

PROTEIN

The Strategy

- Optimize protein intake to build/maintain lean muscle mass.
- Protein intake range for most = 0.7-1.0g/lbs (1.5-2.2g/kg), or per pound of lean body mass or target bodyweight if overweight.
- Lean, contest dieting bodybuilders may benefit from a higher protein intake of 1-1.5g/lbs (2.2-3.3g/kg).

The Details

Once you do account for calories as we've already done in this course, macronutrient amounts and ratios do matter. And of the macros, protein should be the top priority.

Eating adequate protein (in combination with a properly designed strength training program) helps us build, or at least preserve lean muscle mass while residing in the calorie deficit necessary for fat loss. This is critical as lean muscle is what provides our body with its shape, tightness, tone, and definition.

If you indiscriminately lose weight, but lose a bunch of muscle along the way, you will still appear loose, soft, and flabby despite the overall drop in bodyweight. That's what happens with those extreme detox and starvation-type diets. And that's obviously not the end result we're after.

So despite the goal of getting into a calorie deficit to drop fat, we still want to allot enough calories to protein in order to support the gaining or maintenance of lean muscle mass.

Sedentary Nutrition and Sports Nutrition are two completely different things. This means the physique person's protein needs are likely higher than the RDA recommendations for two reasons:

1. The RDA's are set for the general, non-exercising population. Exercising, especially weight training, places unique stresses on the body. The constant breaking down and rebuilding of muscle tissue increases the body's demands for protein.
2. The RDA's are set to avoid the side effects related to protein deficiency, and for maintenance of the average physique, not for the higher aspirations of meatheads and divas looking to maximize lean muscle mass while stripping away body fat.

The scientists who believe that protein requirements are greater for athletes and exercising people offer two explanations: 1. Amino acids may be oxidized during exercise. 2. Increased

protein synthesis is necessary to repair damage and forms the basis of training adaptations. - Asker Jeukendrup, Sports Nutrition

Protein, High Satiety, & Dietary Adherence

Protein is one of the highest satiety foods. Research shows protein-based meals are highly effective at reducing hunger cravings, even while in a calorie deficit (and even more so than small, frequent meals). This is key in improving diet adherence and success rates.

People understand in theory that getting into a calorie deficit is necessary for fat loss. So why don't they consistently do it?

Many people try, but then hunger, disinhibited eating, mindless snacking, etc. takes over. If once we cut back on our poor food choices and portions sizes, we can somehow reduce the potential for running into these roadblocks; we have a better chance of succeeding with our fat loss plans.

Protein-based diets (both on a per-day and per meal basis) help with that, probably more so than nibbling on celery stick snacks or drinking more water or whatever the latest diet blog health tip is.

Weigle, et al. **A high-protein diet induces sustained reductions in appetite, ad libitum caloric intake, and body weight despite compensatory changes in diurnal plasma leptin and ghrelin concentrations.** Am J Clin Nutr. 2005 Jul;82(1):41-8.

An increase in dietary protein from 15% to 30% of energy at a constant carbohydrate intake produces a sustained decrease in ad libitum caloric intake that may be mediated by increased central nervous system leptin sensitivity and results in significant weight loss.

Leidy HJ et al. **Influence of higher protein intake and greater eating frequency on appetite control in overweight and obese men.** Obesity (Silver Spring). 2010 Mar 25.

Eating fewer, regular-sized meals with higher amounts of lean protein can make one feel more full than eating smaller, more frequent meals, according to new research from Purdue University. We found that when eating high amounts of protein, men who were trying to lose weight felt fuller throughout the day; they also experienced a reduction in late-night desire to eat and had fewer thoughts of food. We also found that despite the common trend of eating smaller, more frequent meals, eating frequency had relatively no beneficial impact on appetite control. The larger meals led to reductions in appetite, and people felt full. We want to emphasize though that these three larger meals were restricted in calories and reflected appropriate portion sizes to be effective in weight loss. Our advice for people trying to lose weight is to add a moderate amount of protein at three regular meals a day to help appetite control and the feeling of fullness.

The Thermic Effect of Food & The True Metabolic Advantage

Protein has the highest thermic effect of any food. This is just a fancy term describing how many calories are burned off in the digestion, absorption, and storage processes. The thermic effect of protein is 20-30%, compared to carbohydrate at 6-8%, and fat at 2-3%.

Preserving lean muscle and the higher thermic effect of food is why research shows it is primarily protein that provides the “metabolic advantage” of different macronutrient distributions, not necessarily the carb and fat amounts and ratios.

Metabolic advantage is another geeky term used in nutrition to describe the ability of a diet to achieve greater weight loss than another diet of equal calories. This is a more technical way of saying that while calories are the first step, macros matter for optimal fat loss too.

If you emphasize the most satiating food that also has the highest percentage of calories burned off in the digestion and absorption processes, you'll have a leg up (or love handle down) on the fat loss process, as well as improved odds at long-term sustainability.

Soenen, et al. **Relatively high-protein or 'low-carb' energy-restricted diets for body weight loss and body weight maintenance?** *Physiol Behav.* 2012 Oct 10;107(3):374-80.

Body-weight loss and weight- maintenance depends on the high-protein, but not on the 'low-carb' component of the diet, while it is unrelated to the concomitant fat- content of the diet...The novelty of our study is the finding that it is primarily the relatively high-protein intake that underscores the success of the so called 'low-carb' diet that is usually high in protein.

Lowered carbohydrate intake per se had no effect on decrease in BW (bodyweight) and FM (fat mass) during energy restriction, while daily elevated absolute protein intake of 1.1 vs. 0.7 g/kg BW promoted BW loss while reducing FM during the weight-loss phase.

Protein: Carb Ratios, Blood Sugar Control, & Biomarkers of Health

Increasing the protein content of your diet in relation to excessive carbohydrate intake (both on a per-day, and per-meal basis) can lead to better blood sugar control, and improvements in other biomarkers of health, especially for those individuals who are insulin resistant, pre-diabetic, and significantly overweight (a high percentage of our modern population).

Keep in mind your activity levels need to be factored into this equation as well. A higher carbohydrate emphasis for performance athletes may be more appropriate. But for most of us who sit at a desk and hit the weights a few times a week simply for cosmetic reasons, a moderate ratio may just be the magic physique transformation ticket.

In real world terms, thinking protein first at each meal, and eating something like eggs and fruit vs. kid's cereal or a mocha and muffin combo for breakfast, or more reasonable portions of chicken, rice, and veggies vs. pasta and chips for lunch, etc. not only will help you lose body fat if you are in a calorie deficit, but the effect of that more reasonable ratio of protein: carbohydrate on hunger and blood sugar control will actually make it much easier to stick to

that plan and sustain those results on a long-term basis (at least once you detox from the addictive properties of hyper-palatable, highly-refined foods).

Layman, et al. **A Reduced Ratio of Dietary Carbohydrate to Protein Improves Body Composition and Blood Lipid Profiles during Weight Loss in Adult Women.** J. Nutr. February 1, 2003 vol. 133 no. 2 411-417

Claims about the merits or risks of carbohydrate (CHO) vs. protein for weight loss diets are extensive, yet the ideal ratio of dietary carbohydrate to protein for adult health and weight management remains unknown. This study examined the efficacy of two weight loss diets with modified CHO/protein ratios to change body composition and blood lipids in adult women. Women (n = 24; 45 to 56 y old) with body mass indices >26 kg/m(2) were assigned to either a CHO Group consuming a diet with a CHO/protein ratio of 3.5 (68 g protein/d) or a Protein Group with a ratio of 1.4 (125 g protein/d). Diets were isoenergetic, providing 7100 kJ/d, and similar amounts of fat (approximately 50 g/d). After consuming the diets for 10 wk, the CHO Group lost 6.96 +/- 1.36 kg body weight and the Protein Group lost 7.53 +/- 1.44 kg. Weight loss in the Protein Group was partitioned to a significantly higher loss of fat/lean (6.3 +/- 1.2 g/g) compared with the CHO Group (3.8 +/- 0.9). Both groups had significant reductions in serum cholesterol (approximately 10%), whereas the Protein Group also had significant reductions in triacylglycerols (TAG) (21%) and the ratio of TAG/HDL cholesterol (23%). Women in the CHO Group had higher insulin responses to meals and postprandial hypoglycemia, whereas women in the Protein Group reported greater satiety. This study demonstrates that increasing the proportion of protein to carbohydrate in the diet of adult women has positive effects on body composition, blood lipids, glucose homeostasis and satiety during weight loss.

Carbohydrate Diet Group: 1700 calories, 68g protein (16%), 239g carbs (58%), 50g fat (26% fat)
Protein Diet Group: 1700 calories, 125g protein (30%), 171g carbohydrate (41%), 50g fat (29%)

Ratliff, et al. **Consuming eggs for breakfast influences plasma glucose and ghrelin, while reducing energy intake during the next 24 hours in adult men.** Nutr Res. 2010 Feb;30(2):96-103

Subjects consumed fewer kilocalories after the EGG breakfast compared with the BAGEL breakfast (P< .01). In addition, subjects consumed more kilocalories in the 24-hour period after the BAGEL compared with the EGG breakfast (P < .05). Based on VAS, subjects were hungrier and less satisfied 3 hours after the BAGEL breakfast compared with the EGG breakfast (P < .01). Participants had higher plasma glucose area under the curve (P < .05) as well as an increased ghrelin and insulin area under the curve with BAGEL (P < .05). These findings suggest that consumption of eggs for breakfast results in less variation of plasma glucose and insulin, a suppressed ghrelin response, and reduced energy intake.

The Drawbacks of Bodybuilding Extremes

While I believe protein should be the foundational piece of individual meals and your overall diet, it should not be excessively high as many extreme bodybuilders, hardcore muscle magazines, and protein supplement companies recommend.

Remember what I said about the whole natural vs. drug-enhanced issue in relation to diet program specificity. Steroids increase protein synthesis, and those using them may indeed be able to utilize excessively high amounts of protein for supra-physiological processes.

They also may be able to cut their carbs/fats/energy nutrients to extremely low levels without the physiological, metabolic, or hormonal repercussions (at least in the short-term) because the drugs can compensate for any reductions/down-regulations. This is not true for the natural athlete.

For naturals, in high amounts especially combined with low carb diets, a process called deamination occurs where the body strips amino acids of their nitrogen molecule and simply converts them to glucose. This is a metabolically (and literally) costly way to obtain glucose.

This just means that although the athlete's goal is to fuel their muscles first, your body's evolutionary goal is to fuel the brain first. Your body will find a way to fuel the brain before anything else, even if it means breaking down protein, or even your own muscle tissue, to do so.

And at some point, despite what many proclaim about unlimited protein diets, there can be drawbacks. At very high amounts (5g+/kg), you can exceed the liver's capacity to convert excess nitrogen to urea and excrete it through the urine. This causes blood ammonia levels to rise, which can lead to gastrointestinal distress, chronic fatigue, and other side effects.

Bilsborough, et al. **A Review of Issues of Dietary Protein Intake in Humans.** Int J Sport Nutr Exerc Metab. 2006 Apr;16(2):129-52

1. *The accepted level of protein requirement of $0.8\text{g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$ is based on structural requirements and ignores the use of protein for energy metabolism. High protein diets on the other hand advocate excessive levels of protein intake on the order of 200 to 400 g/d, which can equate to levels of approximately $5\text{g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$, which may exceed the liver's capacity to convert excess nitrogen to urea. Dangers of excessive protein, defined as when protein constitutes > 35% of total energy intake, include hyperaminoacidemia, hyperammonemia, hyperinsulinemia, nausea, diarrhea, and even death (the "rabbit starvation syndrome").*
2. *The key issues are the rate at which the gastrointestinal tract can absorb amino acids from dietary proteins (1.3 to 10 g/h) and the liver's capacity to deaminate proteins and produce urea for excretion of excess nitrogen.*
3. *This gives us an initial understanding that although higher protein intakes are physiologically possible, and tolerable by the human body, they may not be functionally optimal in terms of building and preserving body protein. The general, although incorrect consensus among athletes and bodybuilders, is that rapid protein absorption corresponds to greater muscle building.*

Research on Optimum Protein Amounts for Most People

Physique-focused people need more than the RDA, but less than the steroid extreme. What's the sweet spot? The majority of the research suggests 1.5-2.0g/kg, which equals 0.7-0.9g/lbs of bodyweight. We can round up to the fitness standard of 1g/lbs.

Lemon, PW. **Effects of exercise on dietary protein requirements.** [Int J Sport Nutr.](#) 1998 Dec;8(4):426-47.

This paper reviews the factors (exercise intensity, carbohydrate availability, exercise type, energy balance, gender, exercise training, age, and timing of nutrient intake or subsequent exercise sessions) thought to influence protein need. Although there remains some debate, recent evidence suggests that dietary protein need increases with rigorous physical exercise. Those involved in strength training might need to consume as much as 1.6 to 1.7 g protein x kg(-1) x day(-1) (approximately twice the current RDA) while those undergoing endurance training might need about 1.2 to 1.6 g x kg(-1) x day(-1) (approximately 1.5 times the current RDA). Future longitudinal studies are needed to confirm these recommendations and assess whether these protein intakes can enhance exercise performance. Despite the frequently expressed concern about adverse effects of high protein intake, there is no evidence that protein intakes in the range suggested will have adverse effects in healthy individuals.

Morton, et al. **A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training-induced gains in muscle mass and strength in healthy adults.** *Br J Sports Med.* 2017 Jul 11

Dietary protein supplementation significantly enhanced changes in muscle strength and size during prolonged RET in healthy adults. Increasing age reduces and training experience increases the efficacy of protein supplementation during RET. With protein supplementation, protein intakes at amounts greater than ~1.6 g/kg/day do not further contribute RET-induced gains in FFM.

For SA (strength athlete), the LP diet (low protein 0.9g/kg) did not provide adequate protein and resulted in an accommodated state (decreased WBPS [whole body protein synthesis vs. MP and HP]), and the MP (moderate protein – 1.4g/kg) diet resulted in a state of adaptation (increase in WBPS and no change in leucine oxidation). The HP diet (high protein 2.4g/kg) did not result in increased WBPS compared with the MP diet, but leucine oxidation did increase significantly, indicating a nutrient overload. – The Journal of Applied Physiology

How do those numbers translate into practical strategy? Look at the Leidy study above. The take home was to emphasize protein at your main meals, which for most is breakfast, lunch, and dinner.

If you eat 3-protein based meals a day (eggs for breakfast, meat/fish for lunch and dinner, etc.), you'll more than likely end up near that optimal protein range for physique purposes. All that's left would be to adjust the portion sizes for more "Precision Nutrition". 4oz of protein (about the size of a deck of cards) = roughly 25g of protein.

Special Circumstances

There are a few instances where research points to more protein being beneficial for a few advanced demographics – lean bodybuilders during contest preparation. This usually necessitates intensified training combined with aggressive calorie deficits.

The extra protein may potentially prevent muscle loss/preserve lean muscle tissue, increase satiety and mood.

Helms, et al. **Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation.** *J Int Soc Sports Nutr.* 2014; 11: 20.

The popularity of natural bodybuilding is increasing; however, evidence-based recommendations for it are lacking. This paper reviewed the scientific literature relevant to competition preparation on nutrition and supplementation, resulting in the following recommendations. Caloric intake should be set at a level that results in bodyweight losses of approximately 0.5 to 1%/wk to maximize muscle retention. Within this caloric intake, most but not all bodybuilders will respond best to consuming 2.3-3.1 g/kg of lean body mass per day of protein, 15-30% of calories from fat, and the remainder of calories from carbohydrate.

Antonio, et al. **A high protein diet (3.4 g/kg/d) combined with a heavy resistance training program improves body composition in healthy trained men and women – a follow-up investigation.** *Journal of the International Society of Sports Nutrition* 2015;12:39

This is the second investigation from our laboratory that has examined the effects of a true high protein diet (i.e., > 2 grams per kg body weight daily). Previously published work has shown that the mere addition of extra protein does not lead to substantive changes in body composition (i.e., no statistically significant change in FFM, fat mass or % body fat) in trained individuals who otherwise do not alter their exercise regimen [6]. This is the first investigation in which a high protein diet in conjunction with a periodized heavy resistance training program was performed; moreover, subjects did not perform any aerobic exercise during the treatment period. In brief, our data suggests that consuming protein well above the recommended dietary allowance (RDA) can favorably alter body composition as long as changes are also made in one's exercise training regimen. This is in contrast with our original pilot study in which subjects consumed five times the RDA for protein (~4.4 g per kg daily) for eight weeks. In that investigation, there were no statistically significant changes in body composition in the high protein diet group. Thus, this follow-up study was undertaken to ascertain if changing the resistance-training regimen in conjunction with a high protein diet could indeed affect the adaptive response.

It should be noted that other investigators have suggested that trained individuals may have a lower requirement for protein due to increased efficiency of use of protein. Accordingly, "several studies have shown that strength training, consistent with the anabolic stimulus for protein synthesis it provides, actually increases the efficiency of use of protein, which reduces dietary protein requirements" [10]. If indeed regular heavy resistance training enhances efficiency, there would be no effect of added protein vis a vis body composition alterations. In other words, the consumption of protein in amounts far above the RDA should have little to no effect on body composition. Our investigation demonstrates that protein intakes that are approximately 60 % greater than even the highest recommended intakes (i.e., 2 grams per kg body weight daily)

produce favorable alterations in body composition when combined with a periodized heavy resistance training regimen.