDA derived from a flawed method?

❖Chapter 6: Is The RDA For Protein Determined By A Flawed Method?

The RDA for protein is established by using nitrogen balance technology. This method, which has been used for at least 50 years, basically measures the nitrogen going into your body (from food) and the nitrogen coming out (excretion).

It theoretically assumes that nitrogen serves as a proxy for essential amino acid (EAA) utilization by your body. Therefore, the difference between the two measurements will tell whether EAAs are in a deficit or abundance.

The number they arrived at to achieve a nitrogen balance is 0.8 grams/kg/d.

It's stated this way: 0.8 g/kg/d is

> "...the minimum daily needs for protein to maintain short-term nitrogen balance in healthy people with moderate physical activity."

However, because the nitrogen balance method has several drawbacks, it has fallen into disfavor with current leading protein researchers.

Now, here is another important question to consider as we go forward. **While, according to the RDA, 0.8 g/kg/d is the absolute minimum protein intake people should be striving for, are there benefits to consuming amounts of protein above that recommended allowance?**

Let's take a look at the daily amount of protein consumption as recommended by the Food and Nutrition Board.

❖Chapter 7: The Food and Nutrition Board's Recommendation For Protein Consumption

Nutrition guidelines from the Food and Nutrition Board (FNB) of the Institute of Medicine (IOM) make up the cornerstone of macronutrient recommendations in the United States. See also here.

Their Dietary Reference Intake (DRI) guidelines specify for males >19 years old a minimum of 56g of protein/day and females >19 years old a minimum of 46g of protein/day.

However, the DRI also recognizes biological differences in individuals and also uses the RDA of 0.8 g/kg of body weight/day as acceptable.

Interestingly, it goes one step further and proposes an Acceptable Macronutrient Distribution Range (AMDR) for protein.

The AMDR for protein as suggested by the FNB lies between 10% - 35% of the total calories you consume in a day.

This recommendation seems to allow individuals to target specific macronutrients in a complete diet. In other words, you can set protein intake along with fat and carbohydrate intakes.

It also allows you to set protein consumption in accordance with specific dietary goals. For example, an elite athlete might want to maximize their protein consumption.

However, what the FNB has done by proposing a AMDR is suggest that there is an amount of protein above 0.8 g/kg/d that might lead to better health outcomes. So the consumption of 0.8 g/kg/d of protein might not be the healthiest amount for everyone.

Let's see how the FNB's AMDR actually compare to the RDA.

❖Chapter 8: AMDR Vs. The RDA: Are They Compatible?

By allowing a 10% - 35% range of protein intake, the AMDR has set up guidelines that are not consistent with the RDA.

Consider this.

Let's say you're a female weighing 57 kg (125 lb) and consume 2000 (k)cal a day and 10% of that was protein. Then you'd be consuming about 50g of protein a day. However, using the RDA metric you would need to consume (57 x 0.8) 46 g/day.

That means the AMDR recommends about 8% more protein than the RDA .

However, if you consume 30% of your daily calories as protein, which the AMDR states is acceptable, it would amount to 150 grams. Now that's 30% higher than the RDA.

Why such a wide range of protein intake?

While the FNB allows for individual differences in its protein recommendation, it also suggests that higher intakes of protein might account for better health outcomes.

The FNB states that the AMDR,

> "…is provided to give guidance in dietary planning by taking into account the trends related to decreased risk of disease identified in epidemiological and clinical studies."

Thus, FNB acknowledges that there are protein intakes that are well above the RDA that are associated with good health.

Researcher Dr. Robert Wolfe observes,

> "In discussing the RDA for protein, the FNB points out that there may be benefits to eating amounts of dietary protein greater than that in the RDA, and it is extensively documented in the same chapter that no UL for protein intake beyond which adverse effects may result could be identified."

So what's the right amount of protein you should be consuming during the day?

Seeing that the amount of protein you ingest is crucial for good muscle and also good health in general, it's important that we have a clearer answer.

Currently, another method for determining ideal daily protein intake is gaining favor with researchers. It’s called the IAAO method. Let’s take a look.

❖Chapter 9: The IAAO Method For Determining Protein Requirements

An alternate method now being used to determine minimum protein requirements is the Indicator Amino Acid Oxidation (IAAO) Method.

While there are some shortcomings associated with this method, protein researcher Dr. Donald Layman states that the IAAO does address many of the limitations of the Nitrogen Balance method.

However, one important distinction between the two methods is that the IAAO consistently yields higher estimates than the nitrogen balance method.

Researchers using the IAAO have found that for normal healthy younger persons a safe minimal protein intake is 1.0–1.2 g/kg/day.

For the elderly, minimal intakes were found to be at least 1.2 g/kg/day and perhaps as high as 1.4g /kg/day.

Notice that these minimum intakes are 40% - 50% greater than the current RDA.

Also, remember, these values are minimum values and not necessarily optimum values.

But, again, what is the proper amount of protein we should be consuming? Is the IAAO's recommendation the final answer? Let's examine what leading protein researchers are saying about optimal protein intake.

❖Chapter 10: Advice From Protein Expert Groups

Two independently formed groups of protein experts have recently come out with a call for higher protein intakes, especially for older persons. [Most studies consider older persons to be >65 years old.]

The European Society for Clinical Nutrition and Metabolism (ESPEN) suggest a protein intake of at least 1.0-1.2 g protein/kg body weight/day. For older people who are malnourished or at risk of malnutrition because they have acute or chronic illness, they recommend 1.2-1.5 g protein/kg/d, with even higher intake for individuals with severe illness or injury.

The PROT-AGE study group, comprised of world recognized experts on protein nutrition, suggests that to help older people (>65 years) maintain and regain lean body mass and function, they have an average daily intake at least in the range of 1.0 to 1.2 g/kg/d.

The study group further recommends,

> "Both endurance - and resistance - type exercises are recommended at individualized levels that are safe and tolerated, and higher protein intake (i.e., ≥ 1.2 g/kg body weight/d) is advised for those who are exercising and otherwise active. Most older adults who have acute or chronic diseases need even more dietary protein (i.e., 1.2-1.5 g/kg body weight/d)."

As you can see, both the ESPEN group and PROT-AGE group are very similar in their recommendation of protein intake for older people.

Their recommendation is also similar to what the IAAO method suggested for minimal protein intake.

Okay, these are the recommendations for protein intake we have so far. Gender does not seem to play a role in recommended protein intake.

RDA	0.8 g/kg/day for all people
IAAO	1.0 - 1.2 g/kg/d for healthy young people
IAAO	1.2 g/kg/d and perhaps as high as 1.4g/kg/day for older people
ESPEN	1.0 - 1.2 g/kg/d for all healthy people

ESPEN	1.2 - 1.5 g/kg/d or higher for malnourished or ill older people
PROT-AGE	1.0 - 1.2 g/kg/d for people > 65 years old
PROT-AGE	≥ 1.2 g/kg/d for all individuals engaged in strenuous exercise
PROT-AGE	1.2 - 1.5 g/kg/d for older individuals who have acute or chronic disease

So it would seem that, at least for older individuals, the RDA of 0.8 g/kg/day for older individuals is woefully inadequate compared to the IAAO method and the advice from expert groups.

Remember that if your protein intake is insufficient, your health and muscle mass will suffer.

Researchers now, though, are shifting away from considering optimal protein in terms of daily intake basis. Instead they are considering optimal protein intake on a per meal basis.

❖Chapter 11: Optimal Protein Intake Based On A Per Meal Basis

In order to discover an optimal protein intake for young and older adults, protein researchers are now turning their attention to a per-meal basis intake of protein rather than simply focusing on the total daily intake.

This brings us back full circle to the concept of muscle protein synthesis.

Remember that the primary process controlling muscle gain or loss is MPS. The greater your MPS, the better chance you'll have of mitigating muscle loss or even producing muscle gain.

Researchers now know that there is a relationship between the amount of protein you eat at a meal and the amount of MPS created.

Studies have revealed that as the amount of protein you consume increases, there is a graded rise in the rate of MPS up to a point where consuming more protein has no appreciable effect on MPS.

Protein researchers Witard, Moore and Areta independently have all determined that consuming approximately 20 g of protein is enough to stimulate optimum MPS in young adults. Moore suggests this is about 0.24 g/kg/meal.

Note that these studies were done on individuals who engage in RT. RT sensitizes the body to MPS, so whether more protein would be needed to induce optimal MPS in untrained younger individuals is unclear.

Also, the type of protein used was high quality (whey, egg). Most of us do not consume this kind of protein throughout the day.

Interestingly, higher amounts of protein did not significantly raise MPS (20 g compared to 40 g).

There's about a 30 min delay in the stimulation of MPS. It then peaks at 2 hours and then reverts back to basal levels after about 2–3 hours regardless if more protein is consumed. This is what researchers call a muscle full effect.

This means that in order to stimulate MPS and thus limit muscle loss a young healthy adult must eat at least 20 grams of protein at one meal. However, this will only stimulate MPS for around 2 hours.

So what would happen to a 40 year old, non-resistance training individual two hours after eating 20 grams of protein? MPS would end, and then MPB would take over.

What would happen if that individual never consumed more than 20 grams of protein at one meal? That person would be in continual muscle protein breakdown. The rate at which this would occur is of course different for all people.

Concerning the healthy maintenance of muscle you can see why researchers are now focused on suggesting optimal protein intake be viewed on a per meal basis rather than a daily basis.

Let’s look at this a little more deeply.

❖Chapter 12: The Problem Of Unbalanced Daily Protein Consumption

Most people eat an unbalanced amount of protein throughout the day, with most of their protein being consumed at dinner. This causes a problem for creating and sustaining MPS.

Here's why.

Let's assume you eat 10 g of protein for breakfast, 15 g for lunch, and 70 g for dinner.

This means that because it takes at least 20 g of protein to stimulate MPS, you'll only get the benefit of MPS for about 2 - 3 hours after dinner. For the remaining 21 hours, you'll be experiencing MPB and losing muscle.

Now, what if you have 3 meals at 15 g of protein/meal? Then you may not be in MPS at all, and you'd be in MPB throughout the day.

Because of these scenarios, researchers suggest the optimal strategy for building muscle is to spread protein consumption throughout the day.

Phillips et al report that cumulatively the findings suggest "that ~20 g of high-quality protein (or ~0.3 g/kg/meal) is sufficient to maximally stimulate MPS after a single meal and, when repeatedly administered 3h apart, optimize MPS throughout the day."

Therefore, the consensus among leading protein researchers is that young adults should consume at least 20 g/meal (0.24g - 0.3g/kg/) per meal and at least 3 - 4 meals per day.

Notice using 0.3 g/meal at 3 meals would bring you to 0.90 g/d/kg/BW. This is already greater than the RDA of 0.8.

Also note that the phrase "high-quality protein" comes up again. If you're not consuming this type of protein, you may need more than 20g at each meal to optimize MPS. More on this later.

Now, the above data applies to healthy young people. But what about older people?

❖Chapter 13: Protein Recommendations For Seniors

Research has shown that the ability of protein to stimulate MPS is blunted in older people.

Theoretically, therefore, it should take a greater amount of protein to stimulate MPS in older adults than younger.

This is, in fact, what current research has shown.

Moore et al. compiled data from 6 studies and found that for older males it takes ~0.40 g/kg of protein to cause the same MPS observed in younger males.

This tells us that older people can have the same MPS response as young adults although they have to ingest more protein for it to happen.

However, two studies have shown that protein requirements for older people may have to be higher than even 1.2 g/kg/d.

This study showed that 1.2 g/kg/d had no greater effect on MPS than 0.8g/kg/d. Further, this study showed that MPS rates were higher with 1.5 g/kg/d that 0.8 g/kg/d.

Therefore, based on an increasing volume of epidemiological and experimental data, and several expert groups, it seems as though a higher protein intake of at least 1.0 g to 1.5 g/kg/d is necessary for attenuating skeletal muscle loss in older adults.

Remember, though, that this recommendation should be spread over at least 3 meals throughout the day with at least 0.4 g/kg/meal.

If we express this in terms of how many grams of protein older people should consume at each meal, recent recommendations state this should be at least 25-30 g/meal.

Interestingly, in a recent review, protein researcher Stuart Philipps suggests that older adults should consume 0.4–0.6 g of high quality protein/kg/meal for 3 meals per day to attenuate age-associated muscle mass loss.

This would translate to about 30 - 40 grams of protein per meal.

Okay, Let's Recap.

According to recent studies by protein experts, the recommendations for protein consumption are as follows:

Young Adults: Approximately 0.24 g - 0.3 g/kg/meal of high quality protein spread over 3 - 4 meals with at least 20 grams per meal.

Older people: Approximately, 0.4–0.6 g/kg/meal of high quality protein spaced between 3 - 4 meals. And at least 30 - 40 grams per meal.

Now, this seems to be straightforward but there's one more variable to the equation.

According to current research, it appears that the essential amino acid leucine is the key to initiating MPS.

If you don't have enough leucine in your protein, your diet cannot do its part to stimulate MPS.

❖Chapter 14: The Importance of Getting Enough Leucine in Your Diet

Muscle growth is accomplished through a muscle building pathway called mTORC1 (mechanistic target of rapamycin). Researchers now know that the amino acid leucine is responsible for triggering this process.

While the actual amount of leucine necessary to trigger MPS is not known, researchers have a general idea of how much is needed per meal. They have discovered that young adults can achieve MPS activation by about 1 gram of leucine.

However, for older adults the amount of leucine necessary to stimulate MPS is considerably higher.

Researcher Donald Layman states,

> "Although dose-response trials are not available, there is a general pattern that appears from clinical trials that meals containing >2.2 g leucine in the form of EAA mixtures or whey protein stimulate muscle protein synthesis and meals containing <1.8 g leucine produce little to no response. It is important to note that these studies were performed in older, sedentary adults and represent the minimum response threshold."

So, according to Layman's analysis of various click trials, older adults need >2.2 g of leucine per meal to stimulate MPS.

Again, though various trials use different ages when considering who is an "old person", I think we can be safe in assuming this is anyone over 65 years old.

The PRO-TAGE group recommends older people get at least 2.5 - 2.8 grams of leucine per meal to optimize the anabolic response in skeletal muscle.

So, while the amount of protein you consume and when you consume it are important, your protein meal must also contain enough leucine to trigger MPS.

This is important because not all protein sources contain the same amount of leucine.

❖Chapter 15: The Importance Of Protein Quality

Remember previously I mentioned the quality of the protein you consume? Here's why it's important.

Most of the protein studies are done using whey protein. Whey contains the highest amount of leucine.

Therefore, when protein researchers say that 20 g of protein in young adults and 30 g in older people is enough to stimulate MPS, they are basing this on an optimal protein source.

However, in the real world people are not usually consuming whey protein all day long.

Because different sources of protein have different contents of leucine, you may be consuming 20 g of protein, but it may not have enough leucine content to trigger MPS.

For example, three large eggs will yield about 18 grams of protein. However, they will only contain about 1.0 gram of leucine. An older person would have to eat about 7-8 eggs to get enough leucine to stimulate MPS.

Also consider that you would have to eat a lot more plant protein to get the same amount of MPS than you would from red meat.

For example, 6 ounces of 90% lean ground beef contains about 3.5 grams of leucine. That's more than enough to trigger MPS.

However, 7 ounces of quinoa contains about 28 grams of protein but only 0.5 grams of leucine. To get the required 2.5 grams of leucine to trigger MPS, you would need to eat about 35 ounces of quinoa.

Good luck with that!

You may have noticed previously that Phillips' protein recommendation for older people was slightly higher than others (30 - 40 g as opposed to 25 - 30 g). I suspect the reason is that a higher protein amount would lead to a possibly better leucine content.

Okay let's summarize again. Taking into account what we have from the IAAO method, expert groups and recent studies the following parameters seems to be the current recommendations for protein consumption.

Young Adults	At least 0.24 - 0.30 g/kg of high quality protein per meal
	Each dose of protein spread over 3 -4 meals
	At least 20 g per meal
	At least 1.0 g of leucine per meal (this amount is not certain)
Older Adults	At least 0.40 g - 0.60 g/kg of high quality protein per meal
	Each dose of protein to be spread over 3 -4 meals
	At least 25 - 40 g per meal
	At least 2.5 - 2.8 g of leucine per meal

❖Chapter 16: Protein Consumption and Kidney Function

Do higher intakes of protein impair renal function? Layman reports that there is no evidence that higher protein intakes impair renal function.

Layman also reports that,

> "The International Society of Renal Nutrition and Metabolism recommends, for patients with existing kidney disease, consume 0.6–0.8 g/kg body weight if not undergoing dialysis but to increase to 1.0 g/kg during any illness that is catabolic or limits physical activity. For those undergoing dialysis, International Society of Renal Nutrition and Metabolism recommends daily protein >1.2 g/kg, with at least 50% being of high biological value."

This recent study involving individuals who had type 2 diabetes and consumed a moderate 90–120 g/d found no negative effects on renal function during a 2-y period.

Of course, if you have kidney disease, you always consult your doctor before making any dietary changes.

❖Chapter 17: Optimal Protein Consumption For Resistance Trainers

As I stressed at the beginning of this book, everyone, whether you're 20 or 80, should be involved in some form of resistance training (RT). It gives you the biggest bang for your buck in sparing muscle loss and gaining muscle hypertrophy.

For those who are serious about RT and want to maximize their muscle gains, then special attention must be given to optimal protein intake. Take note here that I'm not only talking about younger people who are athletes and want to maximize performance. Even If you're a master athlete (over 45 years old) and serious about your weight training, you need to maximize protein intake if you expect to excel.

Protein researcher Doug Phillips et al. in a fairly recent paper have examined advancements in our understanding of how protein ingestion impacts skeletal muscle growth following resistance exercise.

After reviewing the current research on protein intake and RT, Phillips and team list a number of practical recommendations for "exercisers who wish to maximize the hypertrophic response of skeletal muscle during resistance exercise training".

As we'll see, these recommendations should apply to master athletes as well.

For Individuals in Energy Balance - Athletes who are not currently trying to lose weight.

- Consume ~0.4 g/kg body mass (i.e., 0.24 plus 0.06 with protein added to account for the influence of other macronutrients in meals and protein quality), to maximally stimulate MPS following a period of rest or exhaustive resistance exercise.
- Spacing protein-containing meals ~3–5 h throughout the day maximizes MPS rates over the course of a 12 h (i.e., waking) period.
- Practice pre-sleep protein ingestion (1–3 h prior to sleep) to offset declines in MPS that would occur during an overnight fasting period.
- To maximize muscle protein accretion with resistance exercise, daily protein intakes should be ~1.6 g/kg/day and up to 2.2 g/kg/day. This intake can be achieved by ingesting 3 meals, each containing ~0.53 g/kg protein, or 4 meals containing ~0.4g/kg protein.

Stokes T, Hector AJ, Morton RW, McGlory C, Phillips SM. Recent Perspectives Regarding the Role of Dietary Protein for the Promotion of Muscle Hypertrophy with Resistance Exercise Training. Nutrients. 2018;10(2):180. Published 2018 Feb 7. doi:10.3390/nu10020180

Individuals in Energy Restriction - Athletes who are in the process of “cutting” weight for competition.

- Daily protein requirements are greater than they are during period of energy balance to promote the maintenance or increase in lean body mass.
- Resistance exercise should be performed during energy restriction to promote the retention of lean body mass if desired.
- For athletes ‘cutting’ weight over an extended period, high quality protein sources such as whey and casein, or a blend of each, should be chosen to optimize appetite control and ensure dietary compliance.
- To promote lean body mass retention during weight loss, protein intakes of ~2.3–3.1 g/kg/day have been advocated.
- Exercise-naive adults who have a greater body fat percentage should aim to achieve the lower end of this range, whereas leaner individuals with resistance-training experience who are more vulnerable to losing lean body mass during energy restriction might aim for the higher end of this range.
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Stokes T, Hector AJ, Morton RW, McGlory C, Phillips SM. Recent Perspectives Regarding the Role of Dietary Protein for the Promotion of Muscle Hypertrophy with Resistance Exercise Training. Nutrients. 2018;10(2):180. Published 2018 Feb 7. doi:10.3390/nu10020180

As we can see from the above recommendations the amount of protein suggested for young athletes would be about the same as that suggested for older people in general.

Since the additional effects of protein are greatly diminished beyond a daily intake of 1.6 g/kg body mass per day (up to as high as 2.2 g/kg/day) it seems that the above recommendations would also hold for older people.

❖Chapter 18: Practical Considerations For Seniors

There appears to be a decreased intake of food with aging. One common reason is that as we grow older our sense of taste and smell decreases and there is a slowing of stomach emptying. This increases satiety. If you've been around the elderly, you may have noticed that they are just not hungry and don't want to eat.

This is one of the primary reasons that prevents them from consuming enough protein.

There are, however, other reasons that impede older individuals from consuming enough protein.

Many seniors simply cannot chew and swallow 35 - 40 grams of high quality (beef, chicken, pork etc.) in one sitting.

To make this task easier for older individuals it may help to consume easier to eat sources of protein like ground beef. Another solution is to include a high quality whey isolate protein shake into their diet. These can contain over 20 grams of high quality protein and around 2 - 3 grams of leucine.

Also, as seniors age, their intestinal tracks undergo changes that make it harder for them to absorb nutrients. One notable change that may make it difficult to digest protein is hypochlorhydria, the decreased production of stomach acid. One way that may increase stomach acidity is with an HCl supplement (betaine hydrochloride), often taken in conjunction with an enzyme called pepsin.

Remember, often we view aging in the way that we commonly see it. We see a lot of frail, weak seniors so we suppose this is what aging looks like.

But it doesn't necessarily have to be that way. Resistance training and a proper diet are integral parts of attenuating the aging process.

❖Chapter 19: Final Thoughts

There's no question that maintaining good muscle mass is vital for good health. Unfortunately, due to a diet deficient in protein and a sedentary lifestyle many of us are losing muscle at an alarming rate.

Unchecked, muscle loss and its accompanying loss of strength can lead directly to poor metabolic health, weakness, frailty, and, ultimately, a loss of mobility and independence.

Fortunately, the age-related loss of muscle can be successfully attenuated. The keys to this are resistance training and proper protein consumption.

The harder of the two might be resistance training. Getting yourself into a strength training routine requires dedication and persistence. But everyone has to do some kind of resistance training if they expect to age well.

Consuming the right amount of protein though is not that difficult. The most difficult part is knowing how much protein and leucine is contained in your food. Once you have this down then it's simple.

The consensus of protein experts appears to suggest that young adults (if not strength training), should consume 20 - 30 grams of protein three times a day. Older people, should consume 30 - 40 grams of protein, containing at least 2.5 grams of leucine, three times a day.

As I'm writing this book, I'm about to turn 63 years old. I've been strength training for over fours years and have been following the above protein protocol for over a year. I'm now stronger than I've been since I was 30 years old.

And no, I was not a lifelong strength trainer. From age 30 to age 55, I suffered from a severe form of chronic fatigue syndrome. When I started training at 57, I could barely lift 10 pounds over my head.

So, I can personally attest that most of you can at least greatly slow down your loss of muscle, and, if you work hard, you might even begin to build some back.