

SPORTS NUTRITION FOR ELITE SWIMMING PERFORMANCE

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Goals of Sports Nutrition

- ❖ Fuel to meet daily performance demands
- ❖ Prevent dehydration & ↓risk of sports injury
- ❖ Support training & enhance performance
- ❖ Build & maintain lean muscle mass
- ❖ Establish gastrointestinal comfort

5 Key Nutrient Groups

- Ensures effective fueling for and recovering between practices and competition

✧ Carbohydrates

✧ Protein

✧ Fat

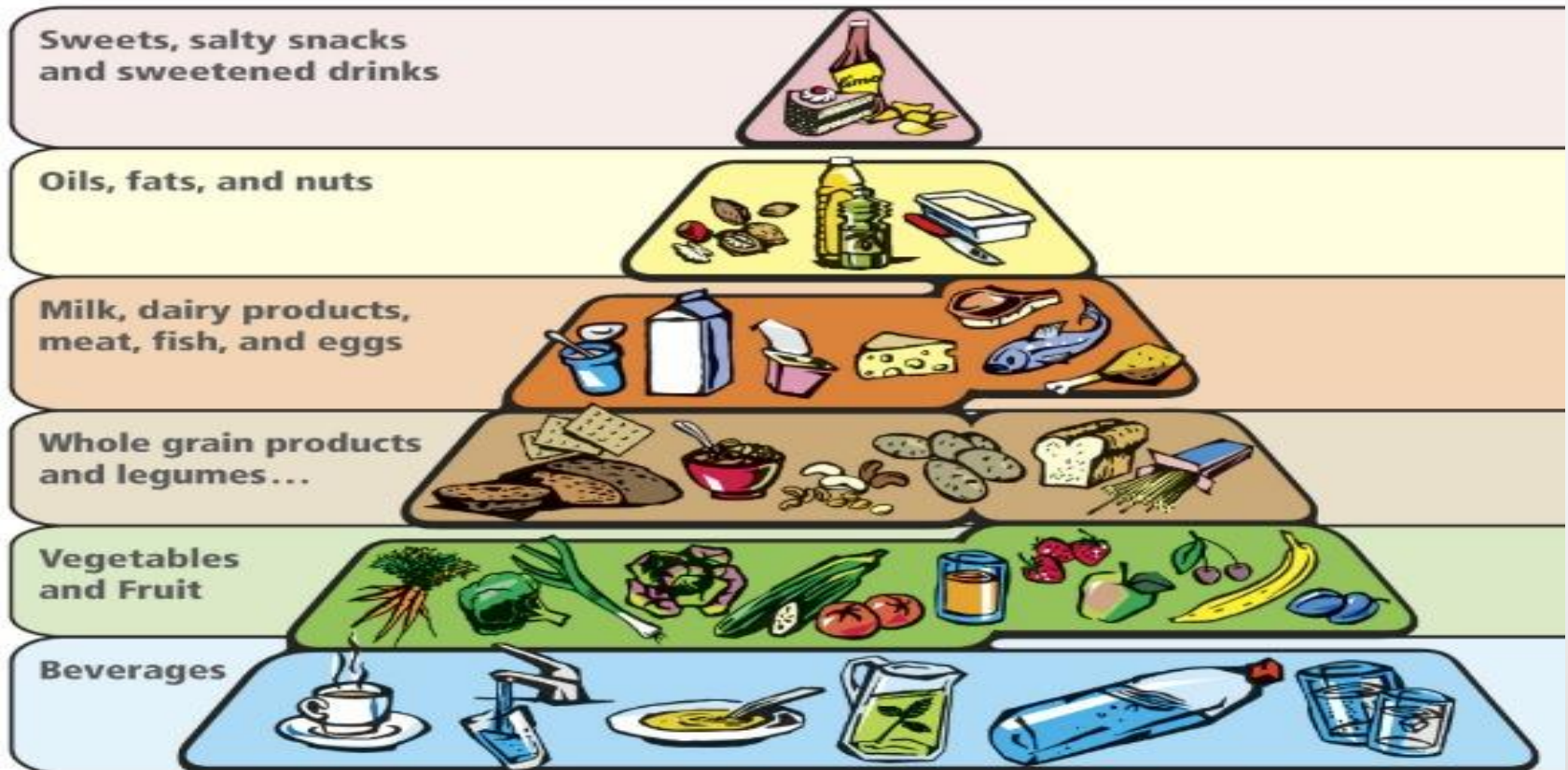
✧ Fluid

✧ Iron-rich foods

Food Pyramid For Athletes

For athletes exercising ≥ 5 hours per week

Based on the Food Pyramid for healthy adults
of the Swiss Society for Nutrition



Athlete Nutrition Guidelines

Easy training – Travel – weight management

ATHLETE'S PLATE

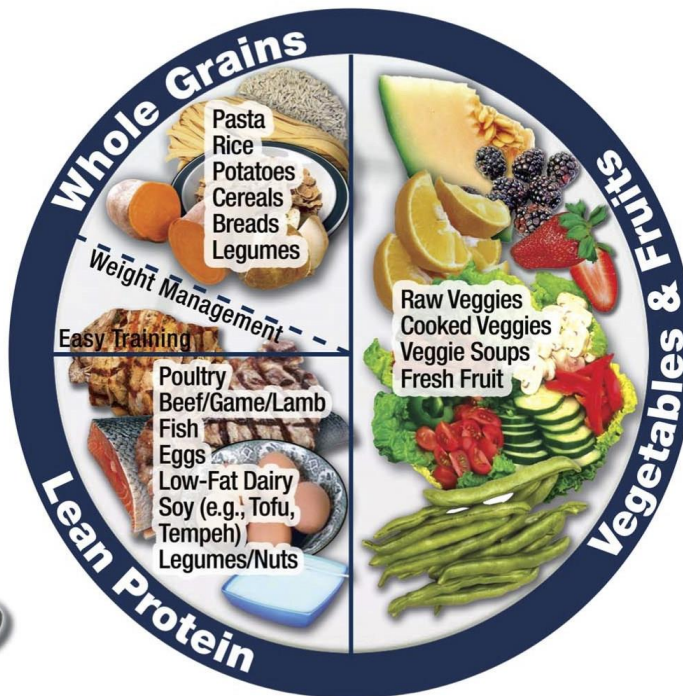
EASY TRAINING / WEIGHT MANAGEMENT:

FATS

1 Teaspoon



Avocado
Oils
Nuts
Seeds
Cheese
Butter



Water
Dairy/Nondairy
Beverages
Diluted Juice
Flavored
Beverages



FLAVORS

Salt/Pepper
Herbs
Spices
Vinegar
Salsa
Mustard
Ketchup



Athlete Nutrition Guidelines

Easy training – Travel – Weight Management – Injury

- An easy workout or tapering does not require additional nutrients and energy (b/c you're not loading up for competition).
- Applies to athletes trying to who are injured or traveling
 - ✧ MORE **VEGETABLES**
 - ✧ LESS **CARBOHYDRATES**
- Applies to athletes in sports requiring less energy/calories due to the nature of the sport
 - ✓ Archery
 - ✓ Bowling
 - ✓ Curling
 - ✓ Diving
 - ✓ Horseback Riding
 - ✓ Shooting

Athlete Guidelines – Easy

Breakfasts (1-2 hrs. before)

Yogurt Parfait

- Plain Greek yogurt
- Mixed berries
- Top w/granola clusters

Veggie Omelet

- 3-4 Eggs
- Spinach
- Low-fat cheese
- Olive oil
- Whole grain toast

Lunches (2-3 hrs. before)

Athlete Salad

- Mixed dark & light greens
- Bright colored veggies
- Dried fruit or fresh fruit
- Chicken breast or salmon
- Kidney beans
- Olive oil & balsamic dressing

Sandwich & Soup

- ½ Turkey sandwich on whole grain bread, lettuce/tomato
- Vegetable-based soup
- Mixed berries

*Timing: 1-3
Hours Before*

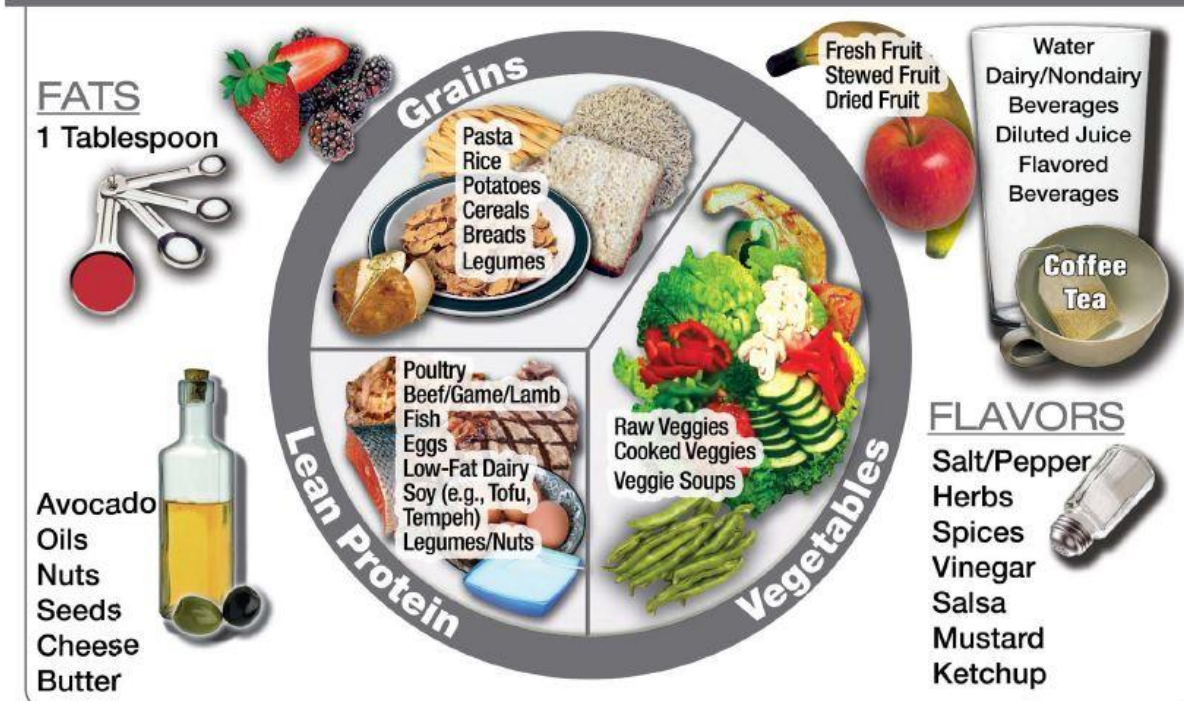
Meal Timing → 1-3 Hours before Exercise

Athlete Nutrition Guidelines

Moderate Training

ATHLETE'S PLATE

MODERATE TRAINING:



The Athlete's Plates are a collaboration between the United States Olympic Committee Sport Dietitians and the University of Colorado (UCCS) Sport Nutrition Graduate Program.

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Athlete Nutrition Guidelines

Moderate Training

- May include two training sessions in one day
 - 1st workout = 3,600 – 6000m swim
 - 2nd workout = 30 min dry land training session
- The moderate day should be the baseline for each athlete
 - Adjust the plate down (make easier) for easy training/weight management
 - Adjust the plate up (make harder) for competition/meet days

Athlete Guidelines – Moderate

Breakfasts (1-2 hrs. before)

Cold cereal

- Whole grain cereal
- Mixed berries or piece of fruit
- 1-2% Milk
- Plain Greek yogurt

Egg & Veggie Scramble

- 3-4 Eggs
- Spinach & tomatoes
- Low-fat cheese
- Olive oil
- Whole grain toast

Lunches (2-3 hrs. before)

Turkey Sandwich

- Whole grain bread w/ deli turkey, mustard, lettuce, & tomato
- Carrots or celery
- Mixed berries
- Granola bar

Healthy Stir-Fry

- Chicken breast
- Broccoli, bell peppers, and snow peas
- Brown rice
- Banana or orange

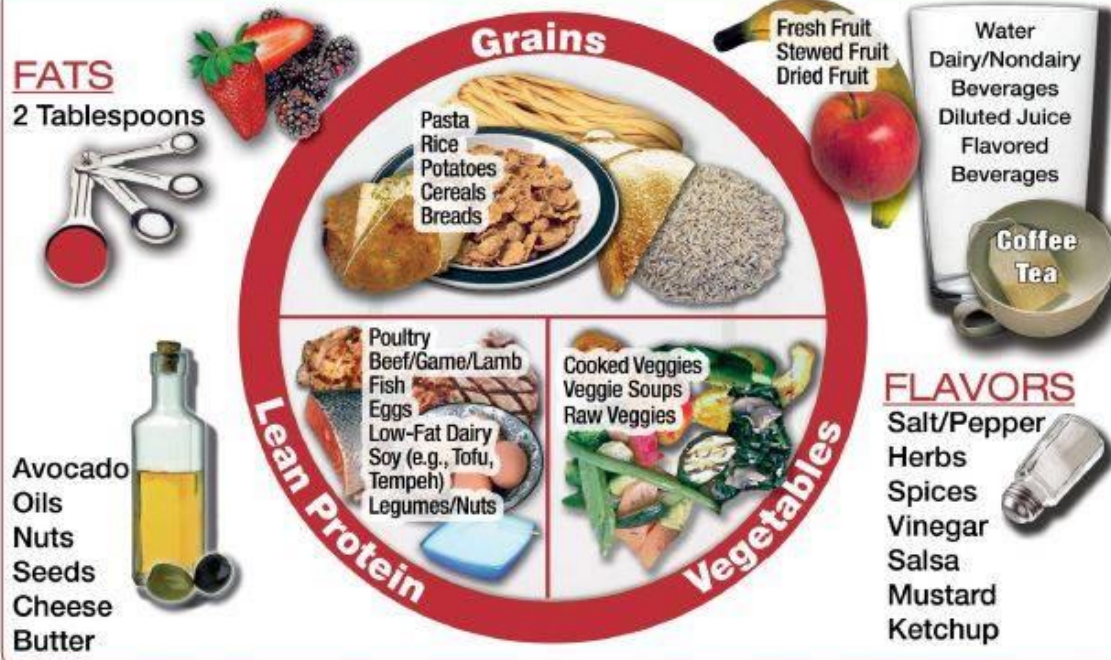
Meal Timing → 1-3 Hours before Exercise

Athlete Nutrition Guidelines

Hard Training – Competition Day

ATHLETE'S PLATE

HARD TRAINING / RACE DAY:



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Athlete Nutrition Guidelines

Hard Training – Competition Day

- Contains at least 2 difficult workout sessions or day of swim meet
- Competition and days with 2 swim workouts requires extra energy from carbohydrate sources
 - MORE carbohydrates
 - LESS vegetables and fruits
- Use this plate as a guideline for loading up on carbohydrates in the days before, throughout, and just after the competition day
 - White grains vs. whole grains – which is best for pre-event meal?
 - **WHITE GRAINS & PASTA**
 - Less fiber, less likelihood of GI upset during the event
 - Rapidly replenishes low muscle glycogen stores
 - Avoid high intake of raw vegetables & salads
 - Fibrous vegetables may cause GI upset
 - Lack high energy content needed for strenuous competitive event

Athlete Guidelines – Hard

Breakfasts (1-2 hrs. before)

Oatmeal & Eggs

- Steel-cut oats cooked in milk
- Apple sauce
- Honey
- Whole grain toast w/ eggs

Healthy Pancakes

- Pancakes made w/ oats
- Top w/bananas & pecans
- Syrup, butter
- Greek yogurt smoothie w/ frozen berries

Lunches (2-3 hrs. before)

Turkey Sandwich

- Whole grain bread, turkey, mustard, lettuce/tomato
- Vegetable-based soup
- Apple sauce
- Granola bar or pita chips

Pasta Bowl

- White pasta
- Baked or grilled white meat/fish
- Marinara red sauce
- Zucchini & yellow squash sautéed in olive oil

*Timing: 1-3
Hours Before*

Meal Timing → 1-3 Hours before Exercise

Carbohydrates

- Primary fuel source for high-volume swim training
 - Best fuel source of immediate fuel for swimmers
- 60 % of daily calories!
- Carbohydrate Functions:
 - Maintains blood glucose levels during training
 - Replaces glycogen stores in muscle and liver
 - Important for brain activity (ex: intrinsic motivation and focus during training and events)

Carbohydrates

- Carbohydrate needs for Swimming
 - Elite, in-season: **7 – 9 g/kg**
 - Elite, off-season: **4 – 6 g/kg**
- Inadequate carbs = ↑risk of injury & fatigue and ↓performance
 - i.e. “Hitting the Wall” or “Bonking”
- Focus on **COMPLEX CARBS** & limit **SIMPLE CARBS** on moderate/easy training days

SLOW ENERGY	FAST ENERGY
Complex Carbs	Simple Carbs
Whole grain bread, pasta and cereal, brown rice, quinoa, legumes/beans, sweet potato, honey, fruits and vegetables	White bread, candy, chocolate bars, soft drinks, energy drinks, syrup, sweetened tea

Carbohydrates

- Before Exercise

- 1 Hour Before

- 0.5g per kg of body weight
 - Ex: 150 lb. athlete needs 75g of carbs

- 4 Hours Before

- 1.8 g per kg of body weight
 - Ex: 150 lb. athlete needs 123g of carbs

- During Exercise

- Less than 45 min - 1 Hour

- Water only

- 1 Hour or More

- 30 – 60g of carbs every hour
 - 16 oz. Gatorade = 34g carbs

- After Exercise

- Within 30 Minutes

- Snack should be **4:1**

- CARBOHYDRATES TO PROTEIN** ratio

- Ex: 150 lb. athlete should eat 75g carbs and 15-20g protein

- 1 – 2 Hours After Exercise

- 1 – 1.5g per kg of body weight
 - Ex: 150 lb. athlete needs 75g – 105g carbohydrates for recovery

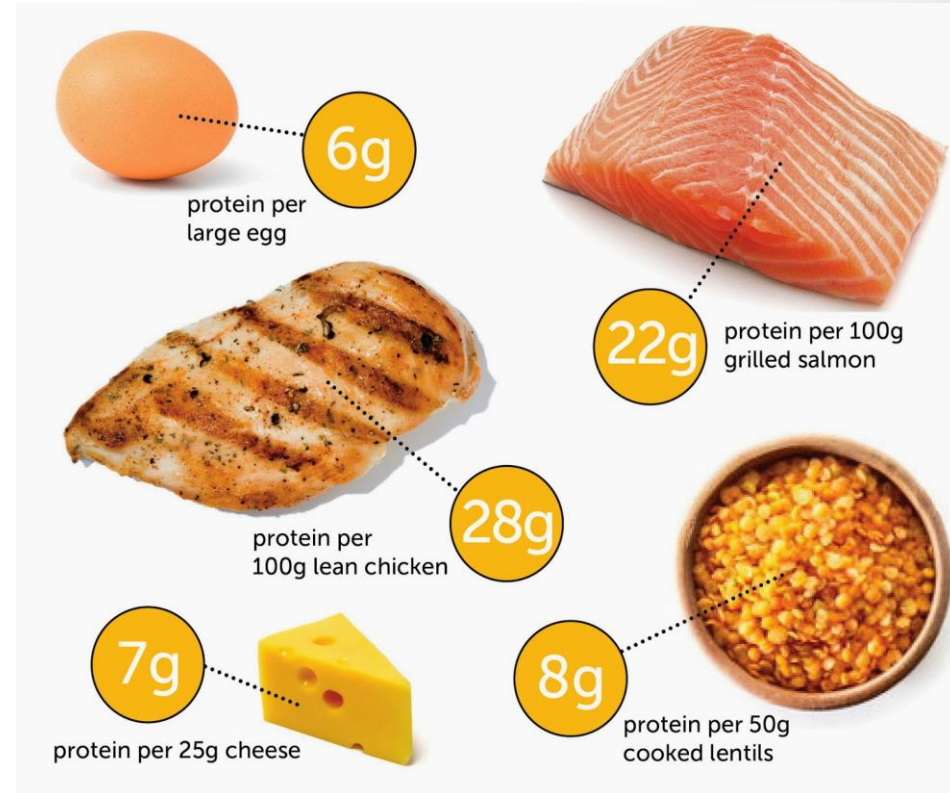
Protein Intake & Females

Common Misconceptions

- ✓ *I'll gain weight*
- ✓ *It will make me too bulky to swim*
- ✓ *I don't want to look like a guy*
- ✓ *Swimmers need carbs, not protein*

Protein

- Essential and non-essential amino acids
- 15 – 20% of daily kcal
- Protein functions:
 - Builds & repairs damaged muscle
 - Supports immune function
 - Forms enzymes and hormones
- Sources of Protein
 - Lean Meat
 - Fish
 - Greek yogurt
 - Tofu
 - Cottage Cheese
 - Eggs
 - Quinoa
 - Edamame



Protein

- Protein Needs Vary by Sport

- Endurance Athletes: 1.2 – 1.4 g/kg
- Strength Athletes: 1.7 – 2.0 g/kg
- Swimmers (recreational): 1.0 – 1.4 g/kg
- Swimmers (elite): 1.3 – 1.7 g/kg
 - 20 – 30g every 4 hours

- Protein Needs for Swimming

- Moderate protein intake is recommended
 - Due to high volume of exercise in both short and long distances
 - Increased strength and lean body mass = difference between competition winners and non-finalists
- Post-Exercise
 - Eat a CHO/PRO snacks ****immediately**** after exercise (within 30 min)
 - 15 – 25g protein & 50 – 70g carb
 - Carbohydrates help to absorb more protein
- Adequate Protein Intake
 - ↑performance & ↓injury risk

Fats For Fuel

- **20%** of daily calories
- Limit intake of processed foods & trans fats
- 3 Types of Fat
 - **Saturated:** red meat, cheese, lard, butter, coconut oil
 - **Monounsaturated:** olives, nuts, seeds, avocados, peanut oil, canola oil
 - **Polyunsaturated:** walnuts, salmon, tuna, trout, sunflower oil, sesame oil, flaxseed
- Fat Functions:
 - Provides energy during exercise
 - Provides fat soluble vitamins (A,D,E,K)
 - Provides essential fatty acids → vital for healthy nerves and wound healing

Iron

- An essential nutrient that **MUST** be consumed through the diet
- Includes Heme and Non-Heme
- Iron Functions:
 - ✓ *Deliver oxygen to working muscles*
 - ✓ Energy production
 - ✓ Immune system maintenance
- Low Iron (iron deficiency or iron anemia) can lead to:
 - ✓ Fatigue
 - ✓ Decreased immunity
 - ✓ Decreased performance

Increase Your Iron

- Eat more iron-rich meals
 - ✓ **Heme Iron** = sirloin steak, lean ground beef, skinless chicken breast/thighs, chicken breast, fish, seafood, pork tenderloin, pork chops
 - ✓ **Non-heme Iron** = iron-fortified cereals, enriched rice, eggs, tofu, pumpkin seeds, spinach, beans
- Enhance your absorption of iron
 - ✓ Combine and eat heme and non-heme sources together
 - ✓ Pair iron-rich foods with foods high in Vitamin C (oranges, grapefruit, citrus, peppers, tomatoes)
- Avoid foods that block iron absorption
 - ✓ ☒ coffee or tea during meals containing high-iron foods
 - ✓ Limit intake of dairy and leafy green veggies with high-iron foods (eat them 30 min before or after)
- Cooking in a cast iron skillet will increase the iron in foods
- Consider iron supplementation ONLY under the supervision of your physician!

What About Hydration?

- Water is the most important nutrient!
- Hydration Functions
 - Maintains blood volume
 - Temperature regulation
 - Regulates cardiac output
 - Regulates heart rate/stroke volume
- Athlete Sweat Rates
 - Average athlete sweat rate: **1 – 4 POUNDS PER HOUR**
 - Factors: environmental conditions (altitude, water temperature, humidity/heat outside of pool), body size, exercise intensity & genetics

Fluid Replacement

- Athletes only replace 30-70% of their sweat losses post-exercise – why?

1. **FORGET TO DRINK**

- ✓ too focused on training/competing

2. **ANTICIPATED STOMACH ACHE/DISCOMFORT**

- ✓ ex: sloshing feeling

3. **PALATABILITY OF THE DRINK**

- ✓ temperature, flavor, viscosity

Know Your Sweat Rate

- How to calculate your individualized sweat rate:
 - ① Measure weight prior to workout and again immediately following exercise
 - Pre-exercise nude weight = 150 pounds
 - Post-exercise nude weight = 147 pounds
 - ② Subtract weight lost during your workout & convert to fluid ounces
 - 3 pounds lost during workout
 - 1 pound = 16 fluid ounces
 - So, 3 pounds = 48 fluid ounces
 - ③ Multiply this amount by 1.5 to determine the amount of fluid needed to replace 150% of fluid lost
 - 48 fluid ounces x 1.5 = 72 fluid ounces
- Consume within **24 HOURS** of exercise or before **NEXT TRAINING SESSION.**

Strategies to Avoid Dehydration

- Start drinking water as soon as you wake up
 - 8-16 oz. with breakfast
- Carry a water bottle with you throughout the day
- Have a bottle easily accessible on the deck and sip between sets
 - ½ - 1 cup fluids every 15-20 minutes of training
- Rely on sports drinks during high-intensity practices
 - Gatorade, Powerade, BodyArmor, etc.
 - Implement after first 45 minutes of training
- Replace electrolytes lost through sweat by salting your food
- Monitor your urine color and volume
 - Pale lemonade = hydrated

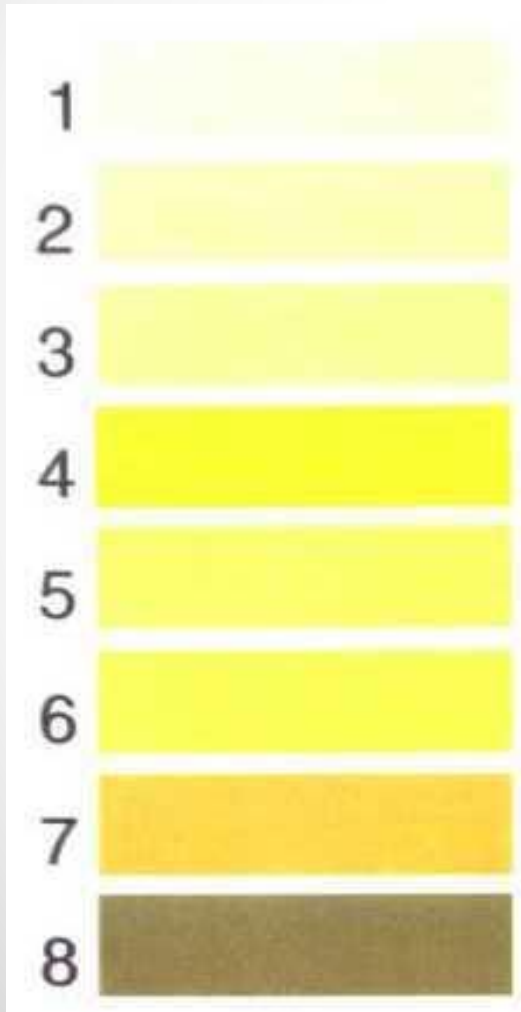
Strategies to Avoid Dehydration

- **Before Training**
 - Within 2 Hours
 - 2 – 4 cups of fluid
 - Less Than 1 Hour
 - 1 – 2 ½ cups of water
- **During Training**
 - *Main goal: replace fluid losses & provide carbohydrates*
 - Every 15 – 20 Minutes
 - ½ - 1 cup of fluid
 - More than 1 Hour
 - ½ - 1 cup of fluid every 15-20 min.
 - Sports drink with water to replenish glycogen stores & electrolytes
- **After Training**
 - Immediately After
 - **3 CUPS OF FLUID** for every lb. of sweat loss
 - Sports drink & water = best recovery!
 - Replace 150% of sweat lost during exercise

Signs of Dehydration

- ✓ Headache
- ✓ Dizziness
- ✓ Flushed skin
- ✓ Nausea
- ✓ Muscle cramps
- ✓ Decreased performance
- ✓ Vomiting
- ✓ Low urine output
 - ✓ Dark urine
- ✓ Dry/sticky mouth
- ✓ Sunken eyes
- ✓ Coma

The Urine Color Chart



- 1 – 3

- Well Hydrated / Target Hydration Status
- Keep drinking fluids at your current rate

- 4 – 6

- Moderately Dehydrated
- Need to drink more fluids or risk ↓ performance

- 7 – 8

- Severe Dehydration
- May indicate blood in urine or kidney disease
- Seek medical attention immediately!

Competition Day Fueling Tips

Time Before Exercise	Type of Fuel	Example
<u>3 – 4</u> hours	Moderate-size meal & liquids	White pasta with meat sauce, vegetables, whole grain roll, water, sports drink
<u>1 – 3</u> hours	Small meal or snacks & liquids	Water and/or sports drink, energy gels or bar, fruit, sandwich or cereal with low-fat milk
<u>30 – 60</u> min	Easily digested snacks & liquids	Water and/or sports drink, energy gels, fruit, sports beans
<u>≤ 30</u> min	Liquids only	Water and/or sports drink

Competition Day Fueling Tips

Time After Exercise	Type of Fuel	Example
Within 30 Minutes	Liquid calories * carbs, fluid & electrolytes *	Low-fat chocolate milk, plain Greek yogurt with mixed berries, Gatorade and graham crackers w/PB
2 Hours (& every 2 hours for 6 hours total)	Moderate-size dinner & fluid	Grilled chicken breast or salmon fillet, brown rice or quinoa, sautéed mixed veggies, low-fat milk, water
Bedtime Snack (Within 30 min of bed)	Small protein snack & fluid	Water and low-fat chocolate milk, plain Greek yogurt, low-fat cottage cheese, low-fat string cheese
Breakfast	Moderate meal & fluid	3-4 egg scramble with spinach, bell peppers, & low-fat cheese, whole grain toast w/butter, mixed berries, low-fat milk, water

Building Your Meal Timing Guide

Protein

Animal-Based

High-quality lean meats & low-fat dairy

- Chicken Turkey
- Red meat Low-fat milk (1-2%, soy, almond)
- Eggs Cottage cheese
- Fish String cheese
- Beef jerky Greek yogurt
- Whey

Plant-Based (contain all EAAs)

- Quinoa Soy/Tofu
- Amaranth Buckwheat

Plant-Based (low in 1 or more EAAs)

- Legumes Grains
- Nuts Nut butters (PB, almond)
- Seeds Protein powder (soy, rice)

Beverage

Short Duration Activity (<45-60 min)

- Water

Long Duration Activity (>60 min)

- Water
- Sports Drinks (6-8% carbohydrates)
 - Every hour after first 60 minutes of exercise

Post-Exercise

- Water
- Sports Drinks
 - Every hour after first 60 minutes of exercise
- Chocolate Milk
- Electrolyte-rich watery foods
 - Low-fat soups
 - Vegetable juice
 - Fruits
 - Vegetables

Building Your Meal Timing Guide

Vegetable & Fruit

Iron

- o Broccoli
- o Dried fruit
- o Spinach
- o Sweet corn

Vitamin C

- o Orange
- o Sprouts
- o Kiwi
- o Citrus fruits
- o Bell pepper
- o Broccoli
- o Strawberries
- o Raspberries

Calcium & Vitamin D

- o Dark, leafy greens
- o Bok Choy
- o Fruit juices
- o Mushrooms
- o Okra
- o Broccoli
- o Kale

Vitamin A

- o Carrots
- o Mango
- o Spinach
- o Pumpkin
- o Apricots
- o Broccoli

B Vitamins

- o Plums
- o Peach
- o Sweet corn
- o Green peas
- o Cauliflower
- o Nectarines
- o Mushrooms
- o Brussels sprouts

Carb & Grains

High Quality Whole Grains

- o Steel cut oats
- o Quinoa
- o Brown rice
- o Granola bars
- o Millet
- o Fruits
- o Low-fat milk
- o Sweet potato
- o Whole wheat pasta
- o Whole wheat bread
- o Whole wheat bagels
- o Whole grain cereals
- o Whole grain crackers
- o Dried fruit
- o Greek yogurt

Avoid Refined Carbohydrates

- o Pastries
- o White flour
- o Cookies
- o Sweet tea
- o Candy
- o Soft drinks
- o Energy drinks
- o Coffee drinks

Plant-Based (low in 1 or more EAAs)

- o Legumes
- o Nuts
- o Seeds
- o Grains
- o Nut butters (PB, almond)
- o Protein powder (soy, rice)

Dietary Supplements

- Energy Bars & Gels

- Between events (if tolerable) w/8 oz. water or after the first hour of swim practice
- Easily digestible carbs for high volume training involved in swimming

- Sports Drinks

- Provides **ELECTROLYTES** plus **30g** carbs for energy
- Sip throughout training/games to replenish glycogen stores

- Caffeine

- Stimulates the central nervous system
- Dosage: 300-500mg 2 hours before exercise
- Side Effects: ↑HR, anxiety, nervousness, insomnia, gastrointestinal discomfort

- Protein Powders

- Assists in building lean muscle mass
- Promotes muscle recovery from strenuous exercise
- 1 serving = 25g protein
- Choose a whey blend powder
 - whey concentrate, whey isolate & hydrolyzed whey

So, How Long Before Seeing A Difference In Performance?

- **Training:** weeks /months
- **Diet:** **WEEKS/MONTHS**
- **Supplements:** hours /days /weeks /months
- Change does not happen over night.
- Give your body time to adjust to any lifestyle changes you make.

* Final Tips For Staying Fueled *

- **Eat breakfast!**
 - Skipping breakfast → greater body fat % & total fat mass
 - **Meal Timing**
 - Pre-, during, between, and post-event
 - **Macronutrients Are Key**
 - Protein: 1.4 – 1.7 g/kg/body wt.
 - Fat: 20% of daily kcal
 - Carbs: 7-9 g/kg/body wt.
 - **Get Your Zzzzzzzzzzzzzzz's**
 - **Don't Neglect Micronutrients**
 - Eat a variety of fruits and vegetables
 - **Drink Milk**
 - Vitamin D, Calcium, Iron – most important for swimmers to maintain skeletal health & support growth
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