Performance Supplements
What You Should Know vs What You Hear From Your Bro

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This supplement will make you- Bigger, Leaner, Faster and Stronger- Or will it?

Nutritional supplements are a multi-million dollar industry. Chances are you, or someone you know, is taking one or more supplements to get that competitive edge.

This article will help you sift through some of the evidence of "What You Should Know vs What You hear From Your Bro" when it comes to making and informed choice about what (if any) supplements you should be taking and why.

Learning Objectives/Goals

- Understand why to focus on the 95% - Diet, training and lifestyle factors
- Be able to apply a practical nutrition pyramid for weight loss, weight gain, wellness and performance enhancement
- Understand why to focus on the macros and micros (Just Eat Real Food- JERF)
- Understand nutritional periodization
- Understand what adaptation(s) are you looking to augment with supplementation
- Be able to confidently recommend some evidence-based ergogenic supplements and their appropriate dosing

Why to focus on the 95% - Diet, training and lifestyle factors?

You may have heard the phrase "you can't out exercise a bad diet". Ultimately, you can't out exercise or out supplement a bad lifestyle, which includes: **S**leep, **P**sychological Stress, **E**nvironmental factors, **E**xercise and **D**iet. What I refer to as "SPEED".

Sleep

Exercising reaction times, vigour, fatigue and depression have been shown to be adversely affected by sleep deprivation.
(Scott, J. P. et al. 2006)

How much sleep do athletes need?
In a study by Mah, C. D., et al.,10 hours of sleep was shown to be beneficial in reaching peak athletic performance.

According to the National Sleep Foundation, sleep is an essential part of recovery and can play a role in hormone regulation, such as cortisol, as well as having effects on glycogen production.

Optimum sleep is part of what determines how quickly one can rebuild muscle and replenish nutrients. Optimum sleep also helps to maintain endurance, speed, and accuracy.

The National Sleep Foundation recommendations based on age: https://sleepfoundation.org/how-sleep-works/how-much-sleep-do-we-really-need

The above recommendations should be the minimum. Athletes should probably aim for 8-10 hours and gauge this based on their training, mood and performance.

Psychological Stress

Stress is a reaction by the body and brain to meet the demands of some challenge or threat.

Stress hormones such as cortisol cross the blood-brain barrier, and if out of balance, can impair cognitive processes such as attention, memory and decision-making.

Stress can also result in physical symptoms such as increased muscle tension, which in turn can adversely affect motor functions.

Stress can interfere with both sleep quality and quantity. The combination of muscle tension and poor sleep hygiene can lead to fatigue.

Stress also affects immune functioning, increasing one's susceptibility to illnesses from viruses and bacteria. It can also have a negative effect on tissue repair.

(Sapolsky, R. M. 1994)

There are a number of stress modification techniques, such as meditation and Guided Imagery.

Repeated practice of meditation techniques has been shown to reverse the effects of chronic stress on health. In addition, mental practice is an effective means of enhancing performance

(Driskell, J. E. et al. 1994).(MacLean, C. R. et al. 1997)

Environmental Factors

Endocrine disruptors are chemicals known to interfere with development and reproduction. In addition, they may cause serious neurological and immune system effects.

These disruptions occur because these chemicals mimic hormones in your body, including the female sex hormone estrogen, the male sex hormone

androgen, and thyroid hormones.

Endocrine-disrupting chemicals may block hormonal signals in your body or interfere with the way the hormones or receptors are made or controlled.

Common sources include:

1. Personal care products
2. Drinking water
3. Canned foods
4. Conventional produce
5. CAFO (Conventional Animal Feed Operations) meat, poultry and dairy
6. High mercury fish
7. Kitchen products, e.g. cookware
8. Cleaning products
9. Office products
10. Cash register receipts

http://www.niehs.nih.gov/health/topics/agents/endocrine/

The Environmental Working Group is a great resource to help address this global issue http://www.ewg.org/

Exercise

A sound exercise/training program is essential when it comes to performance. The NASM OPT model is an evidence-based way to maximize desired adaptations in a safe and progressive manner.

Some key points to consider when designing an exercise program include:
•Dose
•Acute Variables (e.g. sets, reps, rest)
•Exercise type
•Stable baseline before progression
•Addressing impairments and limitations
•Optimal loading
•Program progression
•Periodization

(Clark, M. A., et al. 2008)

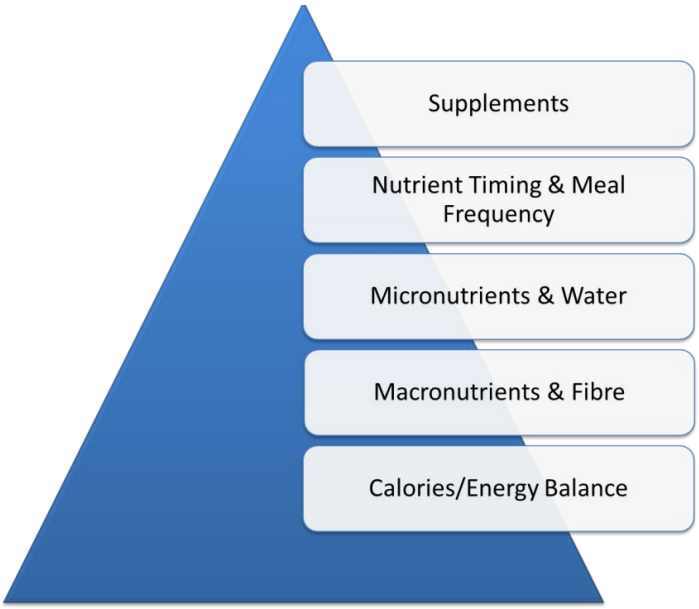
Diet
When it comes to diet, some key considerations for optimal health, performance and recovery include:
•Appropriate selection of foods and fluids
•Balancing energy intake
•Focusing on macro, micro and phyto nutrients
•Timing of intake

In general, focus on vegetables, fruits, nuts and seeds, legumes, eggs, whole grains and free-range/pasture raised animals. In addition avoid refined carbohydrates and proinflammatory fats (Refined seed oils and trans fats) and opt for choosing local, seasonal, sustainable and organic foods.

(Galland, L. 2010) (Simopoulos, A. P. 2008)

More on the macros and micros will be discussed later in this article.

Answer to weight loss, weight gain, wellness and performance enhancement found in pyramid



http://muscleandstrengthpyramids.com/wp-content/uploads/2015/12/The-Muscle-Strength-Nutrition-Pyramid-Sample-Chapter-v1.0.pdf

Eric Helms, a natural bodybuilder and PhD candidate, describes a pyramid approach in his book The Muscle Strength Nutrition Pyramid.

This approach prioritizes nutrition as follows:

1. Calories/Energy balance
2. Macronutrients and Fiber
3. Micronutrients and Water
4. Nutrient Timing and Meal Frequency
5. Supplements

Calories/Energy balance
Total Energy Expenditure and Metabolism is made up of:

- Resting Metabolic Rate (RMR) 60%
- Activity Energy Expenditure (AEE) 30%
- Thermic Effect of Food (TEF) 10%

There are a number of online calculators that can help estimate RMR and AEE. These can be useful for weight gain and weight loss applications. The TEF is highest for protein and fiber, so when the desired adaptation is weight loss, aside from a calorie deficit, focussing on protein and fiber will be useful dietary strategies.

Energy balance is also essential for performance sports or training where weight loss or weight gain is not the goal, but energy to perform the activity is. In these cases, sufficient calories to fuel an activity is important.

One guideline is the acronym HEC:
Hunger/Energy & Emotions/Cravings

If your "HEC" is in check, you are probably energy primed for performance.

Macronutrients

Macronutrients are types of food (Carbohydrates, proteins and fats) required in large amounts in the human diet.

Carbohydrates

Carbohydrates consist of Sugars, Starches and Fibers.
They can also be classified based on how they can influence blood sugar:

- High Glycemic Index/ Load- rapidly increase blood glucose
- Low Glycemic Index/Load- slow increase in blood glucose

Performance Considerations- Train Low for adaptations
When carbohydrate availability is low, AMPK, a metabolic sensor, stimulates the production of PGC-1α, a transcriptional co-activator that regulates gene expression and energy metabolism. This results in increased mitochondrial enzyme activities, increased lipid oxidation, lactate removal and improved exercise capacity/performance.

(Liang, H., & Ward, W. F. 2006) (Knuiman, P. et al. 2015)

Compete High for Optimal Performance
When it comes to game day, carbohydrates are important for:
•Attenuation of central fatigue
•Maintenance of CHO oxidation rates
•Muscle glycogen sparing
•Reducing exercise-induced strain
•Maintenance of excitation-contraction coupling
•Glycogen availability to meet the needs of sprinting or higher intensity

Guidelines
DOSE: Match fuel needs of training and glycogen restoration

- Low Intensity/Skill based- 3-5g/kg BM
- Moderate Intensity- 5-7 g/kg BW
- Moderate-High Intensity (Endurance Program)- 6-10 g/Kg BM

- Extreme- 8-12g/kg BM

• Carb load the day before and maintain during the event
• Ingest 3-6 hours prior to exercise
• Pre-Exercise: Low GI pre-exercise meal resulted in a higher rate of fat oxidation during exercise than did a high GI meal
• Relative shift in substrate utilization from CHO to fat when a low GI meal is ingested before exercise compared with that for a high GI meal
(Research shows here is no difference in endurance running capacity when focusing on lower GI carbohydrates and that this probably promotes metabolic flexibility of energy substrate utilization)

Ingestion of bananas before and during prolonged and intensive exercise is an effective strategy and comparable to ingesting a 6% carbohydrate drink, both in terms of fuel substrate utilization and cost, for supporting performance.

Sources: vegetables, fruits, grains and dairy

(Burke, Louise M. et al. 2001) (Karelis, A. D. et al. 2010)
(Smith-Ryan, A., & Antonio, J. 2013) (Nieman, D. C., et al. 2012)
(Stevenson, E. J. et al. 2006)

Proteins

Proteins are large macromolecules of one or more long chains of amino acid residues.

Proteins functions:
- Catalyzing metabolic reactions
- DNA replication
- Transporting molecules
- Muscle Protein Synthesis (MPS)- Leucine "triggers" mTOR, which in turn promotes MPS. Some studies show that Leucine + Carbohydrates augment this adaptation

Protein and Performance (Hypertrophy/Strength/Power)
•Leucine is the key BCAA to stimulate muscle protein synthesis
•Dose: 2-3 g/kg BW (25-35g of high quality whey protein)
•Food sources: beef, poultry, pork, lamb, fish, eggs, dairy
•In general, plant based protein diets can impair training adaptations relative to meat and dairy diets

•Whey: fast-digesting (consume protein close to training session)
•Casein: slow-digesting (take before bed)

(Dreyer, H. C., Drummond, et al. 2008) (Norton, L. E., & Layman, D. K. 2006) (Smith-Ryan, A., & Antonio, J. 2013)

Fats

Fats and oils are categorized according to the number and bonding of the carbon atoms in the aliphatic chain.
Saturated fats - no double bonds
Unsaturated fats - one or more double bonds

Functions:

- Energy source and energy storage
- Hormone production
- Inflammation

Sources:
Monounsaturated- Avocado, olive oil, macadamia nuts
Omega 6- Seed and vegetable oils, e.g. canola, corn, peanut, sunflower, safflower

Omega 3 Considerations
The SAD (Standard American Diet) is notoriously pro-inflammatory, with the Omega 6:Omega 3 greater than 4:1 (closer to 18:1).

Saturated- Animal products and coconut

Athletes should focus on a diet consisting of: Dark green leafy vegetables, flax/hemp seeds, walnuts cold water fish, grass-fed beef, omega-3 eggs; and limit omega-6 (vegetable and seed oils). Saturated fat should come from grass fed, pasture raised animals.

(Simopoulos, A. P. 2008)

Fish Oil Applications In Athletes
(EPA/DHA)

Controlled Inflammatory Response • Pain • Tissue Remodeling • Repair and Recovery	**Multi-Organ System Support** • Cardio/Vasoprotective • Brain-Mood Support • Neuroprotective • MSK/Orthopedic
Anti-Catabolic • Proteolytic Modulation **Anabolic** • Maintain mTOR pathway	**Metabolic Wellness** • Insulin sensitivity • Body composition

(Smith-Ryan, A., & Antonio, J. 2013)

Fish Oil Supplementation- What you should consider

•Fresh (low levels of peroxidation)
•Molecularly distilled and pure (low levels of heavy metals and contaminants)
•Third-party tested
•Triglyceride vs ethyl esterified molecular form

DOSE: AHA recommends 1g/day for general health. To reduce soreness: 6g dose, spread over the course of a day

Micronutrients & Phytonutients

Micronutrients, as opposed to macronutrients (carbohydrates, proteins and fat), are comprised of vitamins and minerals which are required in small quantities to ensure normal metabolism, growth and physical well-being.

When it comes to micronutrients I say JERF- Just Eat Real Food.

If you're diet is 50-75% plant based and includes healthy fats and adequate protein, you are likely to get the vitamins, minerals and phytonutrients you need without supplementation.

Eating a rainbow of foods (colorful vegetables and fruits) also helps with anti inflammatory phytonutrients, which are rich in antioxidants to help naturally speed up the repair process.

Phytonutrients

Phytonutrients, also called phytochemicals, are chemicals produced by plants. Phytonutrients can provide significant health benefits for humans who eat plant foods. Phytonutrient-rich foods include colorful fruits and vegetables, legumes, nuts, tea, cocoa, whole grains and many spices.

As with other micronutrients, JERF.

Some of my favorite phytonutrients with ergogenic properties

Green Tea

Polyphenols known as catechins (EGCG) are abundant in green tea. Green Tea Extract (GTE) has been shown to enhance endurance by increased metabolic capacity and utilization of fatty acid as a source of energy in skeletal muscle during exercise.

(Murase, T., et a. 2006)

Human studies suggest that green tea may contribute to a reduction in the risk of cardiovascular disease and some forms of cancer, as well as to the promotion of oral health and other physiological functions such as anti-hypertensive effect, body weight control, antibacterial and antivirasic activity, solar ultraviolet protection, bone mineral density increase, anti-fibrotic properties, and neuroprotective power.

(Cabrera, C. et al 2006)

Cocoa (Cacao)

Cocoa consumption could be useful in maintaining a good physical fitness, due to the favourable effects on muscle and redox status in athletes during exhaustive exercise.

(González-Garrido, J. A. et al 2015)

Power smoothie (makes about 2 servings)

- 1 cup Water
- 1 cup Kale or spinach
- ½ cup Frozen organic berries
- 1 Banana
- ½ avocado
- ½ tsp raw cacao

Nutrient Timing and Meal Frequency

Nutrient timing is the application of knowing when to eat and what to eat before, during and after exercise. It is designed to help athletes, recreational competitors, and exercise enthusiasts achieve their most advantageous exercise performance and recovery.

Some sources have looked at nutrient timing as a window of opportunity. In reality, it is more like a garage door.

Nutrient Timing Guidelines (Macronutrient):

• Whey protein dosed at 0.4–0.5 g/kg of LBM pre- and post-exercise
•Maximal acute anabolic effect of 20–40 g
•Pre- and post-exercise meals every 3–4 hours
•Carbohydrate dosage and timing relative to resistance training is a gray area. For maximizing rates of muscle gain meet total daily carbohydrate need instead of specifically timing its constituent doses

(Aragon, A. A., & Schoenfeld, B. J. 2013)

My Take On nutrient timing is that immediately post-exercise there is increased blood flow and nutrient delivery. While MPS is increased for 24 hours post exercise, replacing nutrients as soon as possible is probably more ideal for a number of biochemical and physiological reasons.

Supplements- What adaptation(s) are you looking to augment?

•Lean Body Mass-Strength-Power
•Immune Health
•Hydration
•Cardiovascular Performance Enhancement
•Injury Recovery

Lean Body Mass-Strength-Power

Supplement	**Mechanism**	**Dose**	**Other Considerations**
Creatine monohydrate	Rapid ATP production	0.3 g/Kg Body Weight daily Take pre and/or post exercise Muscle Saturation	Neuro and cardioprotective Food Sources Meat, eggs, fish

		Using a small dose (5g) will take up to thirty days. Using a loading dosage of 15-25g per day will take 5 days Maintenance dosage is (3-5g)	
Beta-hydroxyl-beta-methylbutyrate (HMB)	Anti-Catabolic Active Metabolites of Leucine	1-3 g/day in divided doses Take 30-45 minutes before a workout	20-fold more potent than leucine
Beta-alanine	Buffers Acid increasing performance in the 60–240-sec range. An antioxidant and anti-aging compound	3-6 g Take pre and/or post exercise Loading phase starting with about 6 grams over two or three doses/day for the first six days. Maintenance phase, taking in about 3 grams divided into three doses.	Building block of carnosine Paresthesias reaction can be avoided by time-release formulation or by taking smaller doses (0.8–1 g) several times a day

(Smith-Ryan, A., & Antonio, J. 2013)

Bodybuilding- Making the "cut" Guidelines

• Caloric intake - body weight losses of 0.5% to 1%/wk to maximize muscle retention

• 2.3-3.1 g protein/kg BW of lean body mass per day

• 15-30% of calories from fat

• Remainder of calories from carbohydrate (Low Glycemic)

• Three to six meals per day with a meal containing 0.4-0.5 g protein/kg BW before and after resistance training

(Helms, E. R. et al. 2014)

Immune Health

Probiotics and Performance

The gut microbiota is intimately tied into the digestive system and immune system as well as immune signaling to a variety of organs and systems.

When it come to exercise, GI health helps regulate adaptations to exercise.

Supplementation with probiotics in athletes has been shown to reduce the frequency, severity and duration of respiratory and gastrointestinal illness

Probiotics Sources: Yogurt, kombucha, kefir, fermented foods

For more information on probiotics, visit:

http://blog.nasm.org/fitness/probiotics-can-help-workouts-weight-loss/

(Lopez, R. M. et al. 2015) (Pyne, D. B., et al. 2015)

Vitamin D Consideration and Performance

•May improve athletic performance if deficient

•Peak athletic performance when serum 25(OH)D levels approach 50 ng/mL. Ideal levels may be above 50 ng/mL

•Optimum levels may protect the athlete from several acute and chronic medical conditions

•Should you supplement? Consider your diet, geography, time of year, sun exposure.

For more information on Vitamin D, visit:

http://blog.nasm.org/nutrition/vitamin-d-the-sunshine-vitamin/

(Cannell, J. J., et al. 2009)

Hydration Considerations

•2-3% fluid loss adversely affects performance

•Consider urine color

•Hydrate before, during and after exercise

•Encourage intake before thirst

•After exercise, replenish to sweat losses

•Monitor Pre/Post exercise weight

Both coconut water and bottled water provide similar rehydrating effects as compared to a carbohydrate-electrolyte sport drinks

(Antonio, J. et al. 2009) (Kalman, D. S. et al. 2012)

(Smith-Ryan, A., & Antonio, J. 2013)

Cardiovascular Performance Enhancement

Supplement	**Mechanism**	**Dose**	**Other Considerations**
Dietary Nitrate (Beet Root Juice)	Vasodilation Increased blood flow Decreases 02 cost Increases mitochondrial efficiency	0.5 L/day for six days prior to the event 140 ml (8.4 mmol) containing nitrate, 2-3 h prior to middle distance and endurance exercise Puree or smoothie	Food Sources Beet root Turnips Leafy green vegetables

Sodium Bicarbonate	Acid buffer Resistance to fatigue related to acid-base balance	300-500 mg/Kg bw, 60-180 min prior to anaerobic exercise, 1-3 days.	Bowel tolerance
Caffeine	Adenosine receptor antagonist Influences dopamine, serotonin and adrenalin	3-6 mg/Kg Body weight	Side Effects: Anxiety Restlessness Insomnia Headaches

(Maridakis, V. et al. 2007) (McNaughton, L. R. et al. 2008)

(Smith-Ryan, A., & Antonio, J. 2013)

Coffee

Coffee= Ergogenic aid +

Chlorogenic Acid (Phytochemical) + caffeine= Synergistic Effect

Health Benefits:

•Diabetes mellitus

•Various cancers

•Parkinson's and Alzheimer's

•Oxidative stress

•Cognitive functionality

•NAFLD (Non-Alcoholic Fatty Liver Disease)

(Butt, M. S., & Sultan, M. T. 2011)

Injury recovery

Supplement	Mechanism	Dose	Other Considerations
Curcumin	Anti-Inflammatory	500 mg 3x/day	Poor absorption: Needs to be compounded with piperidine or phosphatidy-choline
Ginger	Anti-Inflammatory	1g ginger powder 3x/day	Add to food or take a supplement
Watermelon Juice (L-Citrulline and Lycopene)	Decreases lactic acid Decreases muscle soreness-Anti-inflammatory	500 mL of juice daily. Start 5 days before event and 20 minutes before exercise	Include as part of diet when in season
Tart Cherry Juice	Antioxidant Anti-Inflammatory	12 oz 2x/day for eight consecutive days prior to event	
Chocolate Milk	Glycogen Resynthesis Protein source Rehydration	16 oz	Post-exercise recovery
Collagen Peptides	Supports fibroblast and connective tissue for soft tissue and bone health	2 scoops in 8 oz water or juice twice daily	Choose product that is from grass fed/pasture raised sources
Vitamin C	Connective tissue repair Collagen production Antioxidant	500 mg-1 g daily	Watch bowel tolerance with higher doses

(Black, C. D. et al. 2010) (Connolly, D. A. J. et al. 2006) (Davis, J. M. et al. 2007) (Saunders, M. J. 2011) (Smith-Ryan, A., & Antonio, J. 2013) (Tarazona-Díaz, M. P. 2013)

Supplement Timing Considerations

Consumption of the supplements are usually suggested into 5 specific times:
1. **Pre-exercise** (nitrate, caffeine, sodium bicarbonate, carbohydrate and protein)
2. **During exercise** (carbohydrate)
3. **Post-exercise** (creatine, carbohydrate, protein)
4. **Meal time** (β-alanine, creatine, sodium bicarbonate, nitrate, carbohydrate and protein)
5. **Before sleep** (protein)

The recommended dosing protocol for the supplements nitrate and β-alanine are fixed amounts irrespective of body weight.

Dosing protocol for sodium bicarbonate, caffeine and creatine supplements are related to corrected body weight (mg/kg bw).

Intake duration is suggested for creatine and β-alanine, being effective in chronic daily time < 2 weeks, while caffeine, sodium bicarbonate are effective in acute daily time (1-3 hours). Ingestion of nitrate supplement is required in both chronic daily time < 28 days and acute daily time (2- 2.5 h) prior exercise.

Supplement Timing Summary

B-alanine: 3-6 g along with each meal containing carbohydrate and protein plus a dose of 1.2 g as a maintenance dose following acute β-alanine supplementation.

Nitrate-rich beetroot juice: 140 ml (8.4 mmol) containing nitrate, 2-3 h prior to middle distance and endurance exercise

Sodium Bicarbonate: 300-500 mg/Kg bw, 60-180 min prior to exercise, 1-3 days.

Caffeine: 3-6 mg/(kg bw), 30- 60 min prior to exercise

Creatine monohydrate: Daily intakes of 3-5 g, or for optimal absorption, 20 g divided into 4 daily intakes of 5 g in combination with carbohydrate and protein

Carbohydrate supplementation before exercise is essential to improve exercise performance. It is suggested that 1-4 g/kg carbohydrate is needed 1-4 h before exercise. In addition, carbohydrate mouth rinse can improve exercise performance (~2-3%) mediated by receptors in the oral cavity and the brain, during exercise lasting less than 60 min. When the exercise duration is more than 60 min, the advice is to ingest 90 g/h of mixed carbohydrates (60 g/ h glucose plus 30 g/h fructose). This is important during prolonged endurance events of 3 hours or more, and, 1.2 g/kg/h carbohydrate is required for glycogen repletion immediately post exercise.

Protein should be ingested in each main meal, immediately post exercise, and also before sleeping with an amount of 20-25 g for stimulating muscle protein synthesis.

(Naderi, A. et al. 2016)

Should You Take A Multivitamin/Mineral?

While not an ergogenic aid, a multivitamin/Mineral can help fill in the gaps, and serve a nutritional insurance policy, especially if your diet is not optimum.

When Choosing a Supplement- Is It Evidence Based?

Research Considerations

- Does it apply to my client/sport?
- Causality or correlation?
- Are the results overstated?
- Conflict of interest?
- Research bias/agenda?
- Peer-reviewed journal?
- Who was studied and where?
- Sample size?
- Controlled?
- Acknowledgement of limitations?
- Can the statistical significance be extrapolated to real life circumstances

Supplement Considerations- What Should You Look For In A Supplement?

- Quality Assurance- GMP facility- same standards required by pharmaceutical companies

- Certificate of Analysis (COA) for ingredients. Tested by an independent lab
- NSF certified- NSF.org third-party quality assurance
- Transparent Labeling- all ingredients are listed. Watch out for proprietary formulas
- Opt for capsules. Pill forms need binders or coatings
- Avoid products that contain sucrose, artificial colors or flavors, or hydrogenated oils
- Therapeutic Dose
- Avoid "kitchen sink" supplements
- Clinical studies
- Cost/Value- are you paying for marketing or research
- Standardized Herbal Extracts vs Whole Herbs
- Company reputation

Key Points

- Focus on SPEED: Sleep, Psychological (Stress management), reducing exposure to Environmental toxins and Optimizing Exercise/training and Diet
- Follow a Pyramid prioritization for weight loss, weight gain and performance enhancement: Energy balance, macronutrients, micronutrients, nutrient timing, supplements
- JERF- Just Eat Real (and a Rainbow of) Food
- Periodize nutrition with exercise
- Understand what adaptation(s) are you looking to augment with supplementation
- Recommend evidence-based ergogenic supplements and their appropriate dosing

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Additional Resources

•International Society of Sports Nutrition (ISSN) https://www.sportsnutritionsociety.org/

•Examine.com

•Labdoor- https://labdoor.com/

•Google Scholar

•PubMed

•NASM https://www.nasm.org/

Other Considerations

WADA- World Anti-Doping Agency

Substances considered for the WADA Prohibited List meets any two of the following three criteria:

1. It has the potential to enhance or enhances sport performance
2. It represents an actual or potential health risk to the athlete
3. It violates the spirit of sport

http://www.usada.org/substances/prohibited-list/

Informed Choice

• Quality assurance program for sports nutrition products, suppliers to the sports nutrition industry, and supplement manufacturing facilities

• Certifies supplements and/or ingredients have been tested for banned substances

http://informed-choice.org/