

# Eating Animal Protein After Training Improves Recovery, According to Study

Analysis by [Dr. Joseph Mercola](#)

October 14, 2025

## STORY AT-A-GLANCE

- › Recent studies recommend eating about 0.3 to 0.4 g protein per kg of body weight (20 to 40 g for most adults) within two hours after training for optimal recovery
- › Aim for around 2 to 3 g leucine in that dose to robustly trigger muscle protein synthesis
- › A new Texas A&M clinical trial in tactical athletes reports better recovery markers after intense training when animal-protein meals were used versus plant-based meals with equal total protein
- › Pairing protein with carbohydrates helps speed glycogen refueling across the next four to six hours
- › Older adults generally benefit from the higher end of the per-meal range (approximately 0.4 g/kg)

Proper recovery from training is the make-or-break factor in how your body adapts to exercise. You may train hard in the gym or on the field, but without the right recovery, strength gains stall, endurance plateaus, and soreness lingers longer than it needs to. Nutrition – especially protein – sits at the center of that recovery process.

Every workout triggers small amounts of muscle breakdown, and the way you refuel determines how quickly those tissues rebuild stronger. Decades of sports nutrition research show that protein intake after training directly stimulates muscle protein

synthesis, the biological process of repairing and building muscle fibers.

Now, the question is, how much protein after workout is ideal for recovery and what's the best source from your diet? Scientists at Texas A&M University recently conducted a controlled trial comparing animal- and plant-based protein and their effects after intense training – I'll discuss these findings later.

## How Much Protein Should You Eat After a Workout?

Finding the right post-workout protein target doesn't need to be complicated. A clear, practical guide for most adults is 0.3 to 0.4 grams of protein per kilogram of body weight within about two hours after exercise. This guideline is widely supported in sports nutrition literature and has been highlighted in a recent peer-reviewed work, which notes that this range consistently stimulates muscle protein synthesis after training.<sup>1</sup>

- **How would this look like in real-life application?** Here's an example – if you weigh 150 pounds (68 kilograms), you'll roughly need 20 to 27 grams of protein. If you weigh more or less, the same calculation works – multiply your body weight in kilograms by 0.3 to 0.4. Below is a table to guide you.

Body weight (lb)	Body weight (kg)	Target protein range (g)
110	49.9	15 to 20
130	59.0	18 to 24
150	68.0	20 to 27
180	81.6	24 to 33
200	90.7	27 to 36
220	99.8	30 to 40

- **Daily totals still matter most, but this post-workout protein dose accelerates recovery from training by triggering a strong anabolic response** — Research published in Cell Reports Medicine shows that protein ingestion drives a dose-dependent anabolic effect, with 20 to 40 g being effective for most adults and even higher doses sustaining synthesis for longer periods.<sup>2</sup>
- **The study also shows the body can adapt to larger protein feedings** — According to the researchers, consuming 100 grams of protein in one sitting triggered a greater and more prolonged anabolic response — lasting over 12 hours — compared to smaller doses.
- **This doesn't mean everyone needs 100 grams after training, though** — However, it challenges the long-standing belief that the body "can't use" protein beyond 20 to 40 grams per meal. For larger athletes, or those consolidating protein into fewer meals, this finding suggests flexibility in how protein can be distributed across the day.

The U.S. Department of Agriculture (USDA) Dietary Guidelines for Americans 2025 to 2030 emphasize that protein quality and distribution throughout the day are important for health. They note that animal-derived foods like lean meat, poultry, fish, dairy, and eggs provide complete amino acid profiles that efficiently support muscle repair and recovery, making them the best protein sources after workout.<sup>3</sup>

## **Does Animal Protein Improve Recovery More Than Plant Protein?**

A recently published study conducted by Texas A&M University's Department of Kinesiology put this question under the microscope. In a randomized, double-blind, placebo-controlled, and crossover-designed study published in Nutrients, researchers worked with military cadets performing the Army Combat Fitness Test — an intense, full-body assessment consisting of "sprints, drag pulls, weightlifting, and other exercises," designed to measure endurance, strength, and resilience.<sup>4,5</sup>

- **The cadets were composed of 23 healthy males and females between 18 and 40 years old** — At each visit, they were weighed, had heart rate and blood pressure checked, gave a fasting blood sample, and filled out questionnaires about diet

satisfaction and side effects. They also took computerized memory and reaction tests and rated muscle soreness when pressure was applied to their thighs.

- **The participants were split into groups** – One consumed pork-based meals ready-to-eat (MREs), while the other ate plant-based MREs carefully matched for total protein content.
- **Despite the identical protein grams, recovery outcomes were different** – The researchers found that the animal-protein group experienced less muscle soreness, lower levels of inflammation, reduced nitrogen excretion (a biochemical marker of muscle breakdown) and healthier testosterone-to-cortisol ratios, which indicate a stronger anabolic (muscle-building) environment.
- **So why did the pork-based meals outperform the plant-based ones?** Amino acid density and creatine content appear to be the decisive factors. Animal proteins are richer in essential amino acids needed for recovery, particularly leucine, which is the key trigger for muscle protein synthesis.
- **They also naturally provide creatine** – This compound supports energy production in muscle cells and has been consistently linked to improved recovery and performance. Richard Kreider, Ph.D., lead investigator of the study, emphasized that plant-based proteins often lack optimal essential amino acid (EAA) profiles and do not provide creatine at all, making it harder for them to match the recovery benefits of animal-derived sources.

*"Our concern was that if we're expecting our military to perform at their best and they're consuming plant-based MREs, we have to make sure those meals provide enough essential amino acids and creatine to meet daily needs," Kreider explained.<sup>6</sup>*

- **Strategic combinations of proteins help fill the gaps** – Pairing legumes with grains, for example, balances out limiting amino acids and produces a more complete profile. By targeting 2 to 3 grams of leucine per meal, even plant-centered recovery

meals can stimulate muscle protein synthesis effectively, provided the total dose is large enough and timed appropriately.

- **This evidence highlights an important nuance** — Protein quality, not just quantity, influences recovery outcomes. While animal protein tends to be the more efficient route to meet these thresholds, plant-forward strategies remain viable if you plan carefully and pay attention to amino acid balance.

### **Study Limitations**

This Texas A&M study provides useful insights, but there are important boundaries to keep in mind:

- **Population** — Findings came from 23 young, healthy military cadets (ages 18 to 40). Results may not apply to older adults, recreational athletes, or people with chronic health issues.
- **Study meals** — Both groups consumed MRE-style rations under controlled conditions. Real-world diets involve more variety, freshness, and quality differences.
- **Protein sources** — The animal group ate pork-based meals, while the plant group consumed plant-based MREs. These choices don't represent all animal or plant proteins, particularly higher-quality plant options like fermented proteins.
- **Duration** — The study tracked recovery over 72 hours. It did not examine long-term training adaptations such as sustained muscle growth or endurance capacity.
- **Context** — Results show recovery benefits in this specific scenario, but they do not prove that animal proteins are universally superior in every case.

## **What Foods Are Best to Eat Right After Training?**

The fastest way to support recovery is to eat a balanced meal or snack with 25 to 35 grams of protein that delivers about 2 to 3 grams of leucine. **Leucine** is one of the branched-chain amino acids, and it plays a central role in "switching on" muscle protein

synthesis – the repair and rebuilding process that makes you stronger after training. Hitting that leucine threshold is what makes the difference between just eating protein and actually driving recovery.

- **Animal proteins usually make this easier because they're naturally rich in leucine and provide a complete amino acid profile** – Lean grass fed beef, organic, pasture-raised pork and chicken, wild-caught fish, dairy, and pastured eggs all reach the leucine target in practical serving sizes. Whey protein isolate is another dense option, offering up to 3 grams of leucine in a single scoop.<sup>7</sup>
- **Fermented plant-based proteins, such as tempeh, also support recovery when portioned correctly** – A 150-gram serving of tempeh contains about 28 to 30 grams of protein and just over 2 grams of leucine, enough to meet the threshold without relying on blends or powders. For those who avoid animal foods, this makes tempeh one of the more practical whole-food options for post-training recovery.
- **A note about unfermented soy** – The researchers included tofu in their recommended plant-based protein sources; however, unfermented soy products are actually linked to a wide range of health problems. In this case, the only soy product I would recommend is tempeh, as the fermentation process cancels out the many undesirable effects of soy. I recommend reading "[Soybean Oil Linked to Genetic and Neurological Damage](#)" for more information.
- **If consuming pork (and chicken), look for organic pasture-raised options** – While the featured study focused on pork-based MREs, I advise you to be cautious of meats from conventionally raised animals, as they are often fed diets high in polyunsaturated fats (PUFs), which affect the meat's nutritional composition. Choose pasture-raised option whenever possible. Organic, pasture-raised pork is high in protein and a top source of thiamine (vitamin B1), vital for energy metabolism.

## Leucine Cheat Sheet

Food (serving)	Protein (g)	Est. leucine (g)
Lean beef, cooked, 3 oz	22 to 26	2.3
Pork loin, cooked, 3 oz	24 to 26	2.1
Whey isolate, 25 to 30 g	23 to 27	2.5 to 3.0
Cottage cheese, 1 cup	25 to 28	2.0 to 2.5
Eggs, 2 large	12 to 14	1.0 to 1.2
Tempeh, 150 g	28 to 30	2.0 to 2.1
Milk, 16 oz	16	1.4 to 1.6

## Quick Meal Ideas You Can Consider

- **Dairy mix** – 8 to 12 ounces of milk with a cup of Greek yogurt for around 30 grams of protein and a full 2 to 3 grams of leucine.
- **Egg-based plate** – Eat 2 whole eggs and 1 to 2 egg whites with fruit or whole grain toast, offering around 20 grams of protein plus carbs to replenish energy.
- **Meat or fish entrée** – 3 to 4 ounces of lean beef, chicken, or wild-caught salmon, paired with white rice or potatoes if extra carbs are needed.
- **Plant-forward option** – Consider a tempeh stir-fry with grains.

The bottom line is simple – Food-first meals built from high-quality proteins are the most reliable way to support recovery. Animal proteins consistently provide the fastest path to the leucine target, while tempeh offers a workable alternative for those seeking plant-based solutions.

# Do You Need to Boost Your Protein with Carbs for Better Recovery?

Recovery after training isn't just about repairing muscle – it's also about restoring energy. Intense sessions drain glycogen, the body's stored carbohydrate, which powers both endurance and strength performance.

- **Pairing protein and carbohydrates** – For endurance athletes, tournaments, or anyone facing back-to-back workouts, pairing protein with carbohydrates speeds glycogen resynthesis and helps you bounce back faster. Sports nutrition guidelines recommend 1.0 to 1.2 grams of carbohydrate per kilogram of body weight every hour for the first four to six hours after exercise when rapid refueling is needed.<sup>8</sup>
- **Strength-focused training, however, uses less glycogen** – If your focus is weight training or explosive sports with at least 24 hours between sessions, you don't need such aggressive refueling. Instead, aim to hit your protein target (0.3 to 0.4 g/kg) alongside your daily carbohydrate needs (200 to 250 g for most adults). This maintains glycogen stores without the pressure of rapid replenishment. Carbs are still important, but timing is less critical in this context.
- **How about athletes doing mixed sports and hybrid training?** Team-sport athletes or those doing both resistance and endurance sessions in the same week fall in the middle. For these groups, post-training carbohydrate intake depends on the time to next session. If recovery time is short (less than 12 hours), follow the endurance protocol. If longer (more than 24 hours), daily totals become the main driver.
- **From a broader energy perspective, most adults are advised to consume at least 200 to 250 grams of carbohydrate daily** – Roughly half of this amount is needed by your brain alone. Consistently dropping below this range risks sluggish recovery, mental fog, and reduced physical performance.

## Should You Take Protein Before Sleep?

Recovery is crucial during nighttime, as this is when your body repairs and rebuilds muscle tissue, and having protein before bed supports this process. Unlike whey, which digests quickly, casein protein digests slowly, releasing amino acids steadily into your bloodstream over several hours. This "slow drip" effect matches the long overnight fasting period, which is why researchers have investigated pre-sleep protein as a strategy to improve recovery.

- **Studies report that a pre-sleep serving of casein boosts overnight muscle protein synthesis and helps maintain a positive protein balance<sup>9</sup>** — Over time, this can translate into greater gains in muscle size and strength, especially when combined with resistance training. For older adults, this approach is particularly valuable because they often experience "anabolic resistance," meaning their muscles respond less efficiently to protein.
- **Newer evidence reinforces this concept** — As the previously mentioned Cell Reports Medicine study showed, the body continues using amino acids for muscle-building well into the overnight period after a large protein feeding.<sup>10</sup> This supports the rationale for consuming casein-rich foods like Greek yogurt or cottage cheese before sleep, ensuring a steady amino acid supply during hours when the body is most active in repair.
- **Whole foods are the most practical way to achieve this** — What you eat before bed doesn't need to be elaborate. A cup of cottage cheese or a small bowl of Greek yogurt topped with fruit can serve as an effective, nutrient-dense nighttime snack. Both are easy to digest and fit into most evening routines, and provide your muscles with the slow-release amino acids they need to repair while you sleep, without requiring powders or supplements.

## **Animal Protein Remains Necessary Until Better Alternatives Exist**

At this time, I firmly agree with the assertion that animal protein is required to optimize human biology. Yet after five decades of studying the issue, I've concluded that relying on animal sources is far from ideal.

That is why I am engaged in research to solve this dilemma – developing healthier, cost-effective alternatives from plants and microbial fermentation that can supply the dozen essential nutrients found only in animal foods, such as creatine, carnitine, choline, carnosine, vitamin B12, taurine, anserine, and others.

I am fully committed to this path, and once a practical replacement exists, I will no longer consume animal flesh. For now, there is no truly pragmatic alternative for most people, but creating one is my deepest commitment.

## **Frequently Asked Questions (FAQs) About Protein for Recovery**

**Q: How much protein should I eat after a workout?**

**A:** Research recommends aiming for 0.3 to 0.4 grams per kilogram of body weight (about 20 to 40 grams for most adults) within two hours after training. This amount consistently stimulates muscle protein synthesis and accelerates recovery.

**Q: Does animal protein improve recovery more than plant protein?**

**A:** Yes. In a recent study, participants eating pork-based MREs recovered better than those eating plant-based MREs with the same protein content. The animal protein group had less soreness, lower inflammation, and healthier hormone ratios, largely due to higher essential amino acids and creatine content.

**Q: Do I need carbs with protein after training?**

**A:** If you're doing endurance exercise, tournaments, or back-to-back sessions, research recommends pairing protein with 1.0 to 1.2 g/kg of carbs in the first four to six hours to speed glycogen refueling. For strength training with long recovery windows, just hitting your daily protein and carbohydrate intake is sufficient.

**Q: What's the leucine threshold for muscle protein synthesis?**

**A:** Around 2 to 3 grams of leucine per meal is required to robustly trigger muscle protein synthesis. You'll get this from about 25 to 35 grams of most animal proteins or around 150 grams of fermented soy such as tempeh.

**Q: Should I take protein before sleep?**

**A:** Yes, especially casein-rich foods like cottage cheese or Greek yogurt. They digest slowly, releasing amino acids overnight and supporting recovery during sleep. Research confirms pre-sleep protein boosts overnight synthesis and long-term strength gains.

**Q: Are whole eggs better than egg whites for recovery?**

**A:** Yes. Whole eggs provide not only protein but also additional nutrients and fats that improve muscle protein synthesis compared to egg whites alone.

## Sources and References

---

- <sup>1, 7</sup> [Nutrients 2025, 17\(12\), 1995](#)
- <sup>2, 10</sup> [Cell Reports Medicine, December 19, 2023, Volume 4, Issue 12, 101324](#)
- <sup>3</sup> [Office of Disease Prevention and Health Promotion, Current Dietary Guidelines](#)
- <sup>4</sup> [Texas A&M University, September 4, 2025](#)
- <sup>5</sup> [Medical Xpress, September 4, 2025](#)
- <sup>6</sup> [Meat Poultry, September 8, 2025](#)
- <sup>8</sup> [Medicine & Science in Sports & Exercise, March 2016, 48\(3\):p 521-526](#)
- <sup>9</sup> [J Sci Med Sport. 2021 Feb;24\(2\):177-182](#)