Capturing the Opportunity for Protein in Sports Nutrition

How Science and The Consumer Are Changing & Creating New Opportunities for Plant Proteins

PFNDAI Seminar

Parina Garg

October 18, 2019

Nutrition & Biosciences

DUPONT™

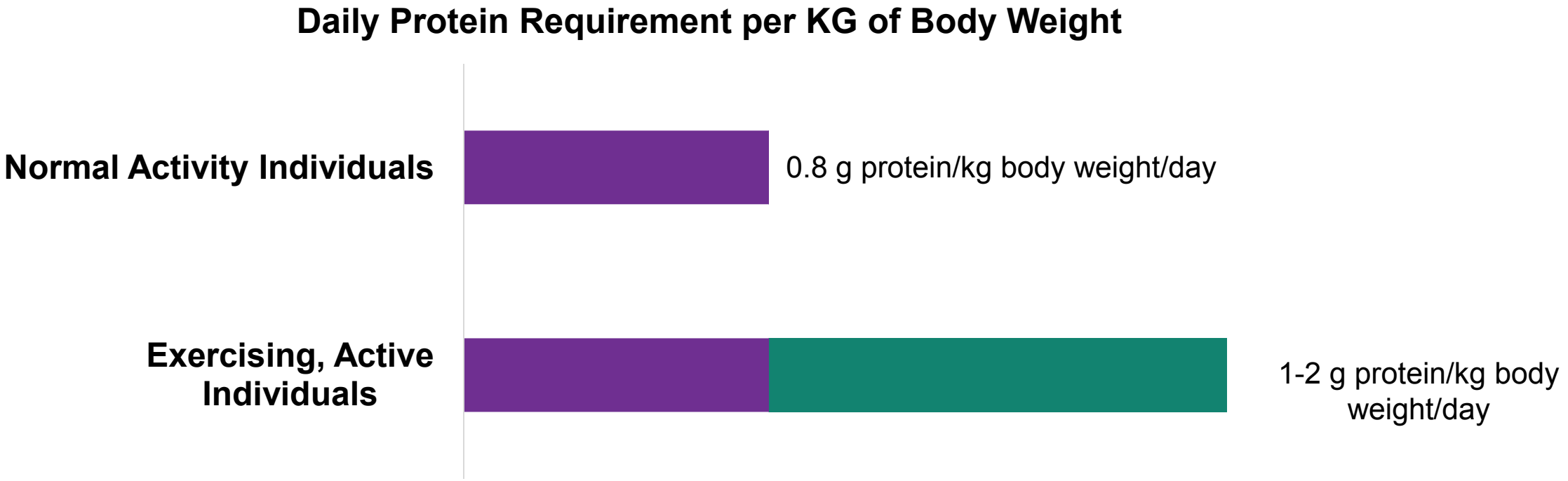
Agenda

- The unique health & sustainability benefits of soy protein

- The evidence supporting soy protein and soy-dairy blends for sports nutrition
  - Theory and Science
  - Evidence from Human Clinical Research

- Protein opportunities in foods and beverages targeting the sports nutrition consumer

Highly Active Individuals Require More Protein



- Most experts agree, that highly active, exercising individuals have a higher requirement for protein that those who are more sedentary.
- Estimates range from 1-2 g of protein/kg of body weight/day, depending on the level and type of activity and overall fitness goals, vs. 0.8 g/kg for normal individuals

Source: Reidy & Rasmussen (2016), J Nutr, Feb; 146(2):155-83

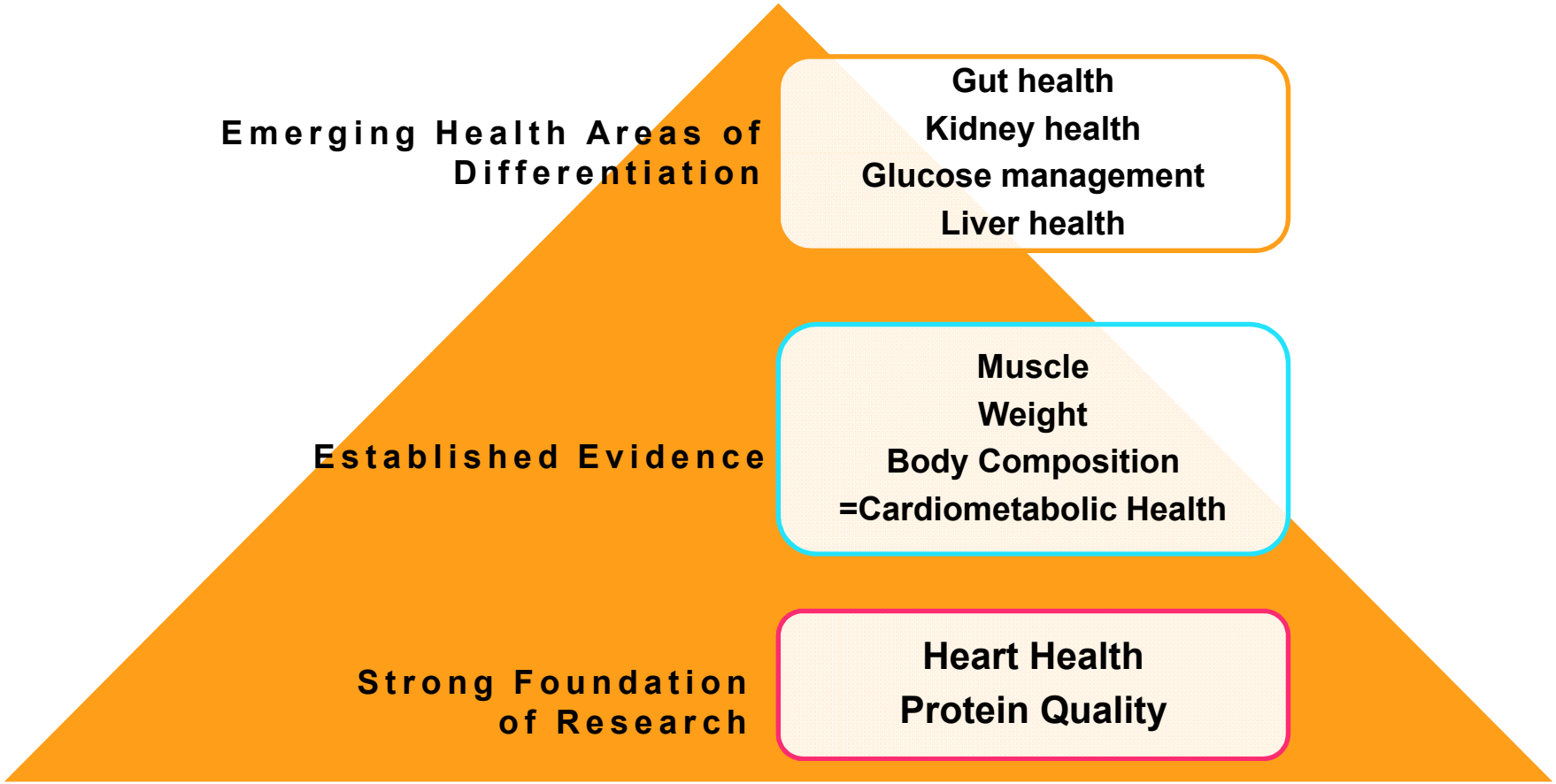
Muscle Growth Occurs When Protein Synthesis Exceeds Protein Breakdown

- Protein consumption has been shown to enhance rates of muscle protein synthesis and possibly lower rates of muscle protein breakdown.

- When muscle protein synthesis > muscle protein breakdown, skeletal muscle increases in mass.

Source: Phillips & Van Loon (2011), J. of Sports Sciences, 29:sup 1, S29-S38

Health Benefits of Soy Protein

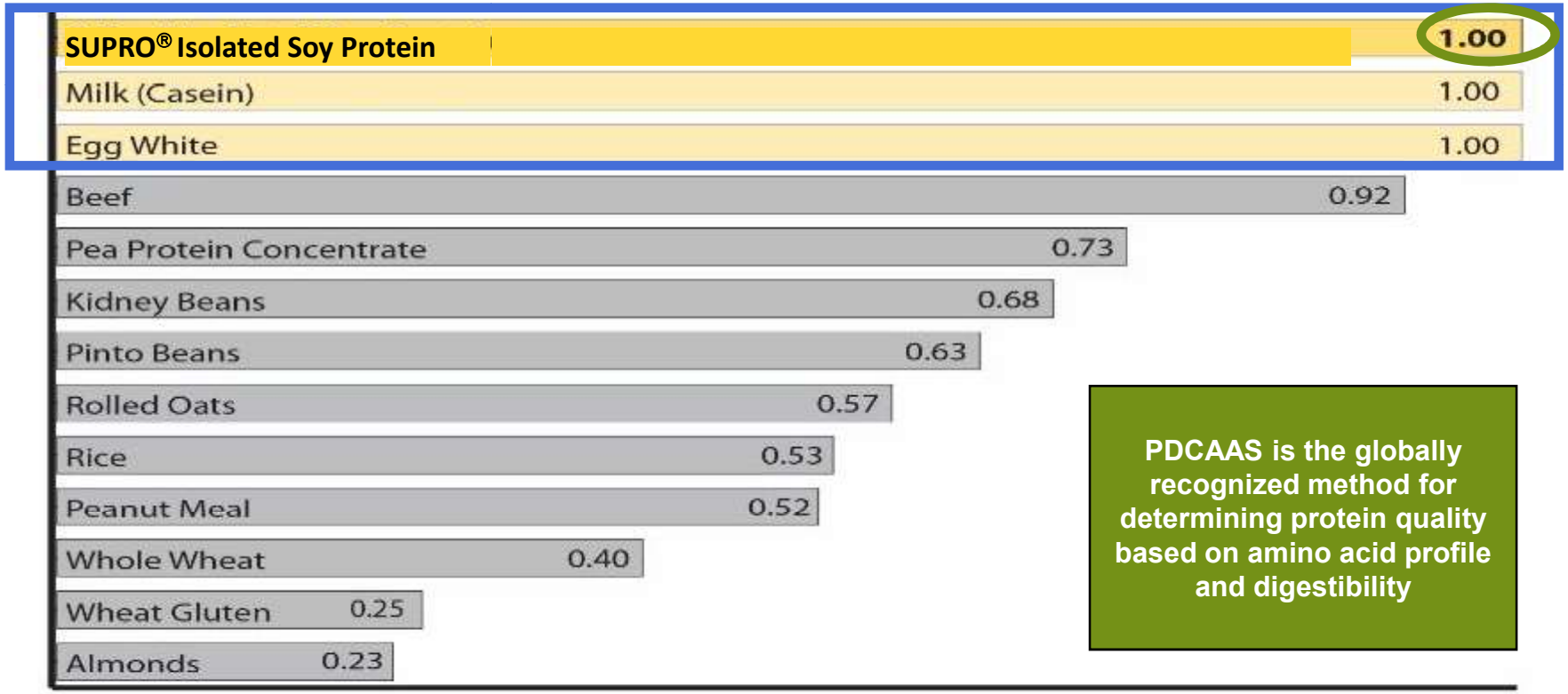


"Proven to deliver health benefits, supported by hundreds of clinical studies."

The Importance of Protein Quality to Protein Choice

- High quality proteins contain all of the essential amino acids in the right proportions to support muscle maintenance & development
- High quality proteins are easily digested
- Soy protein is the only commercially viable plant protein source that is also considered to be high quality
- Most other plant sources are lacking in one or more of the essential amino acids and are considered lower in quality

Protein Digestibility-Corrected Amino Acid Score (PDCAAS) of Commonly Consumed Proteins

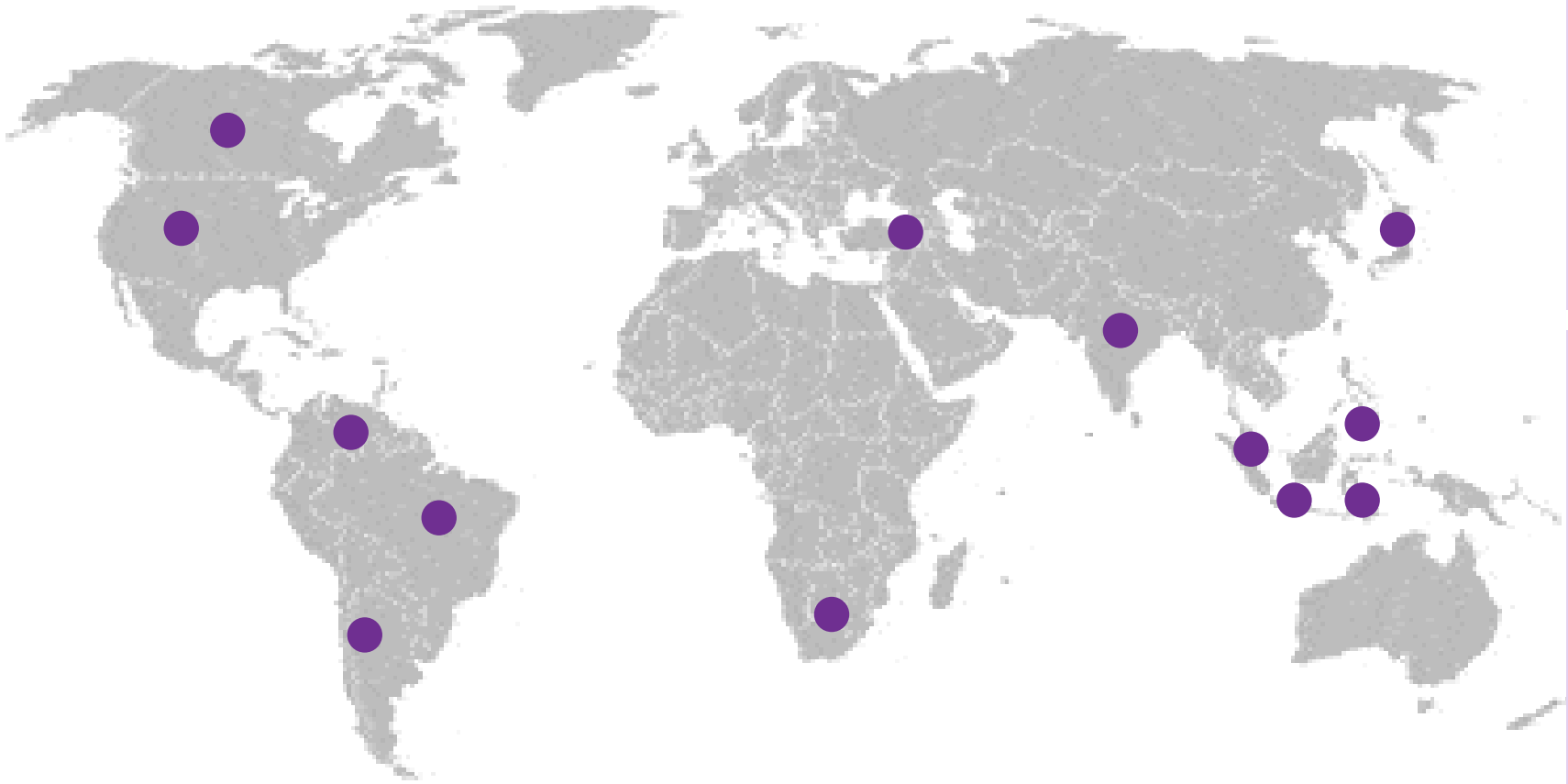


PDCAAS is the globally recognized method for determining protein quality based on amino acid profile and digestibility

PDCAAS values of selected foods. PDCAAS values from published sources or calculated using publicly available amino acid and digestibility values. A score of 1.00 is the highest attainable score and is based on the amino acid reference pattern for 2-5 year olds.

Adapted from Hughes, et al, J Ag Food Chem, 2011

Soy Protein Heart Health Claims



The Strength of the Research Supporting Soy Protein's Heart Health Benefits Has Led to the Establishment of Heart Health Claims in 13 Countries

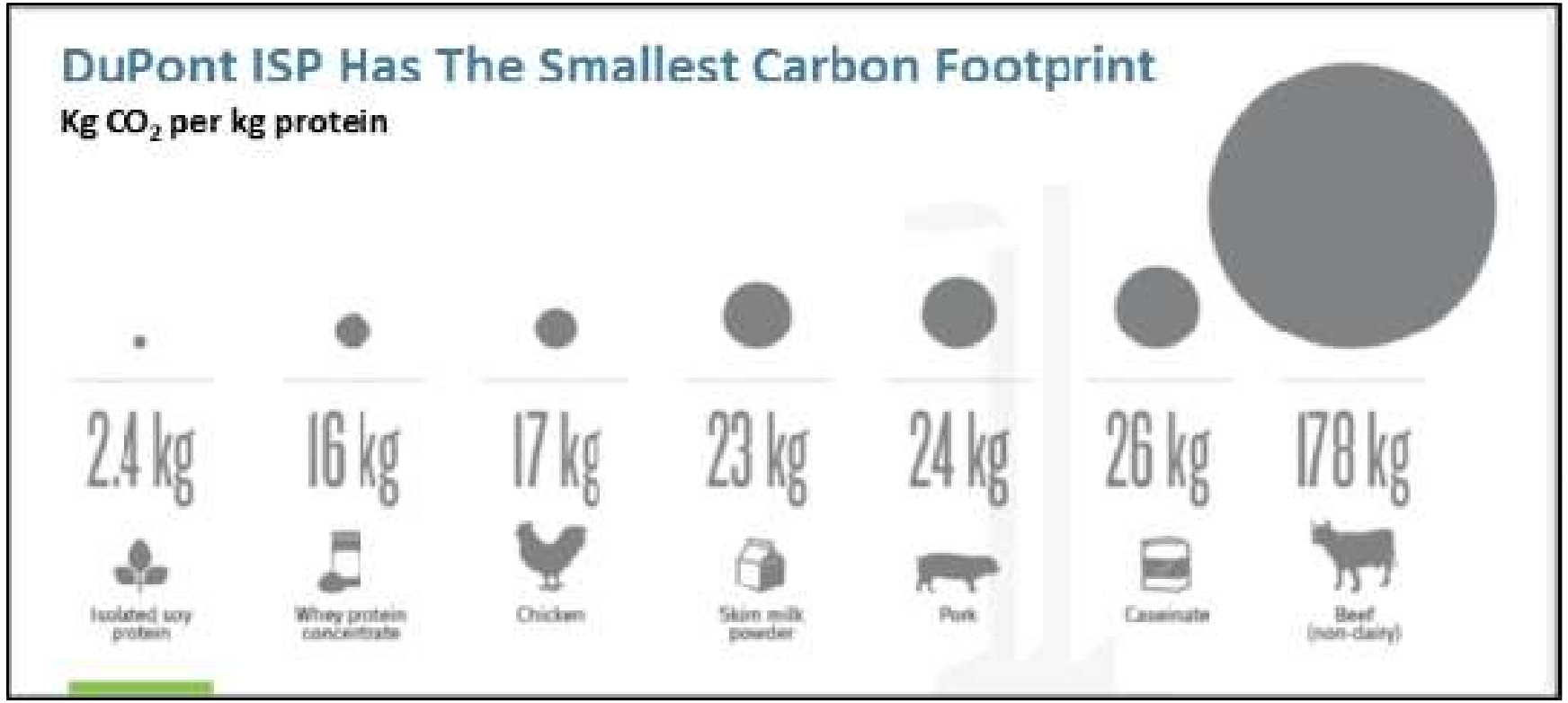
United States
Canada
India
Japan
South Africa
Brazil
Chile
Colombia
Philippines
Indonesia
Malaysia
Korea
Turkey

Typical Claim Language: "25 grams of soy protein a day, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease."

Key Advantages: Soy VS Dairy Proteins

Environmental Sustainability:

As a plant-based protein, soy protein is more environmentally sustainable than animal-based proteins (meat & dairy).



Soy protein has a lower carbon footprint – 8-80X lower than analyzed dairy & meat proteins.

Soy protein requires less water, land, and energy to produce a kg of protein

Source: DuPont Life Cycle Assessment, Soy Protein Operations

Soy-Dairy Blends
The Theory & Science Behind Why They Work

Whey Protein & Soy Protein Have Been Shown To Support Lean Muscle Gains

Acute

- Soy protein is effective for building muscle in acute (short-term) studies.

Chronic

- Soy protein is effective for building muscle in chronic (long-term) studies.
- Soy and whey protein do not differ in chronic studies for lean body mass gains *(including studies with both trained and untrained individuals)*

	Study Duration (wk)	Lean Body Mass Gain (kg)	Protein (g/day)	Statistically Different (P ≤ 0.05)
Brown et al. Nutr J 3:22, 2004.	9	Whey protein (+1.3) Soy protein isolate (+1.2)	33	NO
Candow et al. Int J Sport Nutr Exerc Metabol. 16:233-244, 2006.	6	Whey protein (+2.5) Soy protein isolate (+1.7)	~ 85	NO
Kalman et al. J Int Soc Sports Nutr. 23(4):4, 2007.	12	Whey protein (+0.5) Soy protein Isolate (+0.5)	50	NO

The Theory Behind Blending Dairy & Soy Proteins for Sports Nutrition

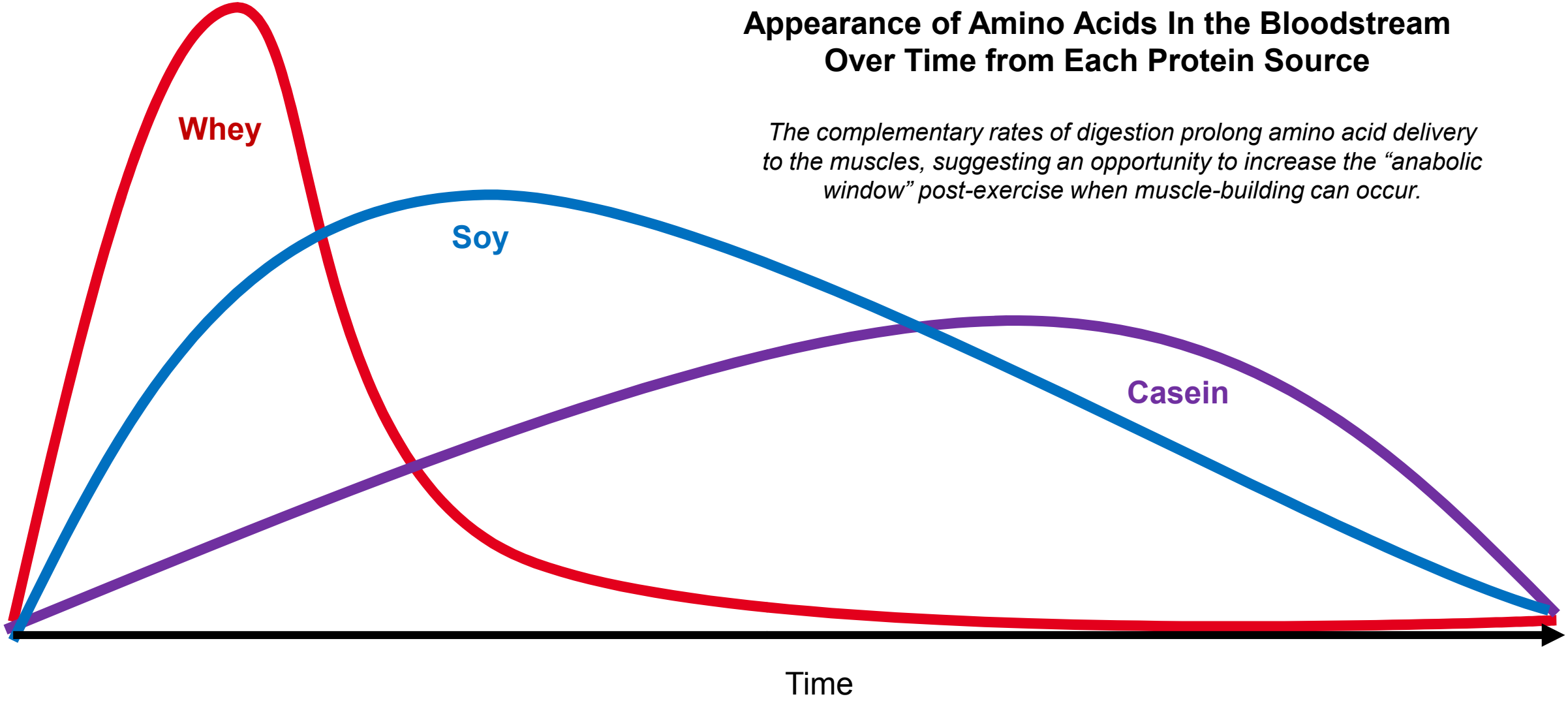
Protein	Complete Protein
Whey	✓
Soy	✓
Casein	✓
Combined	✓

Paul, G., Ph.D., “The Rationale for Consuming Protein Blends in Sports Nutrition”, *Journal of the American College of Nutrition*, Vol., 28, No. 4, 464S-472S (2009)

Digestion Rate Differences – Soy VS Whey VS Casein

Appearance of Amino Acids In the Bloodstream Over Time from Each Protein Source

The complementary rates of digestion prolong amino acid delivery to the muscles, suggesting an opportunity to increase the "anabolic window" post-exercise when muscle-building can occur.



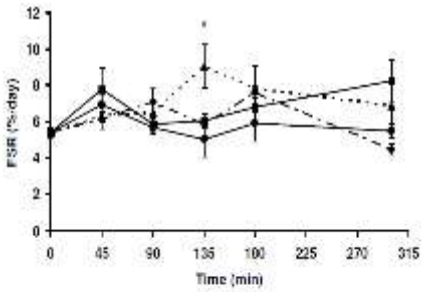
Evidence from Human Clinical Research Supports Soy-Dairy Blends

Results of Short & Long-Term Studies

Soy-dairy Protein Blend For Enhanced Muscle Building

Blending soy, whey and casein proteins increases the anabolic window for increased growth and maximize muscle building

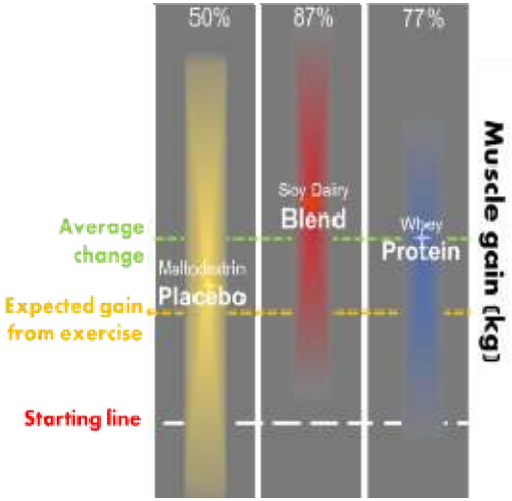
Animal study to identify the 'best blend'



Acute clinical study in young adults

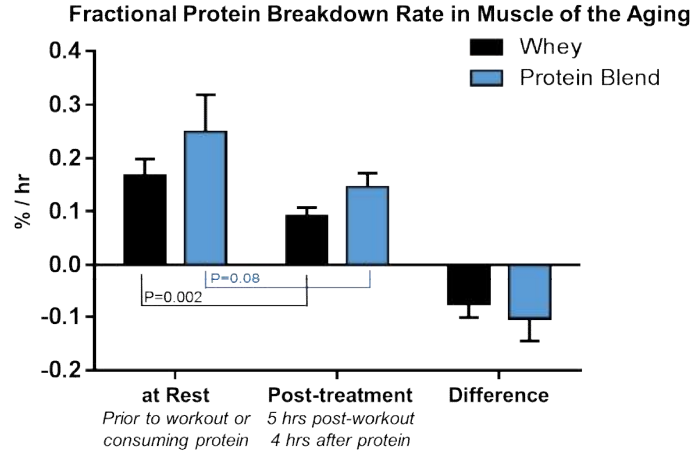
Reidy, et al. J Nutr. 2013
Reidy et al. J Appl Physiol. 2014

Extended clinical study in young adults



Reidy, et al. J Nutr. 2016

Acute clinical study in older adults

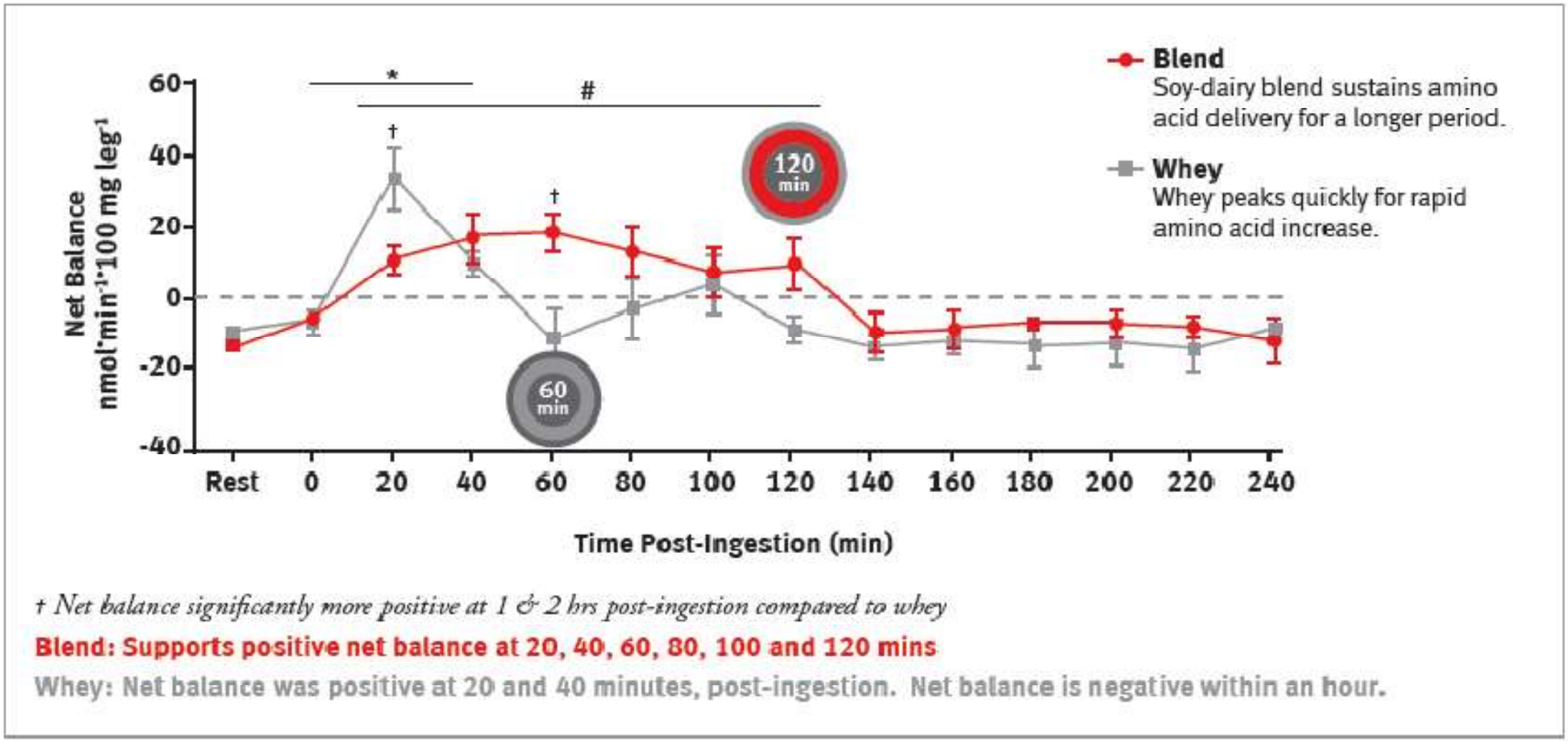


Borack, et al. J Nutr. 2016

Soy-dairy protein blend (25% whey, 25% SUPRO® soy protein isolate, 50% casein)

Soy-Dairy Blend Extends The "Anabolic Window" Post-Exercise

Findings from Acute Clinical Studies With Young Adults



† *Net balance significantly more positive at 1 & 2 hrs post-ingestion compared to whey*

Blend: Supports positive net balance at 20, 40, 60, 80, 100 and 120 mins

Whey: Net balance was positive at 20 and 40 minutes, post-ingestion. Net balance is negative within an hour.

Reidy, et al. J Nutr. 2013, Reidy et al. J Appl Physiol. 2014

Soy-dairy Protein Blend For Enhanced Muscle Building

Extended (Chronic) Study in Young Adults

Dietary Supplements

Maltodextrin Placebo (MDP)	100% Maltodextrin
Protein Blend (PB)	25% whey protein isolate, 25% SUPRO® soy protein, 50% caseinate
Whey Protein (WP)	100% whey protein isolate

- Supplements daily for 12 weeks ingested with 300 mL water:
  - Immediately following workout 3x / wk
  - Between meals on non-workout days 4x / wk

	PB	WP	MDP
	per serving		
Serving *g*	25.2 *g*	26.2	25.2
Protein	21.9	21.5	0.0
Fat	0.7	0.6	0.1
Ash	0.9	0.7	0.0
Moisture	1.5	1.8	1.4
Carbohydrate	0.2	1.5	23.7
Calories	95	98	96
Alanine	0.87	1.19	-
Arginine	0.94	0.51	-
Aspartic Acid	2.00	2.40	-
Cysteine	0.26	0.58	-
Glutamic Acid	4.60	4.17	-
Glycine	0.53	0.39	-
Histidine[2]	0.57	0.40	-
Isoleucine[2]	1.19	1.48	-
Leucine[2]	2.00	2.31	-
Lysine[2]	1.71	2.04	-
Methionine[2]	0.52	0.50	-
Phenylalanine[2]	1.04	0.70	-
Proline	1.82	1.45	-
Serine	1.17	1.11	-
Threonine[2]	1.10	1.63	-
Tryptophan[2]	0.29	0.34	-
Tyrosine	1.00	0.66	-
Valine[2]	1.36	1.36	-
Total EAA	9.78	10.76	-

Reidy, et al. J Nutr. 2016

Protein Opportunities in Foods & Beverages Targeting the Sports Nutrition Consumer

Opportunities in Food & Beverage

Differentiate with Blended Proteins

- Leverage science supporting soy-dairy blends to create uniquely positioned powders and RTD beverages

Capture New Consumers with Plant-Based Options

- Casual or lifestyle consumers are more motivated by health, sustainability – ideal target for plant-based options

Innovate in New Formats, Capture New Use Occasions

- Newer ingredient formats and functionalities can enable high protein levels in a wide range of applications

DUPONT

DuPont Offers a Variety of Plant Protein Ingredients to Support Food & Beverage Innovation

Soy Protein Powders:

Isolates
(90% Protein) or
Concentrates
(70% Protein)

Versatile range designed to deliver application-specific functionality for beverages – dry, RTD, spray-dried; extrusion; meat/poultry & meat-free; general protein fortification.

Pea Protein Powders:

83% protein powder for beverages – Dry & RTD

Pea & Soy Protein Extruded Crisps or Nuggets:

55-90% protein; adds crispy, crunchy texture to nutrition
bars, cereals, snacks

Textured Soy Protein Concentrate:

~70% protein; flakes, granules, & crumbles. Ground meat & poultry, meat-free applications.

Structured Vegetable Protein:

~58-71% protein – whole-muscle like texture in shreds, chunks or strip formats. Meat & meat-free applications

Nutrition & Biosciences

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Newer Technology is Expanding Plant Protein Options, Applications & Range of Functionality

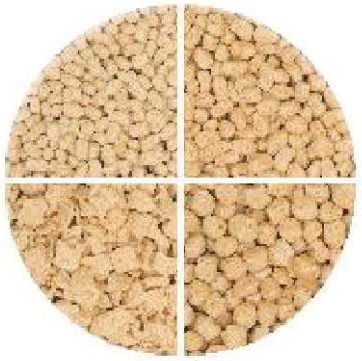
SUPRO® XT 219D Isolated Soy Protein For Dry Powdered Beverages

- Designed to deliver exceptional dispersibility & stability
- Excellent flow properties

SUPRO® XT 55 Isolated Soy Protein For High Protein RTD Beverages

- Improved protein stability/viscosity balance
- Up to 50% dairy protein replacement

SUPRO® 90% Nuggets For Nutrition Bars, Cereals, Snacks



- High-content/high-quality protein
- Crispy, crunchy texture

TRUPRO™ Pea Protein Nuggets for Nutrition Bars, Cereals, Snacks

- 75% protein
- Crispy, crunchy texture

TRUPRO™ 2000 Pea Protein for Beverage Applications

- 83% protein
- Superior taste
- Excellent dispersibility
- Not labeled as an allergen