


FUELS OF ENGAGEMENT

Applying Science to the Athlete's Plate Using Effective Strategies to Communicate

PRESENTER
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Disclosures

- California Prune Board
- National Dairy Council
- Potatoes USA
- Klean Athlete
- Bayer




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My Clients

- 2020 SuperBowl champions - Kansas City Chiefs
- Sports Nutrition Provider for the NFL
- Worked with the Pittsburgh Steelers
- Worked with the Pittsburgh Penguins
- Worked with 5 Major League Baseball teams
- Worked with Olympic rowers, swimmers, track and field, figure skaters
- Worked with the Pittsburgh Ballet Theatre



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Your World

- How do you define "active"?
- Who does that include?
- Health and wellness or performance?
- Macros
- Micros
- Microbes
- Phyto
- Hydros



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My Plate in Microbes

Fruits

Ellagic acid
Coffee Fiber
Polyphenols
Vegetables

Vegetables

Inulin/fructans
Soy isoflavones
Glucosinolates
Xanthohumol
Polyphenols
Porphyrans
Lignans
Short Chain Fatty Acids

Grains

Polysaccharides
Oligosaccharides
Starch
Short Chain Fatty Acids

Protein

Phosphatidylcholine
Heterocyclic amines
Nitrosamines
Amino Acids

Dairy

Milk Oligosaccharides
Fermentation products
Probiotics

Buller, R. J. et al. Curr Opin Clin Nutr 2012

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What Do Our Athletes Want/Do

Help over health:

- Help me achieve my goals
- Help my optimize body composition
- Help me extend my playing career
- Help me with underlying health issues

What they do:

- Performance AND appearance driven
- May opt for recommendations without rationale
- If we say no, they go!
- Nutrition info from those that don't know

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Practicality

Food choices/meal guidelines that are:

- Available
- Accessible
- Easy to prep
- Portable
- Cost effective
- Palatable



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New Reality

- Personal hygiene - what does it mean to be clean?
- Supporting a healthy immune system
- Reconfiguring training tables - from the buffet to stay away
- Budget concerns
- How do we put the visual into the virtual?



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Your Charge

Evidence based on the literature **not the listserv**

- #ScienceNotOpinion
- #FactoverFallacy
- #FoodtotheFigure

Provide food guidance, **NOT meal plans!**



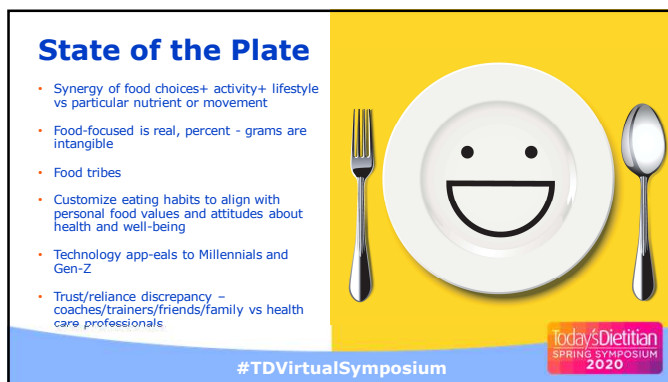
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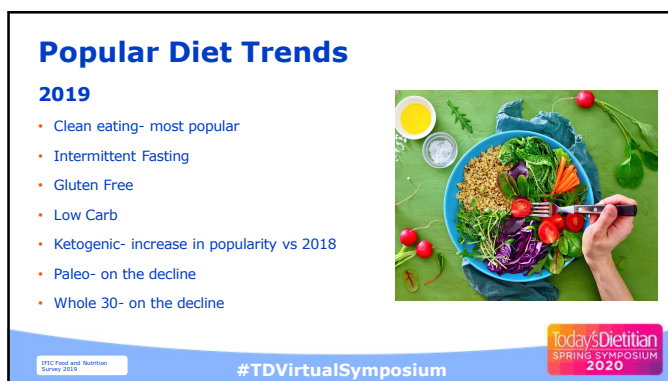
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Unintended Consequences

- Gluten elimination → protein, fiber, prebiotics & micronutrient deficit
- Carbohydrate mouth rinse → inadequate fluid
- Carbohydrate overemphasis → insufficient protein & fat
- Salt restriction ↓ iodine
- Exercising in fasted state → muscle protein breakdown
- Overconsumption of carbohydrate/calories during/post exercise → increased weight

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EVIDENCE BASED RECOMMENDATIONS

Science Over Speculation



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What's Enticing: Macros and Fluid

NUTRIENT	QUANTITY	SOURCES	BENEFITS	STRENGTH OF EVIDENCE
Protein	0.14 g/lb post training 0.14 g/lb across meals	High leucine sources: whey/milk High quality animal and plant protein sources	Muscle protein synthesis Muscle repair and remodeling	Good
Carbohydrate	.45-.54 g/lb within 1 hr post training 2.2-3.18 g/lb/d over the day	Fruit, cereal, sports drinks, bread Produce, grains, dairy foods	Replenish liver and muscle glycogen Support immune function	Good
~3 PUFA	~3 g/d EPA/DHA	Fatty fish, krill, supplement	↓ Inflammation Support immune function Support muscle repair/remodeling if protein intake is inadequate	Fair
Fluid	15-22 oz/lb body mass lost	Water, sports drink, milk, juice	Fluid balance and plasma volume restoration	Good

Presented by: Dr. Steven Heist

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Daily Carbohydrate Needs for Fuel and Recovery

TYPE OF ACTIVITY	SITUATION	CHO RECOMMENDATIONS
Light	Low intensity/skill-based	1.36-2.27 g/lb/d
Moderate	1 h/d	2.27-3.18 g/lb/d
High	Endurance-1-3 h/d Moderate-high intensity	2.7-4.54 g/lb/d
Very high	>4-5 h/d, Moderate-high intensity	3.6-5.45 g/lb/d

Burke et al., J Sports Sci 2011, 29(suppl):S17-S27

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Acute Carbohydrate Fueling Strategies

TYPE OF ACTIVITY	SITUATION	CHO REQUIREMENTS
General fueling for sport	Prep for events < 90 min	3.18-5.45 g/lb/24 h
CHO loading	For > 90 min of sustained, intermittent exercise	36-48 h or 4.54-5.45 g/lb
Speedy refueling	< 8 h recovery between 2 - a-day training sessions	45-54 g/lb/h for first 4 hrs
Pre-event fueling	Before ex > 60 min	45-1.8 g/lb 1-4 g pre exercise
During brief exercise	< 45 min	Not needed
During sustained HIT	45-75 min	Small amts (mouth rinse)
During endurance & stop and go sports	>1-2.5 h	30-60 g/h
During ultra-endurance exercise	> 2.5-3 h	Up to 90 g/h

Burke et al., J Sports Sci 2011, 29(suppl):S17-S27

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PLANT-BASED

Benefits and Concerns in Athletes

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What Do Plant-Based Meals Offer For Your Athletes?

- Affordability
- Shelf stability
- Versatility
- Palatability
- Availability
- Minimal waste




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State of The Plate

- Only 1 in 10 Americans consume enough produce on a daily basis
- Not all plant-based athletes have optimal eating plans
- Fruit and vegetable intake may be suboptimal and intake of iron, zinc, calcium, and vitamins A and C may be of concern for athletes
- Shortfall nutrients can deleteriously impact:
 - Physiology
 - Physique
 - Performance



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Concerns For Your Plant-Based Athletes

- ↓ Immune function
 - Micronutrients
 - Carotenoids
- ↑ Risk URI
- ↑ Oxidative stress

Adequate caloric and macronutrient intake

Adequate micronutrient intake



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Plant-Based Diets and Athletes

- Attention must be paid to quantity and quality of protein consumed
- Need to optimize intake of BCAAs
- Soy protein can be beneficial
- Less research on muscle protein synthesis using plant-based supplements such as rice, pea, hemp
- Need to ensure adequate fat intake, especially DHA and EPA (through ALA - flax, walnuts, chia, algae)



Regerman, JDSN
2017;11(1):50-59; PMID: 28101281; DOI: 10.1016/j.jand.2017.01.007

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Performance Benefits of Plant-Based Eating

- Higher CHO intake To optimize training, performance & recovery
- Higher antioxidant and phytonutrient intake
- Slight serum alkalinity
- Decreased oxidative stress
- Decreased blood viscosity

Barnard, et al. Nutrients
2019;11(1):130

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Performance Benefits of Plant-Based Eating

- Improved blood flow
- Improved arterial flexibility
- Improved endothelial function
- Decreased indicators of inflammation
- Maintain blood glucose concentrations during race or game day

Barnard, et al. Nutrients
2019;11(1):130

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Nutritional Needs of Your Plant-Based Athletes

DIET PATTERN	DIET CONCERNS	SPORT CONCERNS	SUGGESTIONS
Pesco-vegetarian	Adequate caloric intake, check vitamin D if sun exposure is minimal	Iron deficiency	Vitamin D and iron if levels are low
Lacto-ovo and lacto	Omega-3s, iron, zinc, B vitamins, iodine	↓ Creatine and carnosine stored	Omega-3s, iron, zinc since plant bioavailability is low, iodine through food sources
Vegan	Protein, fat, omega-3s, B12, calcium, iodine deficiencies possible	Iron deficiency, low BMD, energy balance	Protein, fat, omega-3s, iron, zinc, B12, calcium, iodine

Program
2020
2017-14-36

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Micronutrient Concerns For Your Vegetarian Athletes

- Calcium: 1,000 mg DRI
- Iron DRI - 8 mg M; 18 mg F Vegan athletes: 14 mg M, 12 mg F
- Zinc: DRI - 11 mg M; 8 mg F Vegan athletes: 16.5 mg M, 12 mg F
- Iodine: DRI 150 µg
- Vitamin B12: 6 µg
- Vitamin D: 400 IU - more if 25(OH)D levels are < 30 nmol/L
- Potassium: 4,700 mg



• Fotherman, et al. Curr Sport Med Rep. 2015;9(4):233-241.
• Heiler, S. Nutrition Today. 2019;54(1):23-30.

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SPORTS NUTRITION

Areas of Controversy

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What's Enticing: *Exercising When Fasted*

Theory: Exercising in a fasted state forces the body to rely on fat rather than carbohydrate as a fuel source resulting in greater body fat loss.

- Studies by Van Proeyen et al (2010, 2011) and Gillen (2013) found no difference in weight.
- Schoenfeld et al (2014) also observed no difference in body composition when an individual was fasted or fed prior to exercise



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What's Enticing: *Food Avoidance in Athletes*

910 athletes surveyed

55% eliminated at least one FODMAP food category with 82% reporting symptom improvement

- Lactose eliminated most - 85.5%
- Galactooligosaccharides - 23.9%
- Fructose - 23%
- Fructans - 6.2%
- Polyols - 5.4%



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LOW FODMAP: *A Solution For GI Distress in Athletes*

FODMAPS: poorly absorbed short chain carbohydrates that can increase the osmotic load in the small intestine

Need to consider:

- Dairy replacement
- Replacement of prebiotics to protect the immune system
- Trends that may negatively impact the gut, i.e cauliflower as replacement for other carbs

Study of 11 runners:

- 9 of 11 reported ↓ GI symptoms on Low FODMAP

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What's Enticing? *Ketogenic Diet*

- High fat (75-80% of calories), Low carb <50 grams, Moderate protein
- Will increase the amount of fat burned during exercise but effect may be greater in males than females^{1,2}
- May result in weight loss or not^{3,4}
- May ↑ LDL⁵
- May reduce rather than enhance metabolic flexibility by reducing carbohydrate availability and capacity to be used effectively as a fuel substrate during exercise and impair anaerobic exercise performance⁶
- May deleteriously impact bone health⁷

1. Brounoff et al. Metabolism 2019; 91: 25-30.
2. Brounoff et al. Metabolism 2019; 91: 25-30.
3. Brounoff et al. Metabolism 2019; 91: 25-30.
4. Brounoff et al. Metabolism 2019; 91: 25-30.
5. Brounoff et al. Metabolism 2019; 91: 25-30.
6. Brounoff et al. Metabolism 2019; 91: 25-30.
7. Brounoff et al. Metabolism 2019; 91: 25-30.

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Gluten-Free and the Gut

1 month of gluten-free

Beneficial bacteria

- Bifidobacteria
- Lactobacillus
- Faecalibacterium prausnitzii
- Clostridium lituseburens

Pathogenic bacteria

- Enterobacteriaceae
- Escherichia coli

immune function

Dr. Palmer C, et al. Br J Nutr. 2019.

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PROTEIN

Quality, Quantity, Frequency

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Reductionist vs Holistic Approach

When discussing protein requirements, we must consider:

- Requirements based on age/activity
- Overall diet composition
- Protein choices and bioavailability
- Dietary patterns
- Body composition goals
- Environmental impacts of protein choices



Burt et al. Front Nutr. 2015;4:63
doi:10.3389/fnut.2015.00063

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Protein Requirements for Active Adults by Age, Sport, Body Goals

Type of athlete	Protein- gms/lb/day	150 lb athlete
Recreational	0.5-0.7	75-105
Endurance	0.5-0.8	75-120
Strength training	0.5-0.8	75-120
Teenage athlete	0.7-0.9	105-135
Athlete building mass	0.5-0.9	90-135
Athlete restricting calories	0.9-1.0	135-150
Maximum usable amount	0.9-1.0	135-150

Phillips et al. J Sport Sci. 2007;25: Suppl: S26-S28

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Amount of Dietary Protein to Maximize MPS

Animal Source	Leucine % total protein	Protein/meal for 3 g leucine (g)	Amount of food for 3 g leucine
Whey	13.6	23	1 scoop
Milk	10.9	28	3.5, 8 oz glasses
Casein	10.2	30	1.5 scoops
Beef	8.8	35	5 ounces
Egg	8.5	36	5.5 eggs
Cod	8.1	38	5.3 ounces

Bruce et al. Nutrients. 2016;8:1087

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Amount of Dietary Protein to Maximize MPS

Plant Sources	Leucine % total protein	Protein/meal for 3 g leucine (g)	Amount of food for 3 g leucine
Black beans	8.4	36	7/8 cup
Rice	8.2	37	4 cups, dry
tofu	8.0	38	½ cup
Lentil	7.9	39	½ cup
Pea	7.8	39	7/8 cup
Oat	7.7	35	1 cup dry
Quinoa	7.2	43	1-2/3 cups dry

Beckman et al. Nutrients, 2019,11,2907

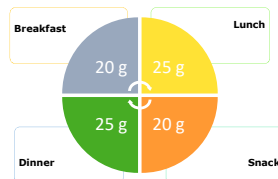
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Protein Distribution is Key

Even out the intake throughout the day
Example: 90 grams of protein per day =



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Protein Recommendations: Customize by Exercise Type

- Sedentary individual: ~15 grams protein/meal
- Strength training focused individual: ~20 grams protein/meal
- Endurance training focused individual (1-2 hrs/day) 20-30 grams protein/meal
- Prolonged endurance training focused individual (> 2-3 hrs/day) > 30 grams protein/meals



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Protein Intake: *Timing and Distribution*

- Protein post resistance exercise → anabolic stimulus in the few hours post
- Repeated ingestion of protein confers better MPS response in the hours post resistance training
- **PRACTICAL:** no need for huge amounts of protein post lift at the expense of no appetite later!
- Protein before bed may help augment MPS overnight BUT not necessarily more protein, **instead better spacing of the protein throughout the day**

• Areta et al. J Phys 2013; 55(2):233-238;
• Thompson et al. J Appl Phys 2017; 117(12):3511-3517

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Comparison of Protein Powders

TYPE OF PROTEIN	PDCAAS- Protein Digestibility Corrected Amino Acid Score	Leucine per 20 gram serving (grams)
Whey	1.00	2.15
Soy	1.00	1.6
Pea	0.82	0.87
Peanut	0.7	1.26

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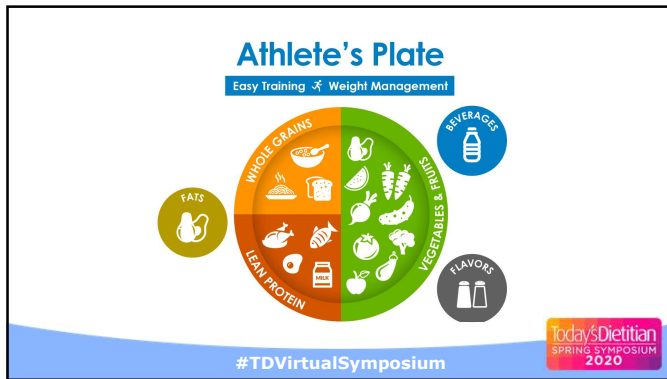
From the Lab to the Plate

Figures to Food

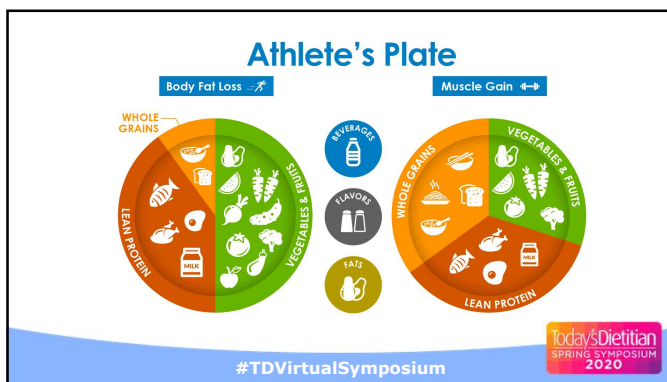
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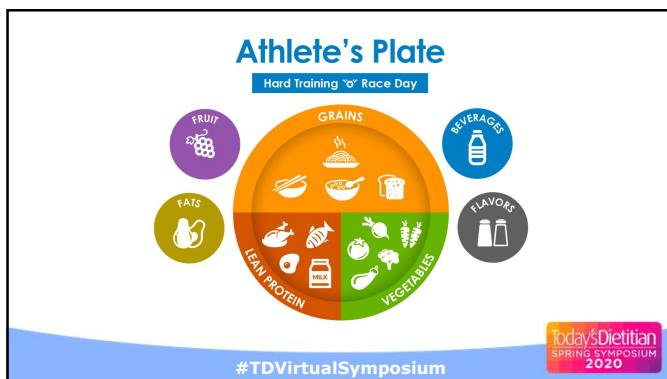
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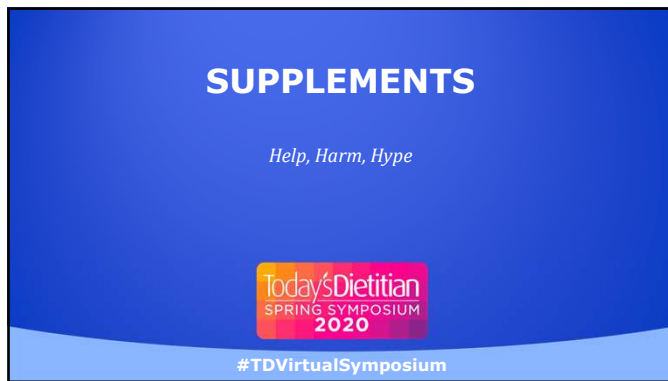
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What's Enticing: *Supplements*

IOC consensus statement definition of a supplement

- A food, food component or nutrient, or non-food compound that is purposefully ingested in addition to the habitually consumed diet with the aim of achieving a specific health and/or performance benefit

Dietary supplements include:

- Functional foods
- Formulated foods
- Single nutrients
- Multi-ingredient products



Heard et al. | J. Am. Diet. Assoc. | Vol. 118 | No. 10 | October 2018 | 152-159-160

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Where Supplementation Might Be Warranted

- Specific nutrient deficiencies
- Complications of under fueling - low BMD
- When calories are low or diet is exclusionary
- Food allergies/intolerances
- Prior to interventions to optimize adaptation: altitude/iron status
- Food hygiene/food safety/availability concerns

Garber L, Hargrett-Keil N. J. Am. Diet. Assoc. | Vol. 118 | No. 10 | October 2018 | 152-159-160

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What's Enticing: *Metabolites and Micros*

Metabolite/Micros	Quantity	Sources	Benefits	Strength of Evidence
Creatine monohydrate	20 g/d x 5 days followed by 3-5 g/d	Meat, poultry, fish	<ul style="list-style-type: none"> ↑ Expression of growth factors to support training adaptation ↓ Inflammation ↑ Glycogen synthesis 	Good
Vit D	Vit D Status: 20-50 ng/L. RDA ~ 600 IU/d	Fatty fish, egg yolk, supplements, sun	Muscle repair/recovery	Fair
Antioxidants	Supplements not advised	Produce	↓ Inflammation	Fair
Gelatin/collagen+ Vit C	15 g collagen hydrolysate with 50 mg Vit C 1 hr pre training	Gelatin, citrus fruits juice, supplements	Promote collagen synthesis	Fair
Curcumin/bromelain	0.4-5 g/d, 900-1000 mg/d	Turmeric, pineapple, supplements	↓ Inflammation	Limited
Caffeine	3-6 mg/kg BM 60 min pre exercise, and <3 mg/kg BM pre/during exercise with CHO	Pill/powder	Improved endurance capacity	Good

• Hyatt et al. Sports Med (2017) 47:2219-2236
 • Hooper et al. Br J Sports Med (2016) 50:1034-1035-1036

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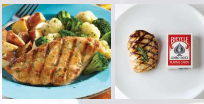
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To Eat or To Supplement?

Amino Acid	Val	Amino Acid	Val
Tryptophan	496	Threonine	227
Threonine	1063	Valine	136
Isoleucine	1063	Isoleucine	1063
Leucine	1063	Leucine	1063
Valine	1063	Valine	1063
Proline	1063	Proline	1063
Alanine	1063	Alanine	1063
Aspartic acid	1063	Aspartic acid	1063
Glutamic acid	1063	Glutamic acid	1063
Glycine	1063	Glycine	1063
Phenylalanine	1063	Phenylalanine	1063

Grilled Chicken (4-oz)
 4 oz = 35 gms protein

Amino Acid Blend Supplement
 (1 serving = 3 capsules)
 1 svq < 2 gms protein



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Reminder to Athletes

- Educate on dose, timing, potential interactions, and necessity while offering a food-centric approach
- Just because you can buy it doesn't mean you should try it!
- Supplementation alone does not always correct deficiencies
- Too much can be detrimental, i.e. energy drinks



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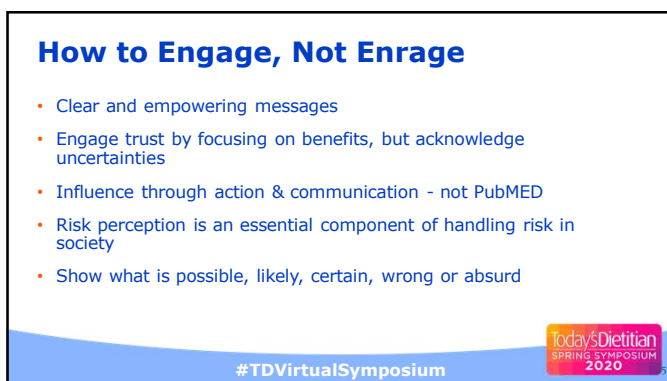
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Resonate With Relevance


Physiology


Performance


Physique


Practicality

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PRACTICALITY

The Athlete's Reality

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Sports Nutrition Recommendations

MUST BE

- Personalized
- Modified according to training load, injury
- Practiced in training to determine gut tolerance
- Achievable
- Affordable
- Convenient

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Budget Bags




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Bottom Line

- Science and evidence over nonsense
- #FactsthatImpact
- Meet them where they are #enabledtable
- Consider the athletes background, economic status, readiness to adapt and enact
- Use your skills: #ClinfortheWin
- Performance Enhancing Diets



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Questions?

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