

Performance Nutrition

Fueling the athletic body.





Dietary Action Plan

- For high school or collegiate swimmers aiming to maximize health, recovery, and growth, a well-balanced diet is essential.
- Athletes at this level need to fuel their bodies to support rigorous training schedules while promoting recovery and long-term health.

Energy is key!

Swimmers typically require a higher calorie intake due to the energy demands of their training.

The exact requirement depends on the athlete's age, gender, training intensity, and body composition.

- Male swimmers can need up to 4,000-6,000 calories a day
- Female swimmers may need around 3,000-4,500.

**Diet affects
performance
and
recovery.**

Every nutritional decision, no matter how small, can impact your health and your performance.

You are, literally, made of what you eat.

Meal Timing and Structure: Pre- workout.

Timing: 2-3 hours before training.

Why? Provides the energy needed for the workout. Should be high in carbohydrates and moderate in protein.

Examples: Whole grain sandwich with lean turkey and vegetables, brown rice with grilled chicken, oatmeal with fruits and nuts.

Pre- exercise do's and don'ts.

Prepare to succeed!

Meal 3-3.5 hours prior (fiber rich, nutrient dense carbohydrates and quality protein)

Light snack 60-90 mins prior (slow-absorbing starchy carbs and small amount of protein w/ minimal fat)

10-15 mins prior (recovery shake, chocolate milk, fruit smoothie, lots of fluids to ensure well hydrated)

Avoid fatty foods/ large amounts of proteins – too slow to process (upset tummy)



Snacks

- **Why?** To provide steady energy and prevent muscle breakdown throughout the day.
- **Examples:** Hard-boiled eggs, almond butter on whole grain toast, trail mix, or a fruit and yogurt parfait.

During exercise



During weight training – sports drink w/ small amt. whey protein



During conditioning – water and sports drink (electrolytes/carbs)



Drinking only water can compromise your performance (removal of necessary electrolytes)

Post workout meal

- **Timing:** Within 30 minutes to 1 hour after training.
- **Why?** Aids in muscle recovery by replenishing glycogen stores and providing protein for muscle repair. Intention is to accelerate the recovery process (maximizing potential/gains for next practice)
- **Examples:** Protein smoothie with banana and spinach, grilled salmon with sweet potatoes, or a Greek yogurt bowl with berries and granola.





Post-exercise: Rehydrate!

Drink until no longer
thirsty.

Most of the fluid should
be in the form of water.

Post-exercise: Repair



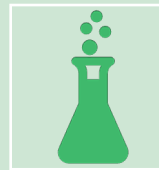
Tissue repair/
Muscle building



Amino acids needed
to adapt to resistance
exercise



Protein synthesis is
elevated to 50% 4 hours
after resistance training
and 109% 24 hours after.
After 36 hours, synthesis
rates return to normal.



Body lacks capacity to
store Amino Acids, so
needs constant
supply/ every 3-4
hours

Hydration Strategies

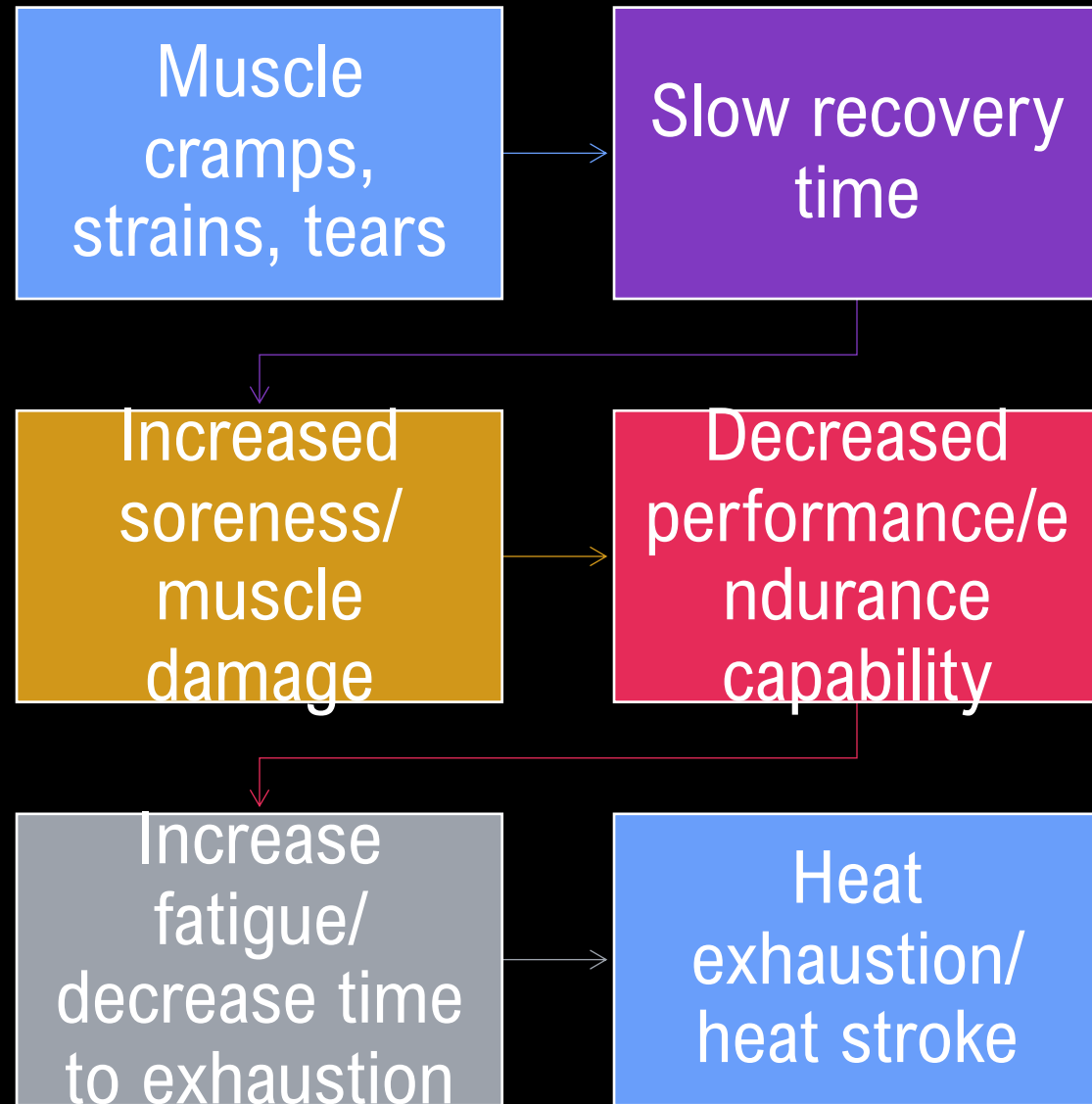
Sweating promotes loss of electrolytes – Mg, Na, K, Ca

Hot? >60min Practice? Need to replace these.

Pre-hydrate – 2 hrs., 16 oz. (following quality night-before-match hydration)

Hydrate ad libitum during training (do not exceed 48-60oz./hr)

Dehydration risks



Best Foods to consume

Lean Proteins: Chicken, turkey, tofu, and fish promote muscle repair and growth.

Fruits and Vegetables: These provide essential vitamins, minerals, and antioxidants, which help fight oxidative stress and inflammation from intense exercise.

Complex Carbohydrates: Whole grains, quinoa, sweet potatoes, and oats are great for providing sustained energy and preventing energy crashes during training.

Healthy Fats: Avocados, nuts, seeds, and fatty fish provide long-lasting energy and aid in hormone production and recovery.

Hydration Sources: Water, coconut water, and electrolyte-rich beverages (preferably low in sugar) help maintain hydration and replenish electrolytes lost through sweat.



How much should I eat?

- Depends upon training levels/intensities
 - Light training?
 - Heavy training?

Use your hand to help measure portion size!



Protein

We use HANDS to measure protein.

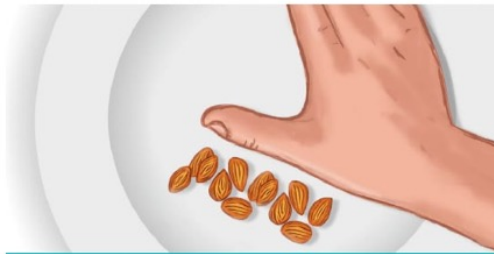
1 hand will contain about 40 grams of protein.



Low-Carb Vegetables

We use FISTS to measure low-carb vegetables.

1 fist will contain between 1 and 15 grams of carbohydrates.



Fats

We use THUMBS to measure fats.

1 thumb will contain about 10 grams of fat.



Carbohydrates

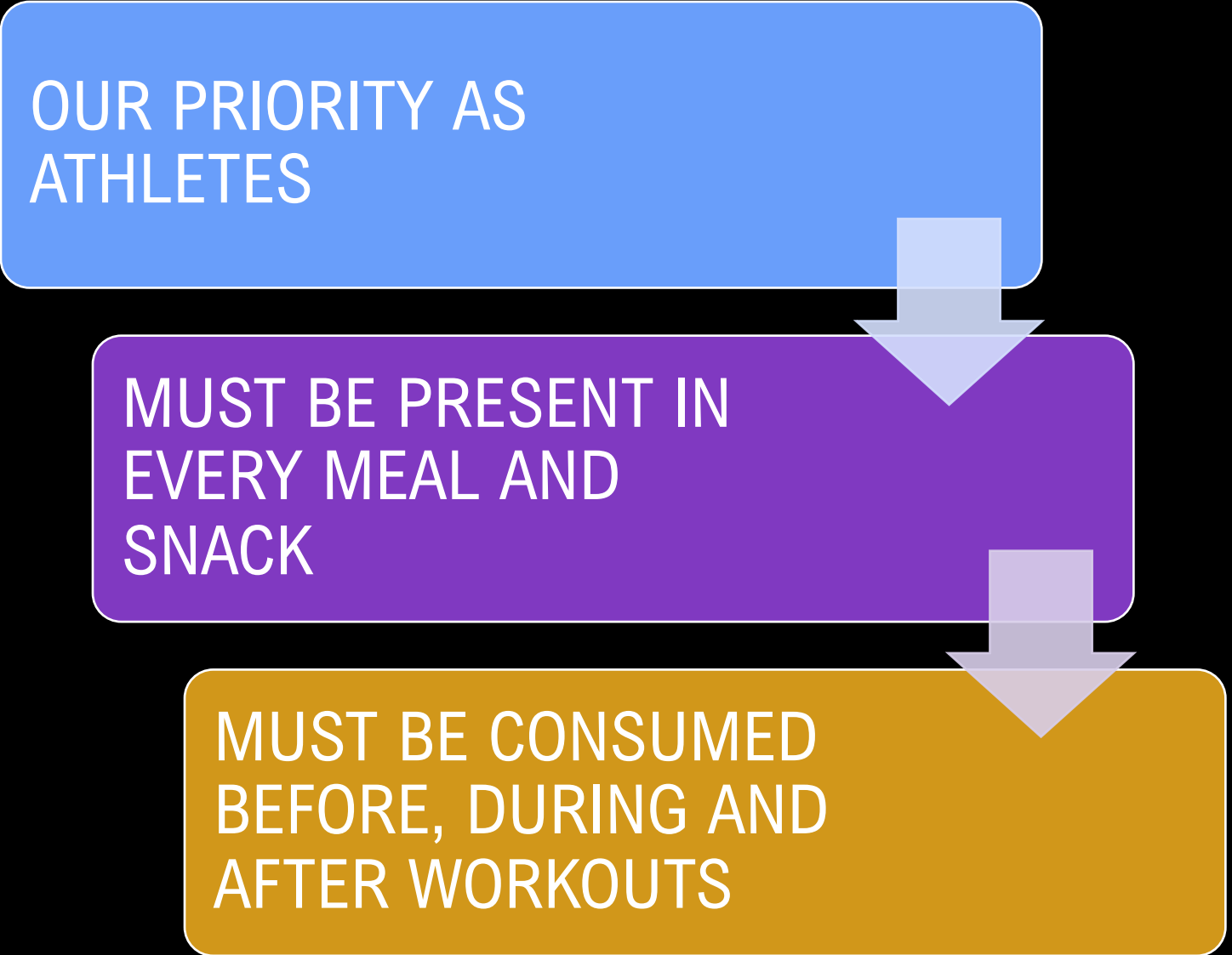
We use CUPPED HANDS to measure carbohydrates (carbs).

1 cupped hand will contain about 20 grams of carbohydrates.



Protein:
crucial for muscle
repair and
growth,
particularly after
intense
swimming
sessions. It also
supports immune
function and
tissue recovery.

OUR PRIORITY AS
ATHLETES



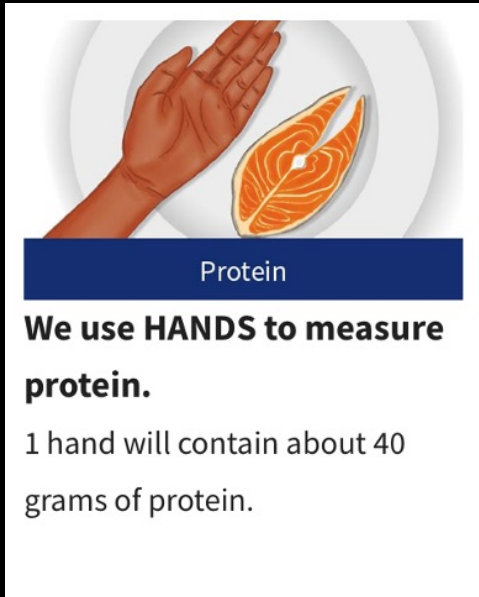
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graph TD; A[OUR PRIORITY AS ATHLETES] --> B[MUST BE PRESENT IN EVERY MEAL AND SNACK]; B --> C[MUST BE CONSUMED BEFORE, DURING AND AFTER WORKOUTS];
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The diagram consists of three stacked, rounded rectangular boxes connected by downward-pointing arrows. The top box is blue, the middle box is purple, and the bottom box is orange. Each box contains white text. The arrows are light blue and point from the bottom of one box to the top of the next box below it.

MUST BE PRESENT IN
EVERY MEAL AND
SNACK

MUST BE CONSUMED
BEFORE, DURING AND
AFTER WORKOUTS

Protein amounts



- Light training
 - Bodyweight (kilograms) x 1.0 grams protein/day
- Heavy training
 - Bodyweight (kilograms) x 1.2-1.5 grams protein/day

1lb = .454 kilograms

(eg: Caleb would want 2 - 3 "hands"/day)



Meats

Unprocessed

Choose organic, wild-caught, free-range, grass-fed options

Fish

Bison

Chicken

Turkey

Eggs

Top Protein Options

Option	Serving Size	Grams/Serving
Eggs	2	6-8g
Milk & Plain yogurt	1 cup	3-10g
Turkey/Chicken	3 oz.	13-25g
Cottage Cheese	¼ cup	3-10g
Fish	3 oz.	13-25g
Bison	4 oz.	14-19g
Ground Turkey	3 oz.	13-25g
Whey isolate	1-2 scoops	15-30g
Beans/Legumes	½ cup	7-9g
Impossible (vegan)	4 oz.	19g



Carbohydrates

- 3 types (fiber rich, starchy, sugary)
- Primary source of fuel
- Assist in digestion and metabolism of fats as energy source
- Found in all the plant-based foods
- Should consume 6-10g/kg of body weight/day for heavy training.



Fiber-rich

- These are your friend
- Nutrient-dense
- Include: broccoli, carrots, spinach/kale/greens, tomatoes, blue berries, citrus fruits, bananas, garlic, green tea, beans, peppers

Top Fiber- Rich Carbs

Top Fiber-Rich Carb Options	Serving Size
Broccoli	2 spears / 1 cup
Carrots	2 medium / 6-8 baby
Spinach/Kale/Greens	1 cup
Tomatoes	1 medium
Blueberries	½ cup
Citrus Fruits	1 large
Bananas	1 medium
Garlic	2-3 cloves / 1tsp powder
Green Tea	1 cup
Peppers	1 cup
Beans	1 cup



Fruits/ Vegetables

- Usually best when consumed raw
- Choose organic and unprocessed
- The more variety, the better

Whole grains

- Choose unprocessed, no added sugar
- Oatmeal
- Brown/wild rice
- Quinoa
- Farro





Plant-based foods serve you well

- Contain phytonutrients
- Rich in electrolytes
- Vitamins
- Dietary fiber



Starchy

- Good and bad types based on what you choose and when you eat it.
- Recommended 1-2 servings/meal, unless trying to lose body fat. Then 1-2 servings @ breakfast and post-exercise only. If trying to gain mass, 3-4 servings/meal.
- Better if high in fiber and low in sugar.

Top Starchy Carbs: great for providing sustained energy and preventing energy crashes during training.

Top Starchy Carb Options	Serving Size
Whole wheat bread	1 slice
Whole grain cereal	1 cup
Brown rice	½ cup
Whole wheat pasta	½ cup
Barley	½ cup
Bulgar Wheat	½ cup
Oatmeal	½ cup
Quinoa	¼ cup
Wheat Pita Bread	1 piece
Whole Wheat Tortillas	1 torilla
Whole Wheat Couscous	½ cup

Sugary Carbs

- Easy to metabolize
- Needed to sustain high intensity performance
 - Energy drink/bar/gel, recovery shake
- Not needed the rest of the time because of the sheer abundance of it in other foods already
 - Cookies, cakes, candy, ice-cream



Fats - lipids

- Good ones
 - Omega-3
 - Anti-inflammatory
 - Polyunsaturated
 - Nuts, oils, fish, plant based
- Bad ones
 - Omega-6
 - Inflammatory, bad on joints
 - Saturated
 - Animal fats, solids at room temp



Healthy Fats:
provide long-
lasting energy
and aid in
hormone
production
and recovery.

Healthy Fats	Serving Size
Raw nuts	1 Palm
Nut butters (peanut, almond)	2 Tbsp
Avocados	½ avocado
Extra Virgin Olive Oil	1 Tbsp
Fish/Fish Oil	3 oz. / 1000mg
Coconut Oil	1 Tbsp
Seeds/Flax Seed Oil	1 palm/ 1 Tbsp

Foods to avoid

- **Highly Processed Foods**
- **Why?** These foods often contain excessive sugars, unhealthy fats, and preservatives that can impair recovery, increase inflammation, and offer little nutritional value.
- **Examples:** Fast food, packaged snacks, sugary cereals, and frozen meals.



Foods to avoid

- **Sugary Drinks and Sodas**
- **Why?** High sugar content can lead to energy spikes followed by crashes, making it harder to maintain steady energy levels during training. They also contribute to unnecessary calorie intake without nutritional benefits.
- **Examples:** Sodas, energy drinks, and sweetened teas.



Foods to avoid

- **Fried Foods**
- **Why?** Fried foods are high in unhealthy fats, which can contribute to inflammation and slow down digestion. This makes it harder to recover from workouts.
- **Examples:** French fries, fried chicken, and other deep-fried items.



Foods to avoid

- **Excessive Refined Carbs**
- **Why?** While carbs are essential for energy, refined carbohydrates like white bread and pastries can cause rapid spikes in blood sugar and provide little nutritional benefit compared to whole grains.
- **Examples:** White bread, pastries, and white rice.



Foods to avoid

- Athletes should aim to minimize or avoid foods containing artificial preservatives, colorings, sweeteners, and other additives to optimize health and performance. Many of these substances are associated with increased cancer risk, inflammation, allergic reactions, and potential disruption of gut health, all of which can negatively impact an athlete's ability to recover and perform at their best. Choosing whole, minimally processed foods is a better strategy for long-term health and athletic success.
- See the slides at the end of this presentation for more on what to avoid.

Supplements

- Caution: can contain trace elements of banned substances if produced in facilities where performance enhancement drugs are produced.
- <https://www.usaswimming.org/parents/popular-resources/anti-doping/clean-sport-medications>
- <https://athleatsnutrition.com/athletes-guide-to-choosing-safe-sports-supplements/>



Supplements: Multi-vitamins

- Can help provide nutrients missing from a less nutritious, less varied, and/or low plant-based diet.
- Choose liquids over capsules, capsules over tablets.
- Find products rich in antioxidants (Vit. A, C, E and phytonutrients; also zinc, calcium, zinc, selenium, magnesium, potassium)
- Choose a 2-a-day over 1-a-day
- Overuse of fat-soluble vitamins (A, D, E, K) can lead to toxicity.



Supplements: Omega-3

Nuts and seeds, Cold water fish, Plant oils

Fatty acids that support your overall health, cell function/growth

Protects against heart attack, stroke, cancer, inflammation, depression

Anti-inflammatory properties, which can help reduce muscle soreness and improve recovery.

They support heart and joint health, beneficial for endurance athletes like swimmers.

- Excessive intake can increase the risk of bleeding and may affect blood clotting.

- Some fish oil supplements may contain contaminants like mercury if not sourced properly.

Supplements: Protein



Whey

Animal source,
fast absorbing,
muscle
repair/growth,
good for pre/post
workout



Soy

Plant source,
ideal for lactose
intolerance,
intermediate
absorption rate,
muscle
repair/growth,
provides anti-
oxidative benefits



Casein

Animal source
(80% of protein in
cow's milk), slow
absorption rate,
great for
prolonged muscle
synthesis hours
after exercise

Protein Supplements (Whey, Casein, Plant-Based)

Pros:

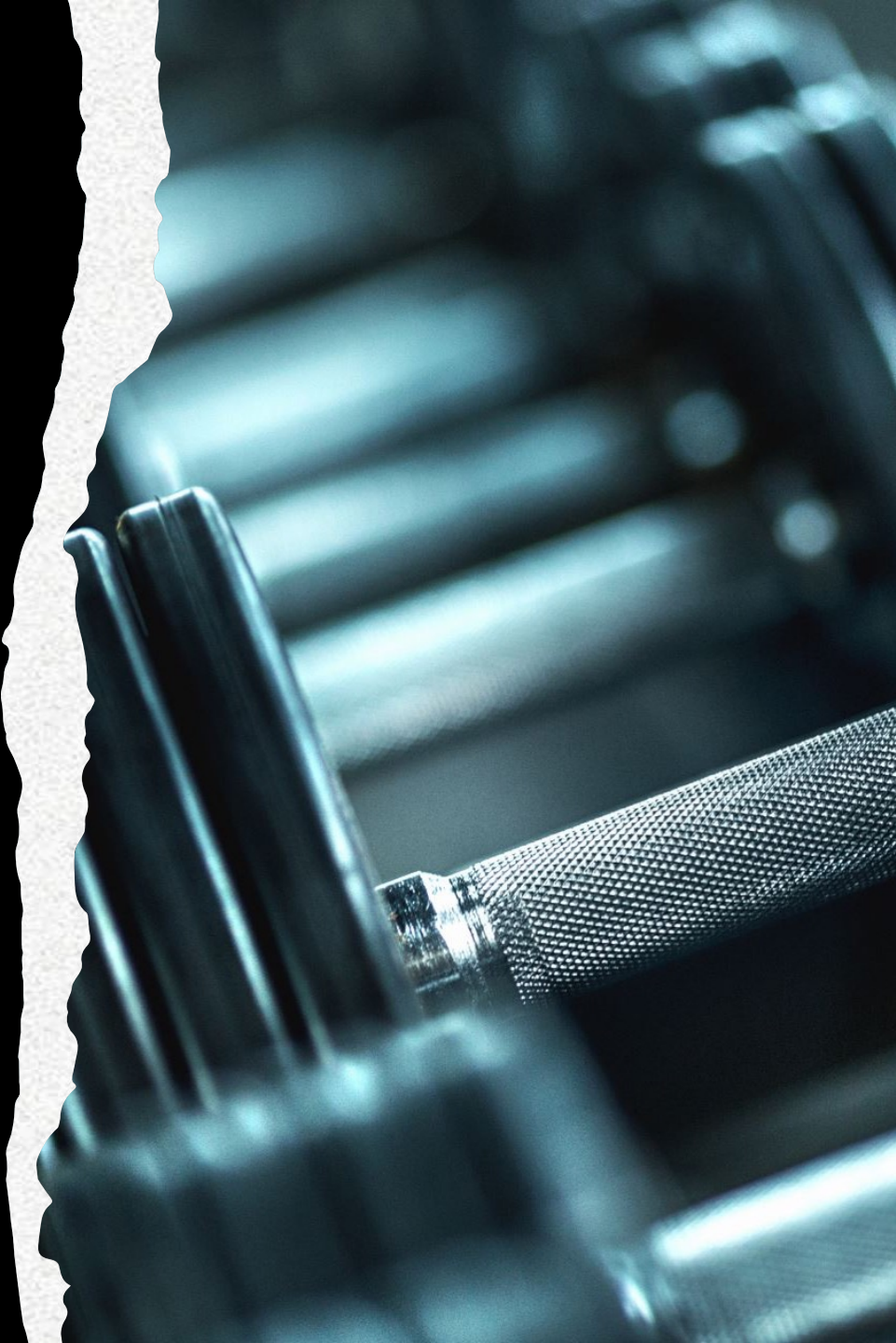
- Convenient source of high-quality protein for muscle repair and recovery.
- Can support increased protein needs after intense training.
- Whey protein is absorbed quickly, making it ideal post-workout, while casein is slow-digesting, providing prolonged amino acid release.

• Cons:

- Excess protein can strain the kidneys over time if not balanced with hydration.
- Over-reliance on supplements can detract from getting whole-food nutrients.
- Some protein powders may contain added sugars or artificial ingredients.

Branched-Chain Amino Acids (BCAAs)

- **Pros:**
 - BCAAs (leucine, isoleucine, and valine) can reduce muscle soreness and fatigue after intense training.
 - They support muscle protein synthesis, particularly when consumed before or during a workout.
- **Cons:**
 - Most athletes consuming enough protein from food sources do not need additional BCAAs.
 - Long-term use may disrupt amino acid balance if taken in excessive amounts.



Supplements: Vitamin D3

Vital to bone mineral formation, fat metabolism, immune function

Athletic demands are higher than normal

Sunshine is not enough

Vitamin D fortified milk not enough (150 IU/serving)

Recommend 1000-5000 International Units every morning (600-800 recommended for normal adults)

Supplements: Antioxidants

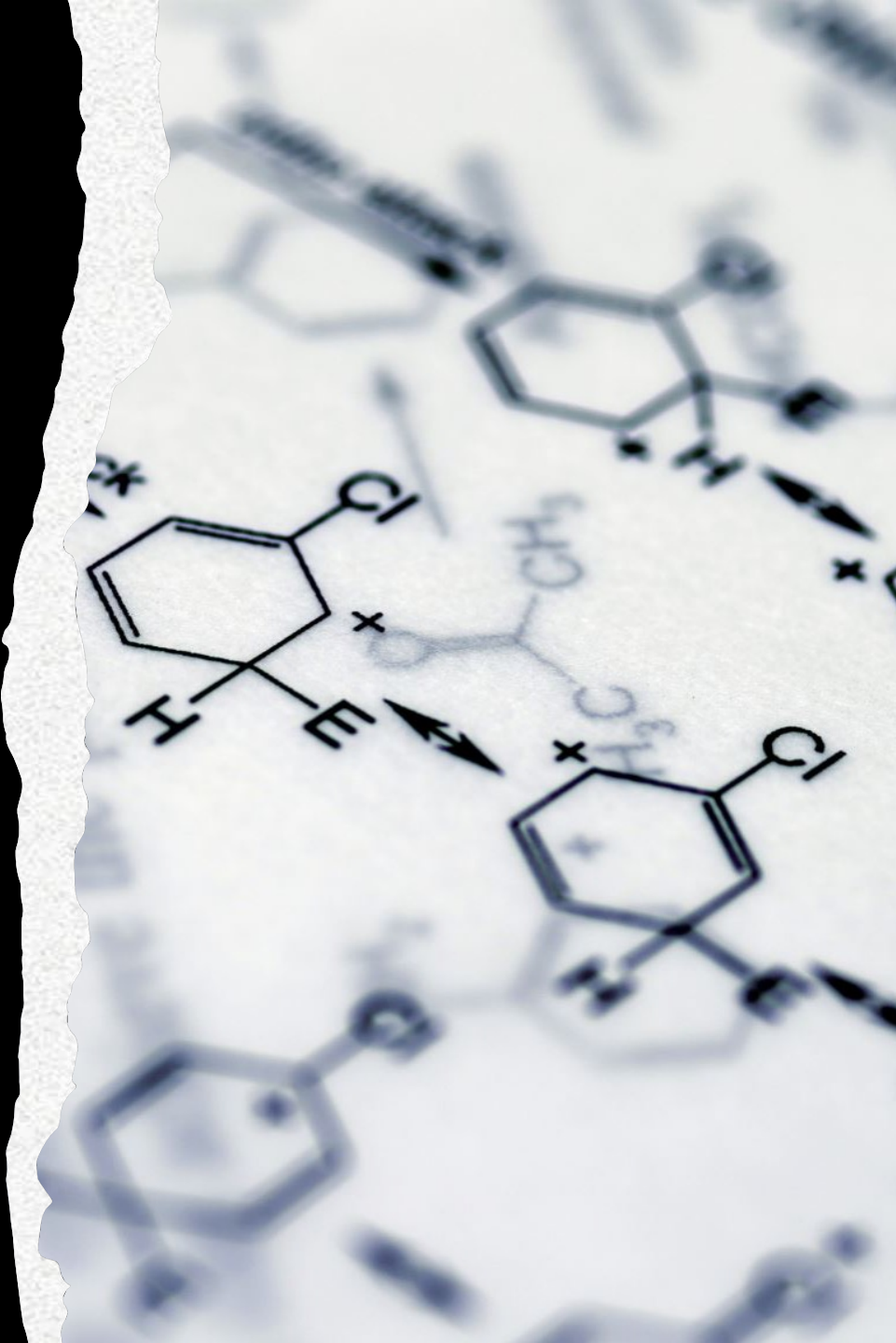
- Clear body of free radicals
- Boost immune function
- Speed recovery process

Caffeine

- Inhibits absorption of vitamins and minerals from food
- Actually promotes their excretion from body (note urine color post-consumption)
- Can affect your circadian rhythm/ quality of sleep
- Sodas – nothing good there. Considered culprit in decreased bone density

Creatine

- Creatine is one of the most well-researched supplements available, with significant implications for both athletic performance and emerging health research.
- **How it Works:** Creatine is stored in muscle cells in the form of phosphocreatine, which plays a crucial role in the production of adenosine triphosphate (ATP). During short bursts of high-intensity activity, ATP is the primary energy source. Creatine helps regenerate ATP more quickly, allowing for sustained power output during high-intensity, short-duration activities like sprints or intense swim intervals.



Creatine

Pros

- Improves performance in short-duration, high-intensity activities such as sprint swimming, starts, and turns.
- Increases lean muscle mass and strength over time when combined with resistance training.
- Supports faster recovery by replenishing ATP stores, reducing fatigue between sets.
- Generally safe for most individuals when taken at recommended doses.

Cons

- Can lead to temporary water retention, which may result in a slight weight increase.
- Some users report minor gastrointestinal discomfort when first starting creatine.
- Long-term effects of creatine use over decades are not fully understood, though no serious adverse effects have been consistently observed in research.

Creatine Emerging research

- Some studies suggest it may have anti-cancer properties
- Some studies suggest it may have neuroprotective properties (reducing severity of post concussion symptoms)
- May improve cognitive function, especially in sleep deprivation or mental fatigue
- Anti-aging effect, preserving muscle mass and cognitive function in aging adults.

Creatine Conclusion

- For swimmers focusing on short bursts of speed (e.g., sprinters) or looking to enhance strength and recovery during dryland training, creatine can be a valuable supplement. Its role in ATP regeneration makes it particularly beneficial for high-intensity, short-duration efforts. However, for endurance-based swimming, the direct benefits may be less pronounced, though improved recovery and muscle retention are still useful.
- Emerging research into its potential health benefits—such as anti-cancer and neuroprotective properties—also adds to creatine's appeal, though these areas require more conclusive human studies.

More things to avoid

- The following slides list what to avoid and why.

Sodium Nitrites and Nitrates

- **Found in:** Processed meats like bacon, sausage, hot dogs, and deli meats.
- **Why to avoid:** Nitrites and nitrates can form nitrosamines, compounds linked to an increased risk of cancer, particularly colorectal cancer. Processed meats containing these preservatives are also associated with inflammation, which can impair recovery from training.
- **Health Impact:** Potential cancer risk, increased inflammation, and cardiovascular concerns.



BHA (Butylated Hydroxyanisole) and BHT (Butylated Hydroxytoluene)

- **Found in:** Cereals, snack foods, butter, meats, and chewing gum.
- **Why to avoid:** BHA and BHT are synthetic antioxidants used to prevent fats from becoming rancid. However, BHA is considered a possible human carcinogen, and both chemicals have been linked to potential endocrine disruption.
- **Health Impact:** Cancer risk, hormonal imbalances.



Sodium Benzoate

- **Found in:** Carbonated beverages, acidic foods like pickles, salad dressings, and fruit juices.
- **Why to avoid:** Sodium benzoate can form benzene, a known carcinogen, when combined with vitamin C (ascorbic acid), commonly found in many soft drinks.
- **Health Impact:** Cancer risk, hyperactivity in children, and potential respiratory issues.

Potassium Bromate

- **Found in:** Bread and baked goods.
- **Why to avoid:** Potassium bromate is a flour improver that strengthens dough and helps bread rise. It is classified as a possible carcinogen and is banned in many countries, though still used in the U.S. in some products.
- **Health Impact:** Increased risk of cancer, particularly thyroid and kidney tumors.





Red 40 (Allura Red AC)

- **Found in:** Snack foods, candy, soda, baked goods, and sports drinks.
- **Why to avoid:** Studies have linked Red 40 to hyperactivity, particularly in children, and it may also cause allergic reactions in some people. Some animal studies suggest a potential link to cancer.
- **Health Impact:** Hyperactivity, allergic reactions, and cancer risk.

Yellow 5 (Tartrazine)

- **Found in:** Candy, soda, chips, baked goods, and pickles.
- **Why to avoid:** Yellow 5 has been associated with hyperactivity, migraines, and behavioral issues in children. Some people may also experience allergic reactions, such as hives.
- **Health Impact:** Behavioral problems, allergic reactions, and potential DNA damage.



Yellow 6



Found in: Beverages, candy, baked goods, and snacks.



Why to avoid: This dye has been linked to adrenal and kidney tumors in animal studies. It may also cause allergic reactions in sensitive individuals.



Health Impact: Cancer risk, allergic reactions, and hyperactivity.

Blue 1 and Blue 2



Found in: Candy, soda, cereals, and sports drinks.



Why to avoid: Blue dyes have been associated with allergic reactions, particularly in children, and Blue 2 has been linked to brain tumors in animal studies.



Health Impact: Allergic reactions, hyperactivity, and potential cancer risk.

Aspartame

Found in: Diet sodas, sugar-free gum, low-calorie snacks, and protein shakes.

Why to avoid: Aspartame has been linked to headaches, dizziness, and potential neurological issues in sensitive individuals. Some studies suggest a possible association with increased cancer risk, though the evidence is mixed.

Health Impact: Neurological concerns, headaches, and potential cancer risk.

Sucralose (Splenda)

Found in: Diet sodas, baked goods, protein powders, and low-calorie desserts.

Why to avoid: Sucralose has been shown to alter gut bacteria, which may negatively affect digestion and immune function. When heated, it may produce harmful chlorinated compounds.

Health Impact: Disrupted gut microbiome and potential toxicity when heated.

Saccharin



Found in: Diet drinks, candies, and low-calorie desserts.



Why to avoid: Saccharin has been linked to bladder cancer in animal studies. While it has been declared safe for human consumption, concerns remain about its long-term effects.



Health Impact: Potential cancer risk and allergic reactions.

Monosodium Glutamate (MSG)

- **Found in:** Processed foods, canned soups, frozen meals, fast food, and snacks.
- **Why to avoid:** MSG is a flavor enhancer that has been associated with headaches, nausea, and other symptoms in people who are sensitive to it (often referred to as “Chinese Restaurant Syndrome”). Excessive consumption may also lead to obesity, metabolic disorders, and oxidative stress.
- **Health Impact:** Headaches, nausea, weight gain, and potential metabolic issues.



Carrageenan

- **Found in:** Dairy products, plant-based milks, ice cream, and processed meats.
- **Why to avoid:** Carrageenan is a thickener and stabilizer extracted from seaweed, but it has been linked to gastrointestinal inflammation, which could lead to digestive discomfort, bloating, and even contribute to conditions like irritable bowel syndrome (IBS).
- **Health Impact:** Inflammation, digestive issues, and potential link to gastrointestinal diseases.



Polysorbates (Polysorbate 80 and Polysorbate 60)

- **Found in:** Ice cream, baked goods, whipped toppings, and salad dressings.
- **Why to avoid:** Polysorbates are used as emulsifiers and can disrupt gut bacteria, potentially leading to inflammation. They have also been linked to allergic reactions and digestive issues.
- **Health Impact:** Digestive discomfort, inflammation, and allergic reactions.





Trans Fats (Partially Hydrogenated Oils)

- **Found in:** Margarine, baked goods, fried foods, and processed snacks.
- **Why to avoid:** Trans fats raise LDL cholesterol (bad cholesterol) and lower HDL cholesterol (good cholesterol), leading to an increased risk of heart disease, stroke, and type 2 diabetes. They also contribute to inflammation, which can impair recovery after intense physical activity.
- **Health Impact:** Increased risk of heart disease, stroke, diabetes, and inflammation.

Sources

- 1. “Creatine: Uses, Side Effects, and More” – Mayo Clinic.
- 2. “Creatine Supplementation and Performance” – Journal of the International Society of Sports Nutrition.
- 3. “Emerging Role of Creatine in Neuroprotection and Recovery” – Frontiers in Neuroscience.
- 4. “Creatine Supplementation: A Review of Efficacy and Safety” – National Institutes of Health (NIH).
- 5. “Creatine in Cancer Metabolism and Therapy” – Cancer Research.

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- 2. “Dietary Recommendations for Swimmers” – NCAA Sports Science Institute.
- 3. “Sports Nutrition for Swimmers” – American College of Sports Medicine.
- 4. “Fueling the High School Swimmer” – Gatorade Sports Science Institute.

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[oai_citation:1,academic.oup.com](https://academic.oup.com/pch/article/18/4/200/2647146) .
- ****Journal of the International Society of Sports Nutrition****: Effects of Protein Supplementation on Muscle Mass and Strength .
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- 3. ^{**}Frontiers in Nutrition^{**}: The Effectiveness of Casein and Pea Protein .