2017 THE ALMOND CONFERENCE

REPOSITIONING PLANT-BASED PROTEIN

Room 306-307 | December 5 2017

california almonds
Almond Board of California

growing ADVANTAGE
The Almond Conference

CEUs – New Process

Certified Crop Advisor (CCA)

- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- *Repeat this process for each session, and each day you with to receive credits.*

Pest Control Advisor (PCA), Qualified Applicator (QA), Private Applicator (PA)

- Pickup scantron at the start of the day at first session you attend; complete form.
- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- Turn in your scantron at the end of the day at the last session you attend.

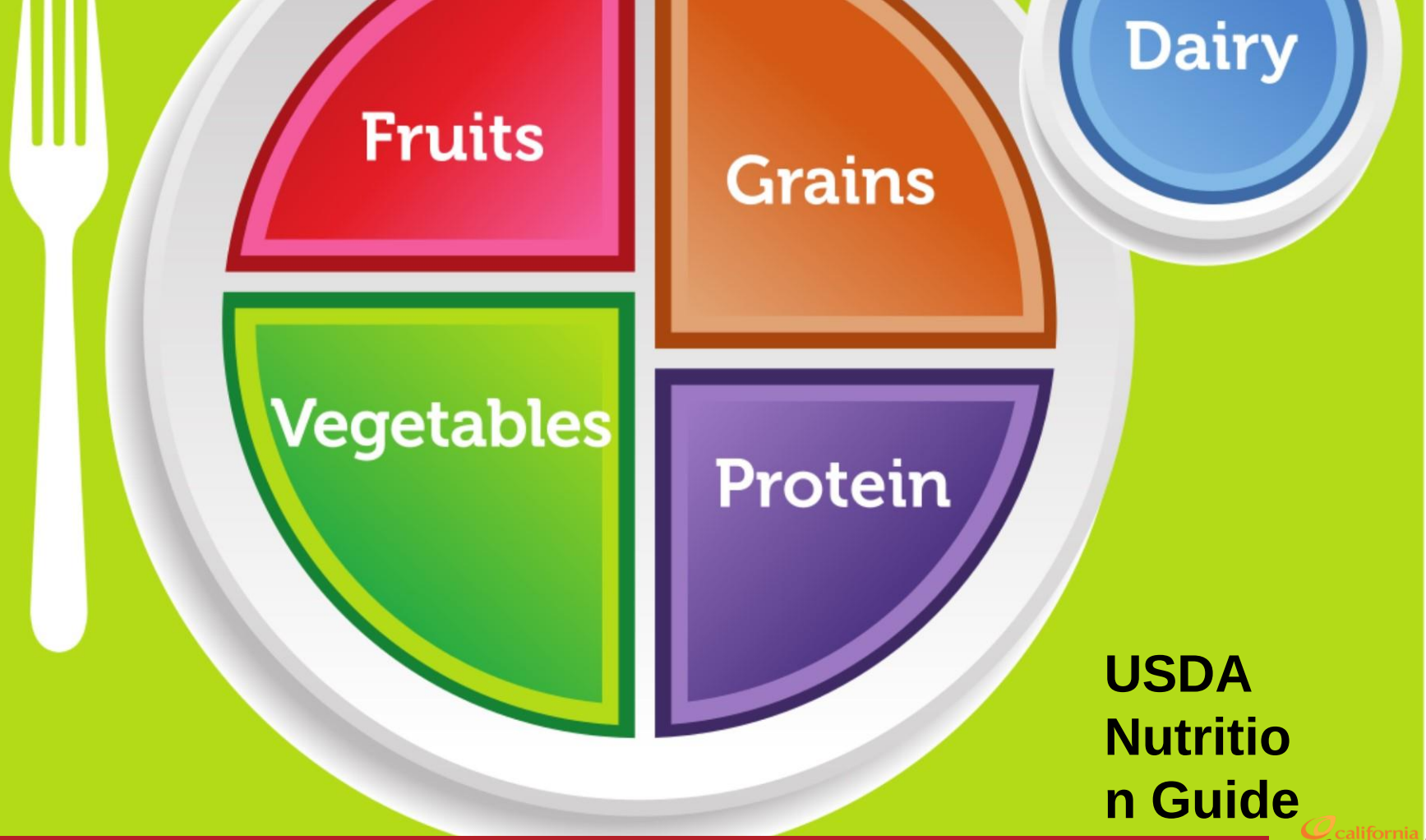
Sign in sheets and verification sheets are located at the back of each session room.

AGENDA

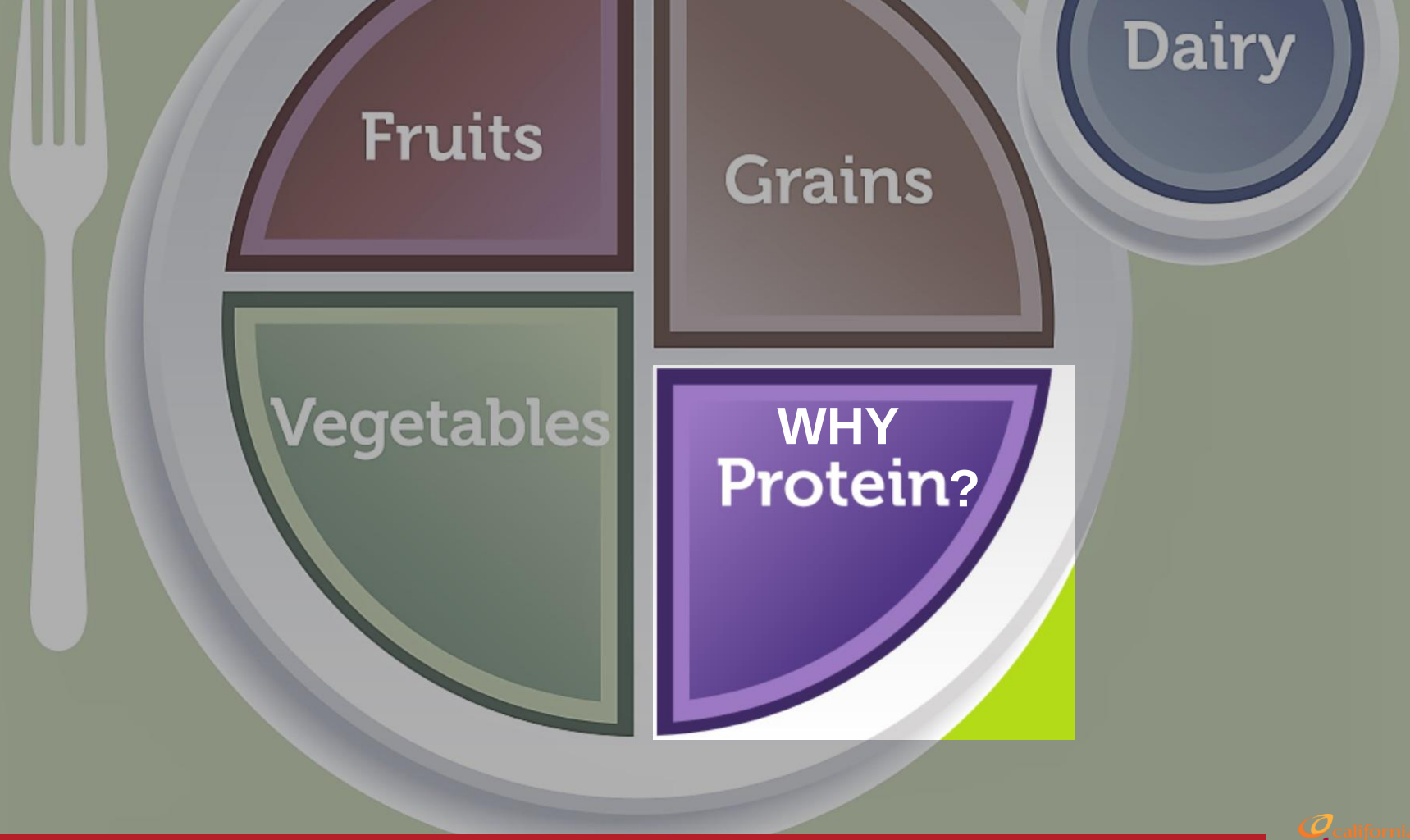
- **Maya Erwin**, Blue Diamond Growers, moderator
- **Swati Kalgonakar**, Almond Board of California
- **Kathy Musa-Veloso**, Intertek Health Sciences, Inc.
- **Janice Rueda**, ADM

PROTEIN – THE BASICS

Dr. Swati Kalgaonkar
Senior Manager, Nutrition Research Program



USDA Nutrition Guide



1. REPAIR & MAINTENANCE

2. ENERGY

3. TRANSPORT & STORAGE

4. ENZYMES

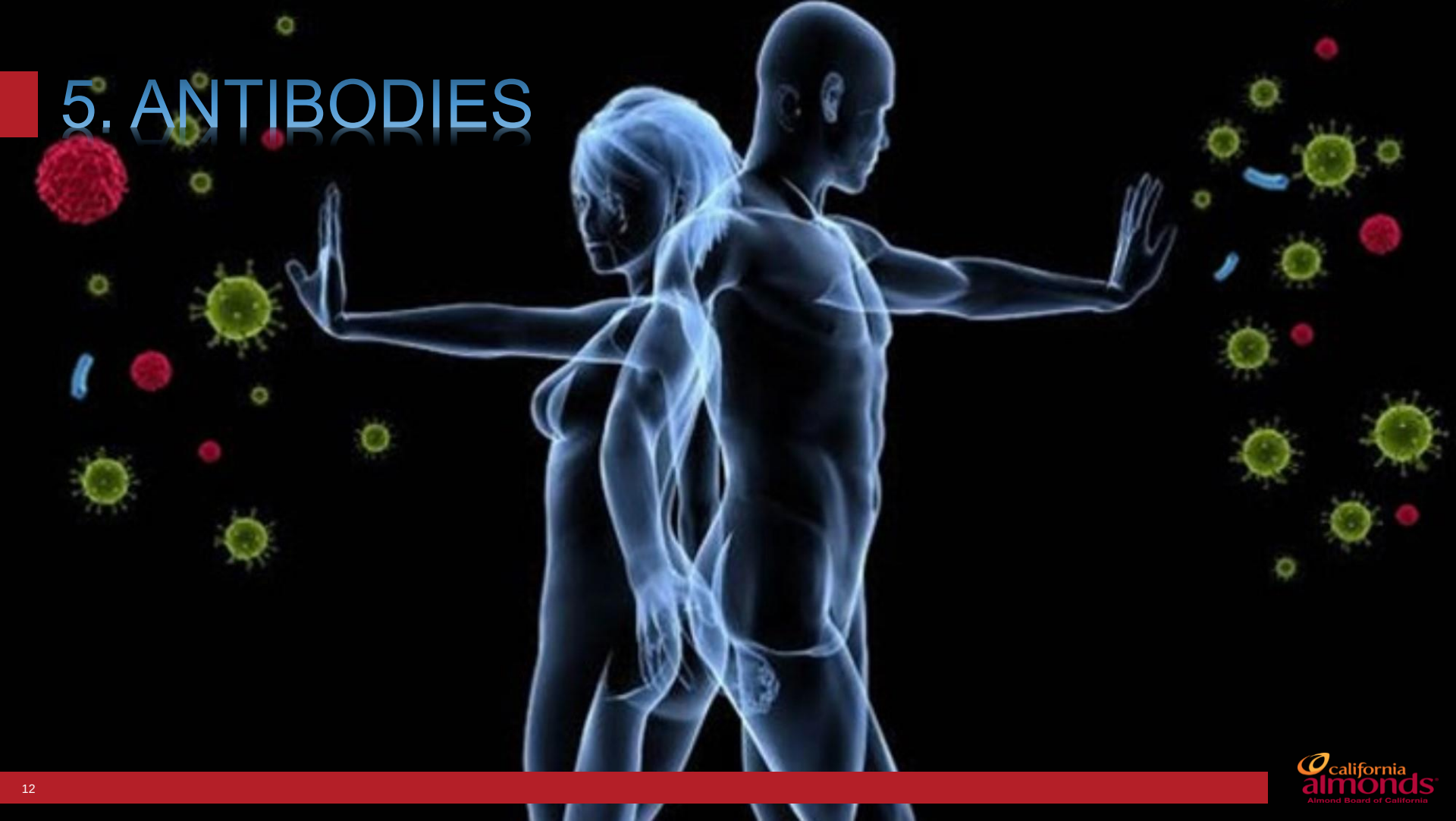
PEPSIN

TRYPSIN

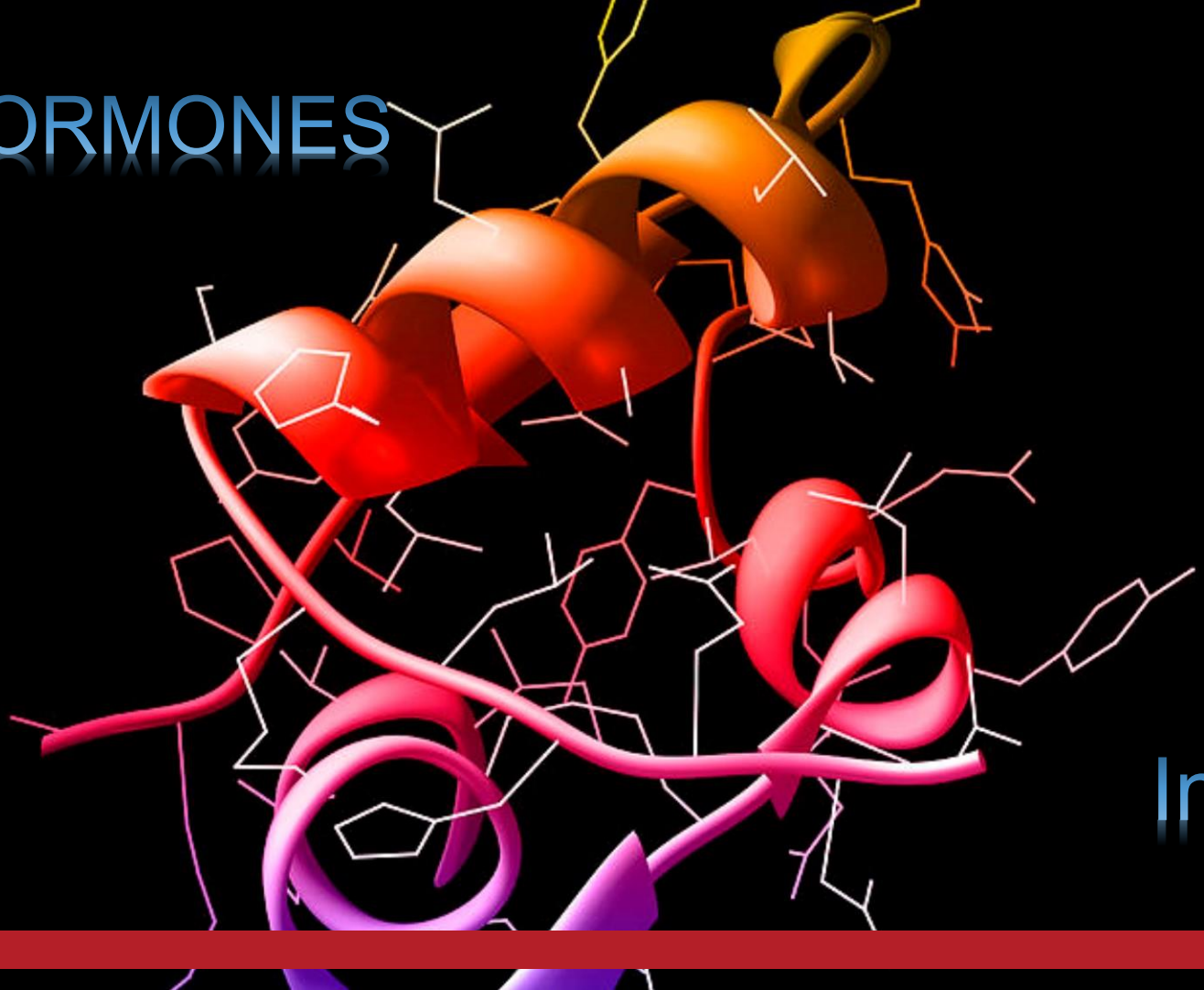
LIPASE

AMYLASE

5. ANTIBODIES

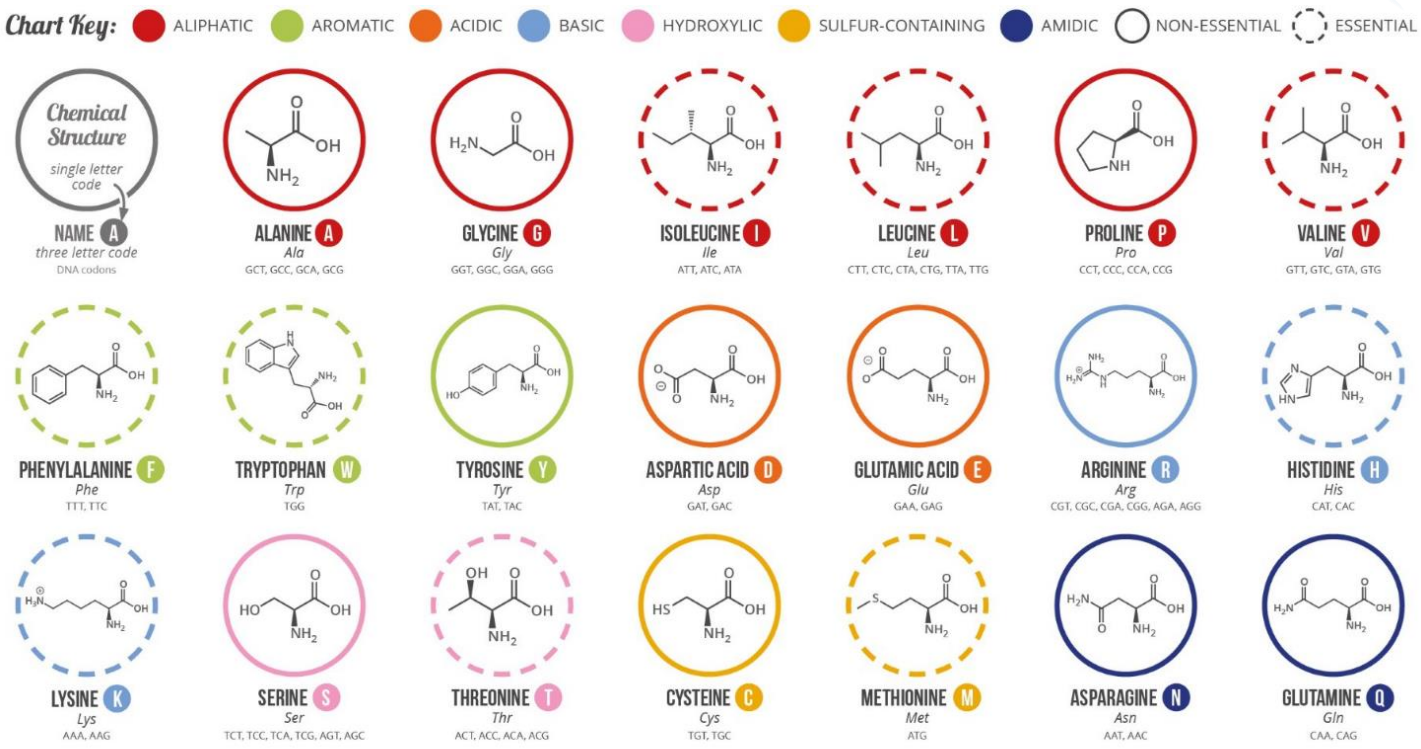


6. HORMONES



Insulin

TWENTY COMMON AMINO ACIDS



Note: This chart only shows those amino acids for which the human genetic code directly codes for. Selenocysteine is often referred to as the 21st amino acid, but is encoded in a special manner. In some cases, distinguishing between asparagine/aspartic acid and glutamine/glutamic acid is difficult. In these cases, the codes asx (B) and glx (Z) are respectively used.

TYPES OF AMINO ACIDS

Non-Essential	Conditionally Essential	Essential
Alanine	Arginine	Histidine
Asparatate	Asparagine	Isoleucine
Cysteine	Glutamine	Leucine
Glutamate	Glycine	Methionine
	Proline	Phenylalanine
	Serine	Threonine
	Tyrosine	Tryptophan
		Valine
		Lysine

PROTEIN INTAKE RECOMMENDATIONS

World Health Organization + Food and Agriculture Organization of the United Nations + UNITED NATIONS UNIVERSITY UNU-EGOV

0.83g/kg BW/d
165lbs - 62.25g

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

0.8g/kg BW/d
165lbs - 60g

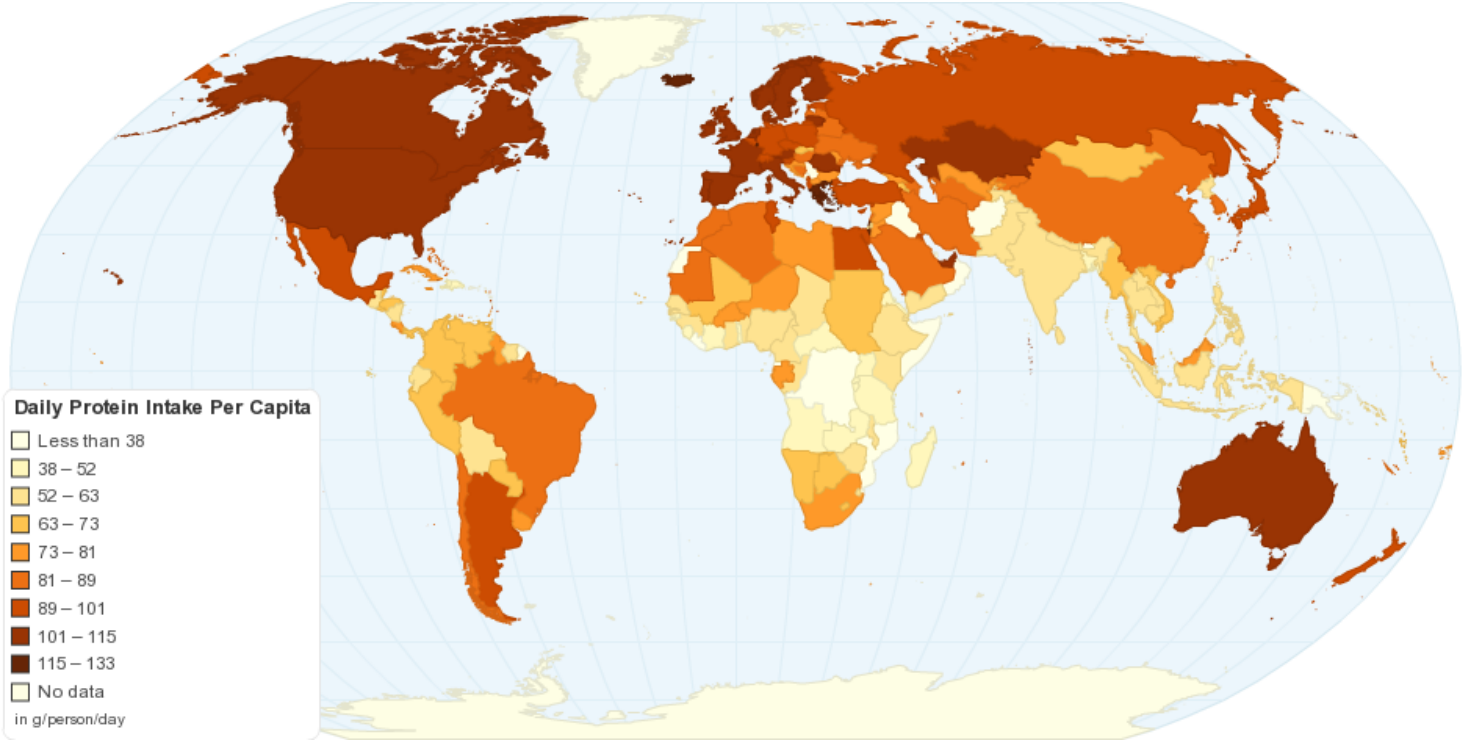
efsa
European Food Safety Authority

0.83g/kg BW/d
165lbs - 62.25g

Australian Government
National Health and Medical Research Council

0.84g/kg BW/d
165lbs - 63g

GLOBAL PROTEIN INTAKE



PROTEIN IN TRANSITION

WHY PLANT PROTEIN?

Vegetarianism

Vegan

The Flexitarian
a.k.a The Flexible Vegetarian

Plant-Based Lifestyle

October 1
is
World Vegetarian Day

intertek
Total Quality. Assured.

LABELING AND ADVERTISING ALMONDS WITH CLAIMS RELATED TO PROTEIN – A GLOBAL PERSPECTIVE

Kathy Musa-Veloso, PhD

Director, Health Claims and Clinical Trials

NUTRIENT CONTENT CLAIMS

Describe the level of a nutrient or dietary substance in the food, either directly or by implication.

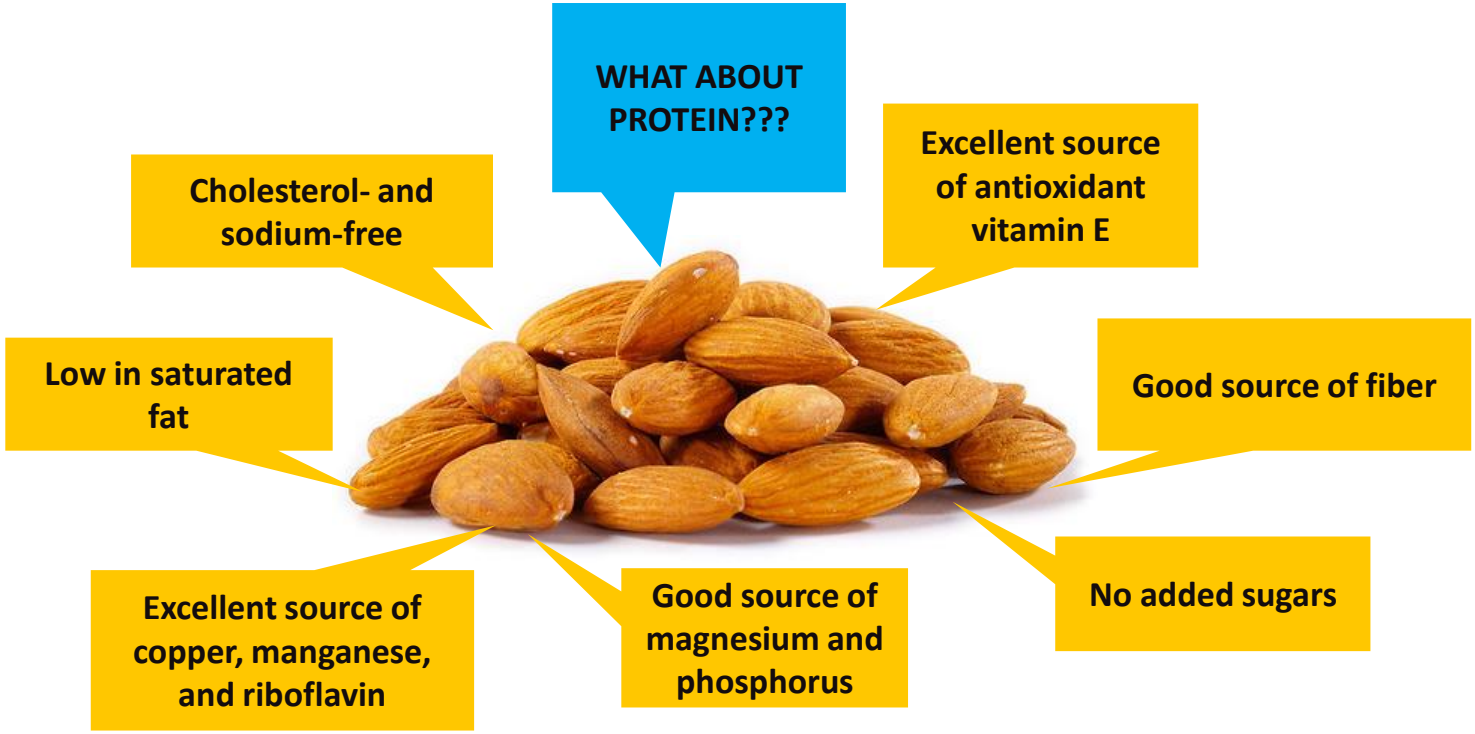
Regulations ensure that descriptive terms such as “high”, “good source of”, or “more” are used consistently.

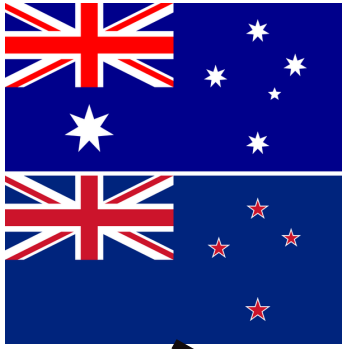
STRUCTURE/FUNCTION CLAIMS

Describe the role of a nutrient in the maintenance of normal body structures and functions.

Are regulated in some countries (*e.g.,* European Union, Australia/New Zealand, Canada, South Korea), but not in others (*e.g.,* United States).

POTENTIAL NUTRIENT CONTENT CLAIMS FOR ALMONDS





What nutrient content and structure/function claims can we make for protein from almonds?

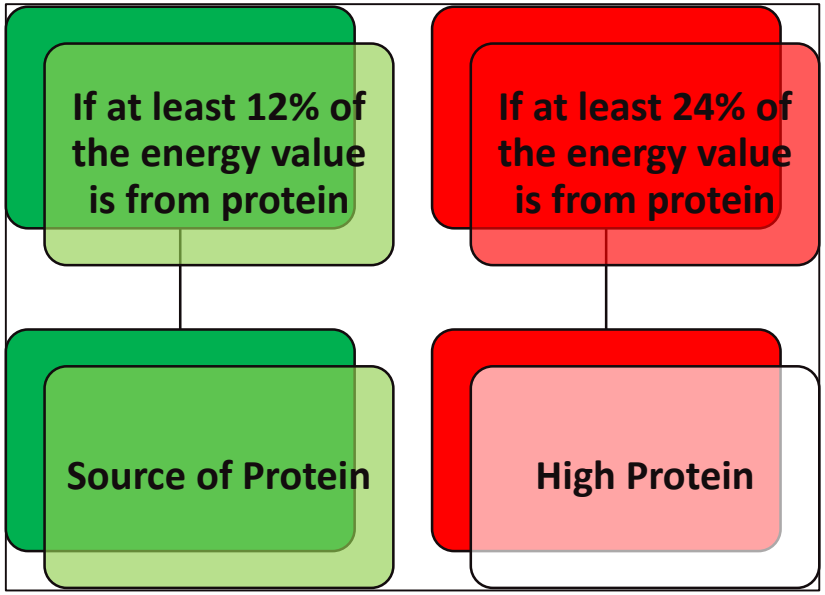
LEGEND

- Red or ✗: protein claim **cannot** be made for almonds.
- Green or ✓: protein claim **can** be made for almonds.

EUROPE

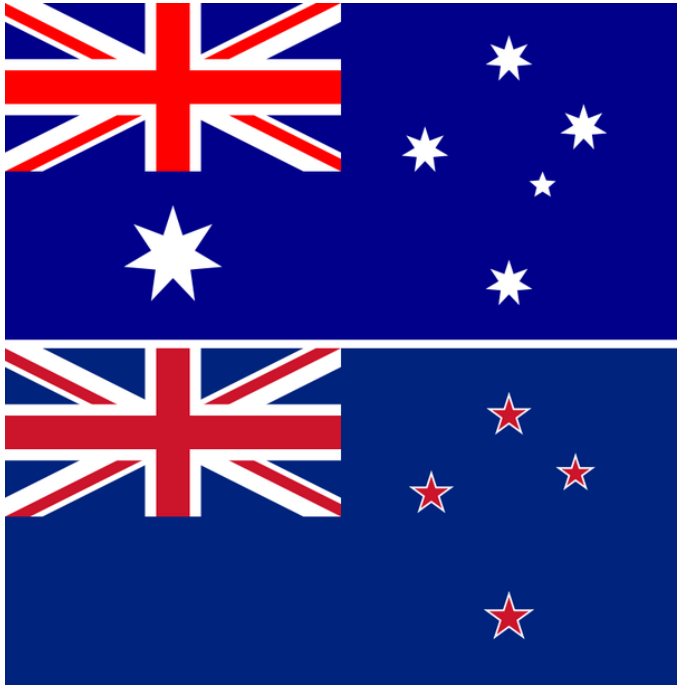
EU – CRITERIA FOR MAKING PROTEIN CLAIMS

15% of the energy value of almonds is from protein.



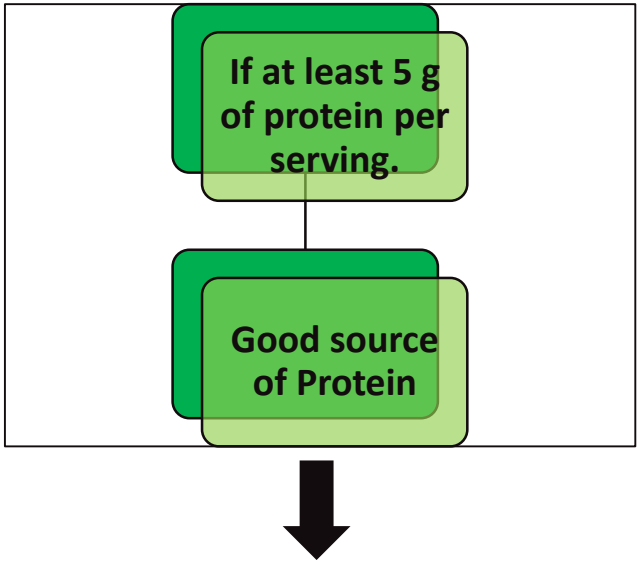
- ✓ Protein contributes to a growth in muscle mass.
- ✓ Protein contributes to the maintenance of muscle mass.
- ✓ Protein contributes to the maintenance of normal bones.

AUSTRALIA/NEW ZEALAND



AUSTRALIA/NEW ZEALAND – CRITERIA FOR MAKING PROTEIN CLAIMS

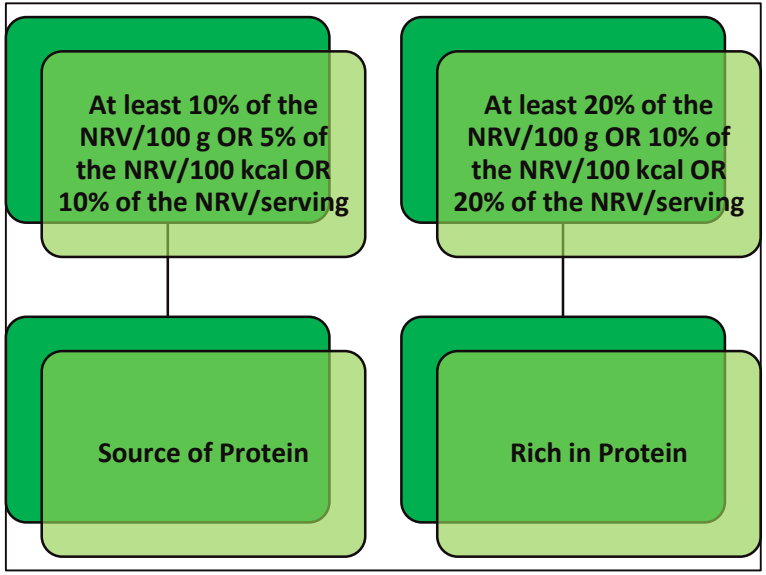
Each 28-gram serving of almonds provides approximately 6 grams of protein.



- ✓ Necessary for tissue building and repair.
- ✓ Necessary for normal growth and development (of bone) (children aged ≥4 years).
- ✓ Contributes to the growth of muscle mass.
- ✓ Contributes to the maintenance of muscle mass.
- ✓ Contributes to the maintenance of normal bones.

SOUTH KOREA

SOUTH KOREA – CRITERIA FOR MAKING PROTEIN CLAIMS



Almonds provide:

- **35%** of the protein NRV/100 g; or
- **6%** of the NRV/100 kcal; or
- **10.5%** of the NRV/30-gram. serving.

NRV = Nutrient Reference Value

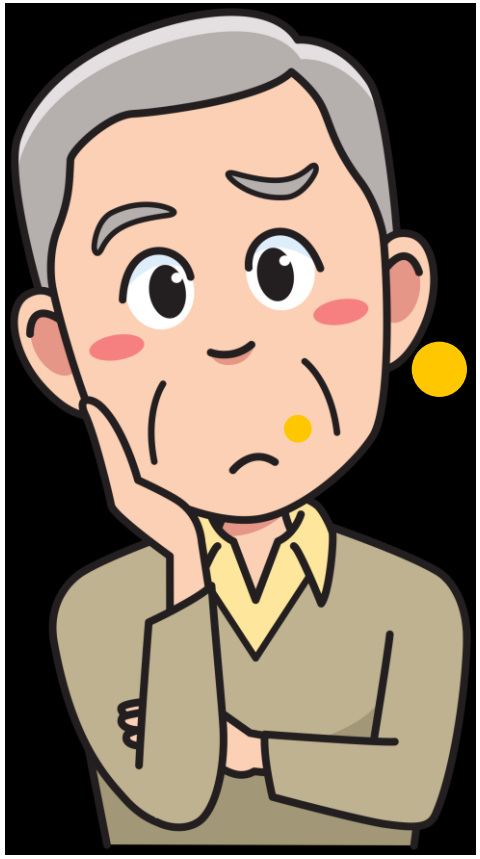
- ✓ Constituent of muscles, connective tissues, and other body components
- ✓ Essential for the production of enzymes, hormones, and antibodies
- ✓ Essential for the transport and storage of nutrients and other active substances
- ✓ Essential for the maintenance of bodily fluids and acid-base balance
- ✓ Essential for the synthesis of energy, glucose, and lipids.

UNITED STATES

NUTRIENT CONTENT CLAIMS FOR PROTEIN – U.S. REQUIREMENTS

- The declaration of the % Daily Value (DV) for protein is **mandatory** only if:
  - A protein content claim is made for the product (*e.g., "*source of protein"); or
  - The product is intended for infants and children under 4 years of age.
- Otherwise, the declaration of the %DV for protein is **voluntary**.

%DV FOR PROTEIN



Why not include the %DV for protein on the Nutrition Facts label???

BECAUSE….YOU HAVE TO FACTOR IN THE QUALITY OF THE PROTEIN…AND THIS CAN BE EXPENSIVE

Protein Quality

- Are all 9 essential amino acids present?
- Are their levels sufficient to support the growth of pre-school aged children?
- Even after considering digestibility?

PROTEIN QUALITY OF ALMONDS

Amino Acid	Level in Almonds (mg/g of protein)[a]	Amino Acid Pattern for Pre-school Aged Children (mg/g Protein)	Amino Acid Score
Threonine	2.49	3.4	0.732
Valine	2.89	3.5	0.827
Methionine+Cysteine	2.05	2.5	0.819
Isoleucine	2.59	2.8	0.924
Leucine	5.76	6.6	0.872
Phenylalanine+Tyrosine	7.25	6.3	1.150
Histidine	1.86	1.9	0.980
Lysine	2.67	5.8	0.460
Tryptophan	0.92	1.1	0.833

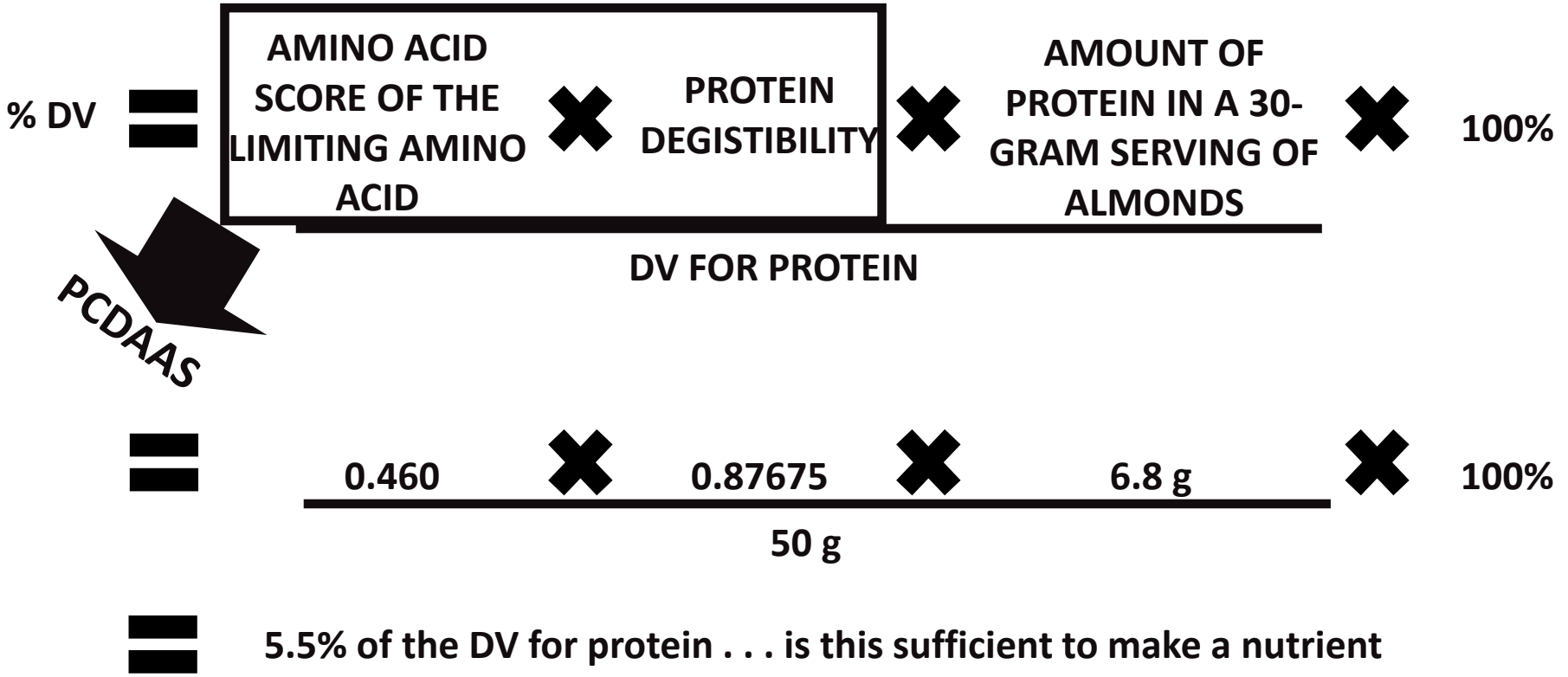
Amino Acid Score of Limiting Amino Acid

[a] Average for 4 varieties of almonds, including Butte, Independence, Monterrey, and Nonpareil; based on unpublished data from the lab of Dr. James House, University of Manitoba.

DIGESTIBILITY OF PROTEIN IN ALMONDS

- Assessed by examining the amount of protein consumed from almonds *versus* the amount of protein excreted in feces.
- Animal studies are used to estimate this value.
- Based on unpublished data from the laboratory of Dr. James House (University of Manitoba), the digestibility of almond protein is approximately **88%** (average for 4 varieties – Butte, Independence, Monterrey, and Nonpareil).
- Protein Digestibility Corrected Amino Acid Score (**PDCAAS**) for almonds:
  Limiting Amino Acid X Digestibility = **0.4033**

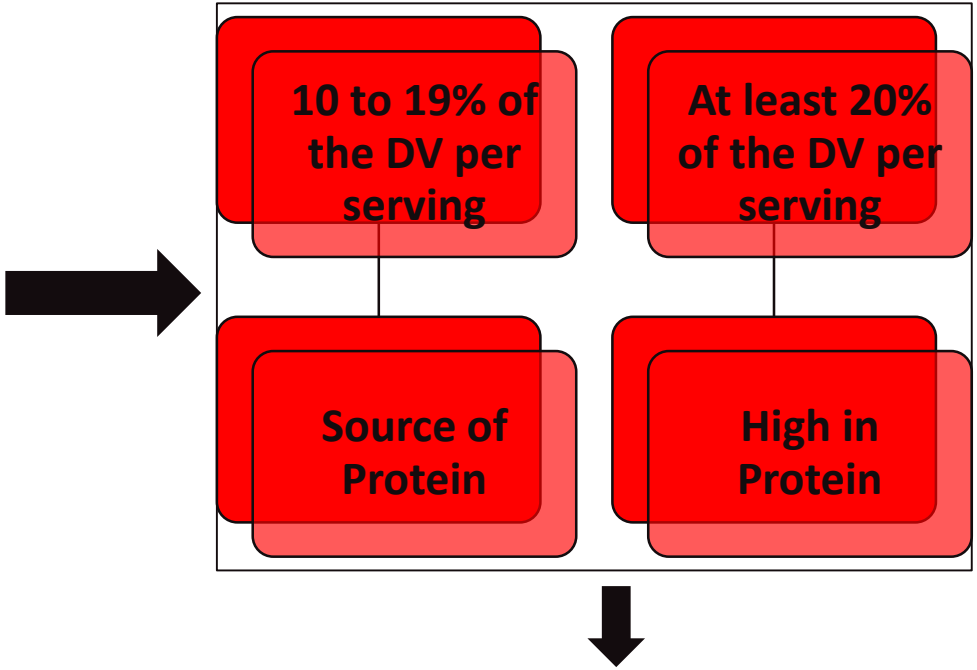
WHAT IS THE CONTRIBUTION OF ONE 30-GRAM SERVING OF ALMONDS TO THE DV



UNITED STATES – CRITERIA FOR MAKING PROTEIN CLAIMS

Almonds provide:

- **5.5% of the DV for protein per 30-gram serving.**

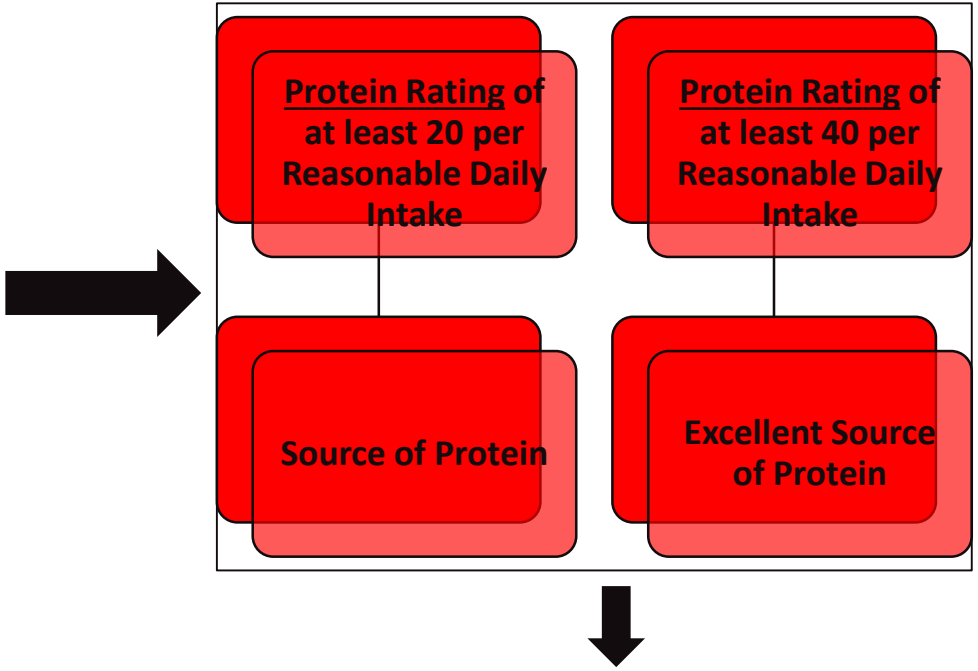


✘ **Scientifically substantiated claims related to the roll of protein in the maintenance of bodily structures or functions.**

CANADA

CANADA – CRITERIA FOR MAKING PROTEIN CLAIMS

Protein Rating of Almonds per Reasonable Daily Intake: 6.4



- Protein helps build and repair body tissues.
- Protein helps build antibodies.
- Protein helps build strong muscles.

WHAT IS THE PROTEIN RATING???

Protein Rating = **PROTEIN EFFICIENCY RATIO (PER)** × **PROTEIN CONTENT OF ALMONDS** × **REASONABLE DAILY INTAKE OF ALMONDS**

=  ×  × **28 GRAMS**

22.82%

1.008 [amount of weight gained (in grams) relative to amount of protein consumed (in grams) after 4 weeks by male weanling rats]

= **6.4**

CROSS-COUNTRY COMPARISONS

	European Union	South Korea	Australia/ New Zealand	United States	Canada
Protein Quality Considered in making Claims	NO	NO	NO	YES	YES
Ability to label almonds as a source of protein	YES	YES	YES	NO	NO
Ability to label almonds with protein structure/ function claims	YES	YES	YES	NO	NO

CONCLUSIONS AND DISCUSSION

- There are limitations of using PDCAAS (U.S.) and PER (Canada).
- Neither is relevant to adults; PER is not even relevant to humans.
- For PDCAAS, the amino acid requirements of pre-school aged children were derived in 1981 in a limited number of 2-year-old children recovering from malnutrition.
- Both generally over-estimate the quality of animal proteins and under-estimate the quality of plant proteins for humans, particularly adult humans.
- Protein quality definitely is relevant to individuals who rely almost exclusively on one source of protein (*e.g.,* formula-fed infants, patients receiving enteral feeds); but, people typically rely on a variety of foods to meet their protein needs.
  - Why is protein quality assessed at the level of each individual food as opposed to the whole diet???

THE FUTURE OF PROTEIN CLAIMS IN CANADA

Commentary

An Appetite for Modernizing the Regulatory Framework for Protein Content Claims in Canada

Christopher P. F. Marinangeli [1,*], Samara Foisy [2], Anna K. Shoveller [3], Cara Porter [2], Kathy Musa-Veloso [4], John L. Sievenpiper [5,6,7,8] and David J. A. Jenkins [5,6,7,8]

Nutrients **2017**, *9*(9), 921; doi:10.3390/nu9090921

- Recommendations were made to either:
  - Drop the application of protein quality entirely in the determination of claim eligibility (similar to South Korea, Europe, and Australia/New Zealand); or
  - Adopt PDCAAS (to align with the U.S.), and have 3 cut-offs for protein content claims – source of (≥5% DV), good source of (≥10% DV), and excellent source of (≥20% DV) – in line with claims for fiber and vitamins and minerals, to create more opportunities for plant-based foods.
- Either option would result in the ability to claim almonds as a “source of protein”.

intertek
Total Quality. Assured.

THANK YOU!

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Director, Health Claims and Clinical Trials
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Intertek Scientific and Regulatory Consultancy
Tel: +1 905-542-2900 ext 293
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Beans Are Hot!
Global Trends in Plant-based Innovation

Janice MW Rueda, Ph.D.
Archer Daniels Midland Company

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Cell: 217-413-7346

WILD Flavors and Specialty Ingredients (WFSI) Extends ADM's Advantaged Portfolio into $50B Specialty Ingredients Space

Industry's broadest portfolio of on-trend ingredients

Addressing nutrition, function, texture and taste

Specialty Proteins

Flavors & Extracts

Nuts, Seeds, & Ancent Grains

Beans, Peas & Pasta

Nutritional Ingredients

Polyols & Specialty Sweeteners

Colors

Fiber

Mint

Emulsifiers

Hydrocolloids

Ingredient Systems & Bases

What is the role of the food industry?

Todd, Jessica E., Lisa Mancino, and Biing-Hwan Lin. *The Impact of Food Away From Home on Adult Diet Quality,* ERR-90, U.S. Department of Agriculture, Economic Research Service, February 2010.

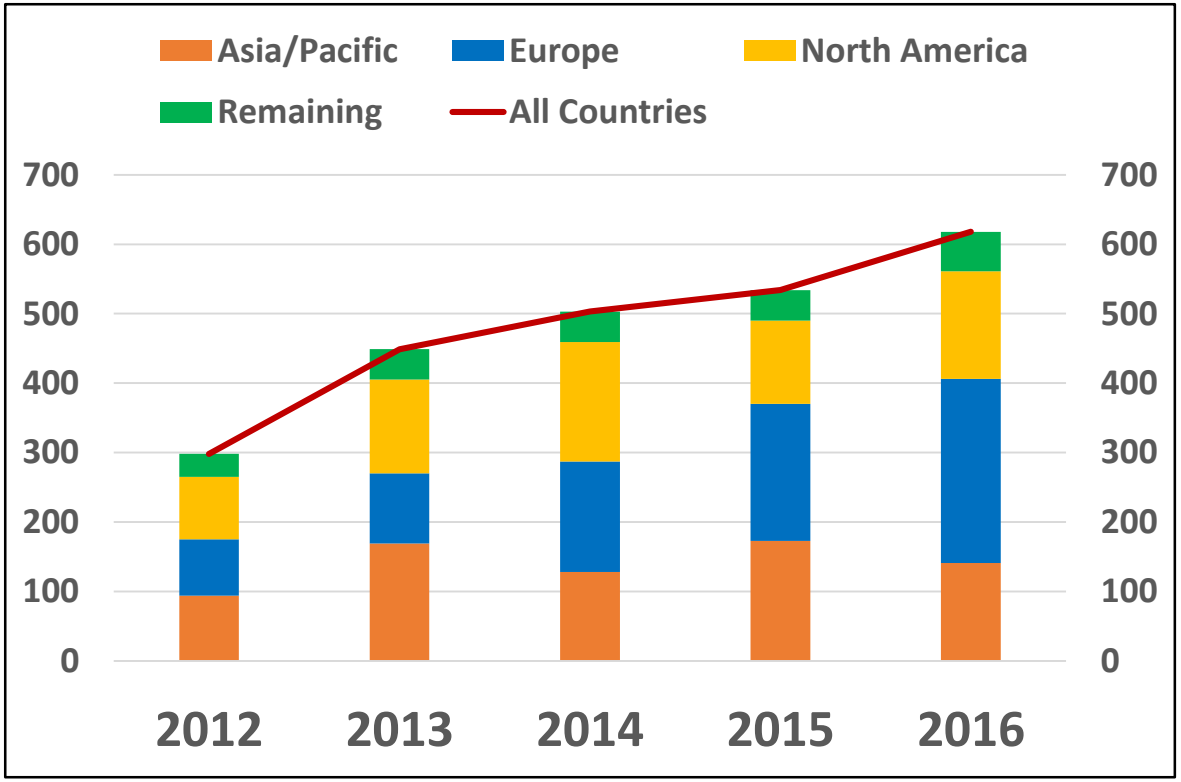
- 47% of food budget was for foods eaten outside of the home
- Eating one meal away from home per week = 2 lbs. weight gain per year!
- ↓ Fruit, whole grains, vegetables
- ↑ Total fat, saturated fat, sodium, added sugar

Protein Imparts Health Halo onto Snacks

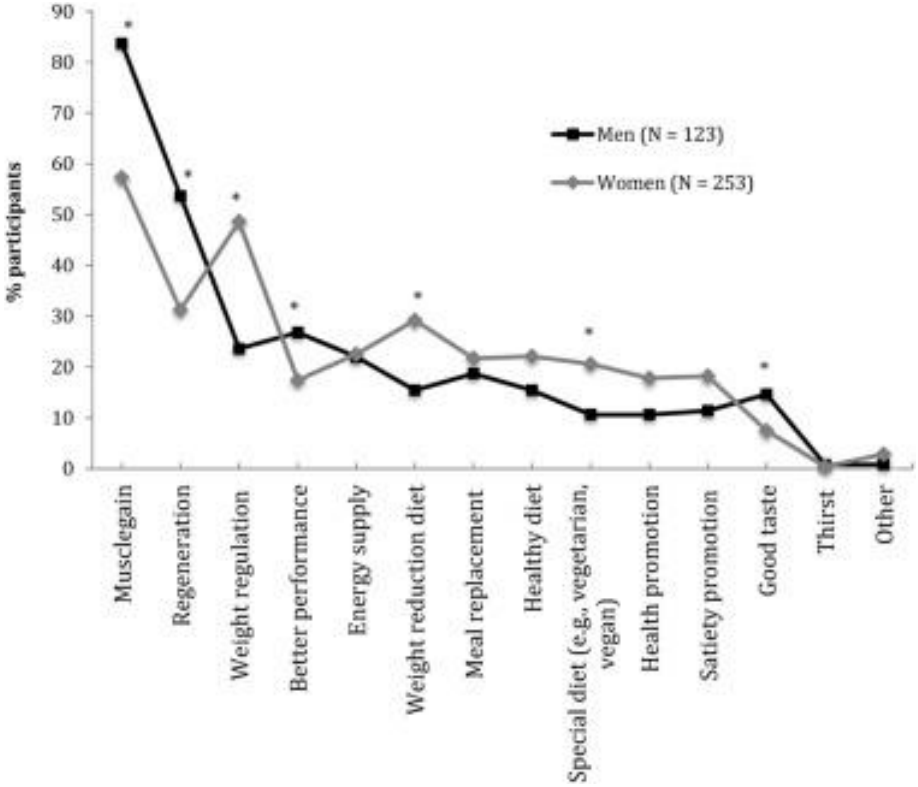
- >80% of consumers believe **plant-based proteins** add health and wellness attributes to snacks
- Nearly 65% of consumers believe protein is important
- High protein snacks are more important to women (65%) than men
- Consumers 25-34 years old reported highest interest in high protein snacks

ADM Outside Voice℠ Snacking Behavior Study, 2017

Global Product Launches: High Protein Snacks



Why Do Consumers Want More Protein?



Hartman, C. et al. (2016) *Appetite. 103:229-35* .

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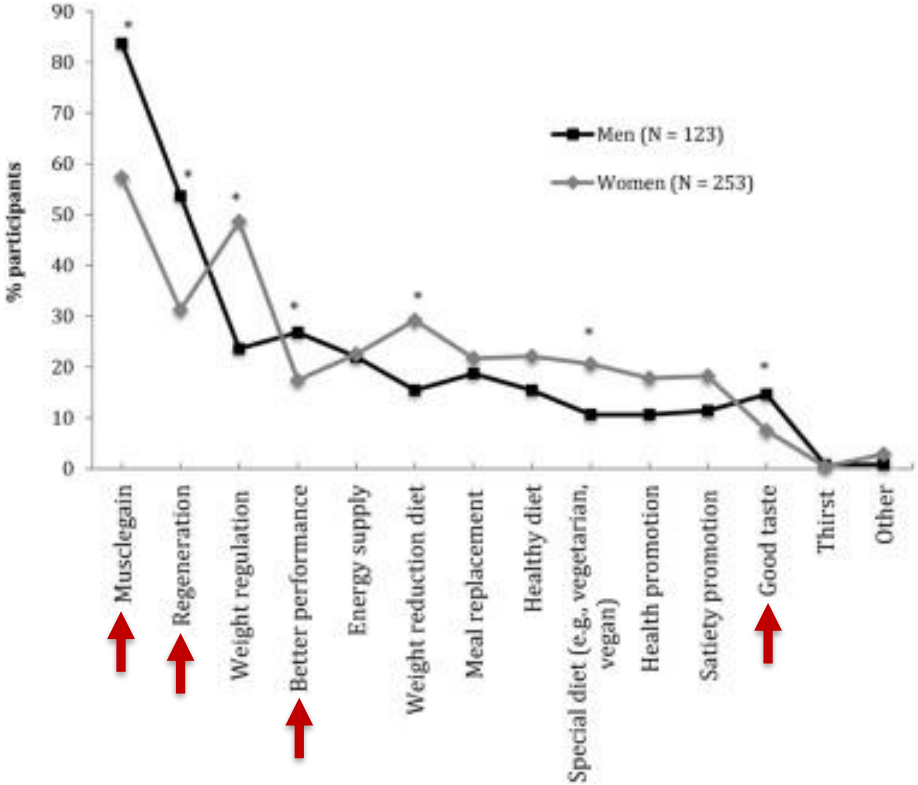

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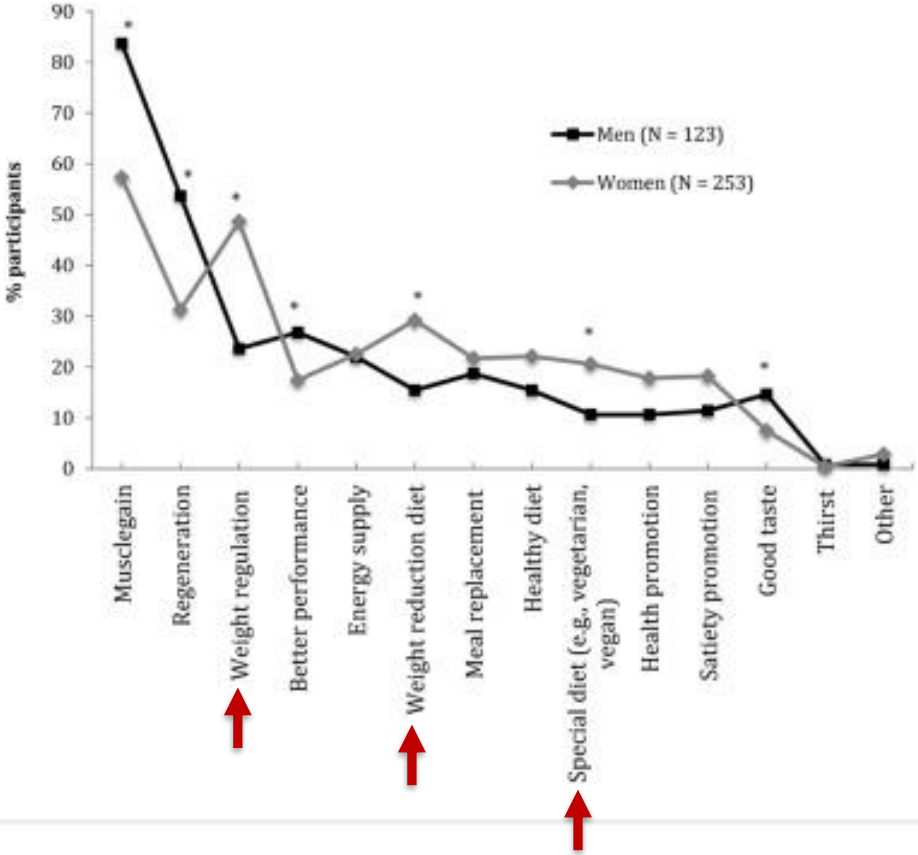


Hartman, C. et al. (2016) *Appetite. 103:229-35* .

Google: "Plant-based Protein"

Pepsi Exec: Plant Protein Will Spark a Sea of Change

By Anna Starostinetskaya | October 30, 2017

PLANT BASED FOODS ASSOCIATION

Business

Boosting its vegan bona fides, Campbell Soup joins Plant Based Foods Association

Updated: OCTOBER 30, 2017 — 4:26 PM EDT

Leonardo DiCaprio joins star-studded investor line up at Beyond Meat

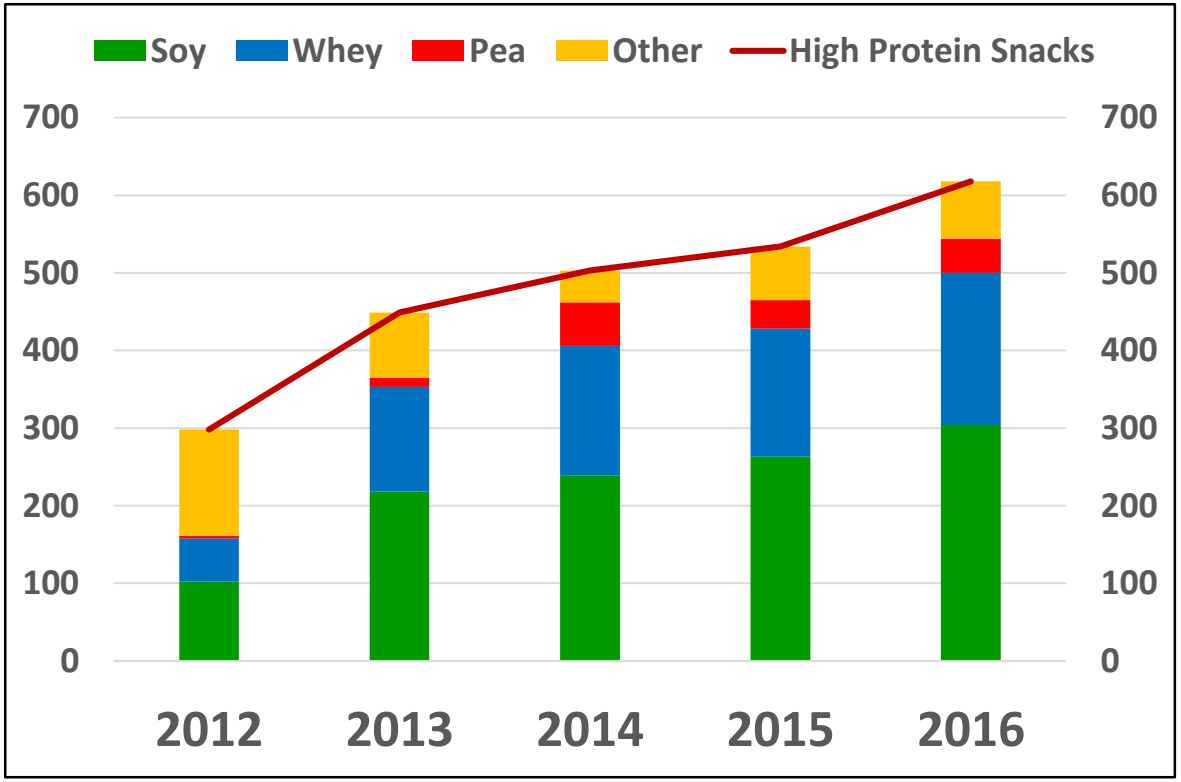
By Elaine Watson

18-Oct-2017 - Last updated on 18-Oct-2017 at 15:41 GMT

1 COMMENT

ADM

High Protein Snacks: Protein Ingredients

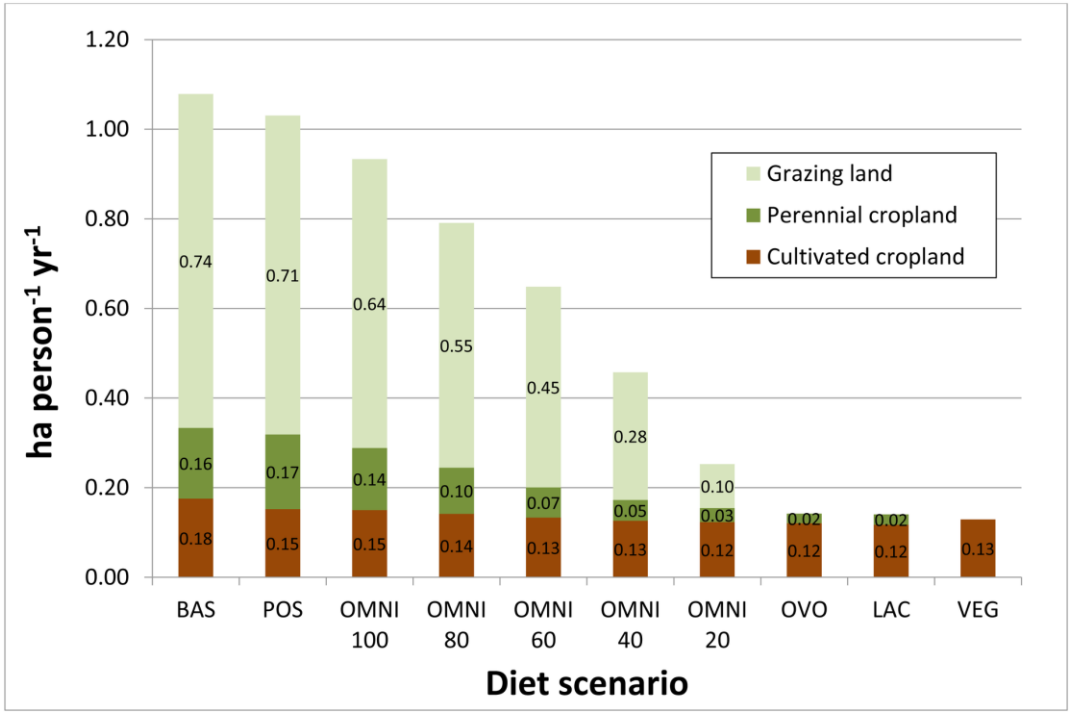


Are Plant-based Proteins Better for Health?

Potential beneficial effect of plant proteins	High blood pressure • ≥130 systolic mm Hg or • ≥85 diastolic mm Hg	Cardiovascular health
	Low HDL-cholesterolemia • <1.03 mmol/L in men • <1.29 mmol/L in women	
No differential effect	High triglyceridemia • ≥1.7 mmol/L	
	High glycemia • ≥5.6 mmol/L	Glucose homeostasis
	High waist circumference • ≥102 cm in men • ≥ 88 cm in women	Body composition

Chalvon-Demersay et al. (2017) *J. Nutr.* E-pub ahead of Print.

Plant-based Diets = Lower Land Use



Peters CJ, Picardy J, Darrouzet-Nardi AF, Wilkins JL, Griffin TS, Fick GW. Carrying capacity of U.S. agricultural land: Ten diet scenarios. Elem Sci Anth. 2016;4:116.

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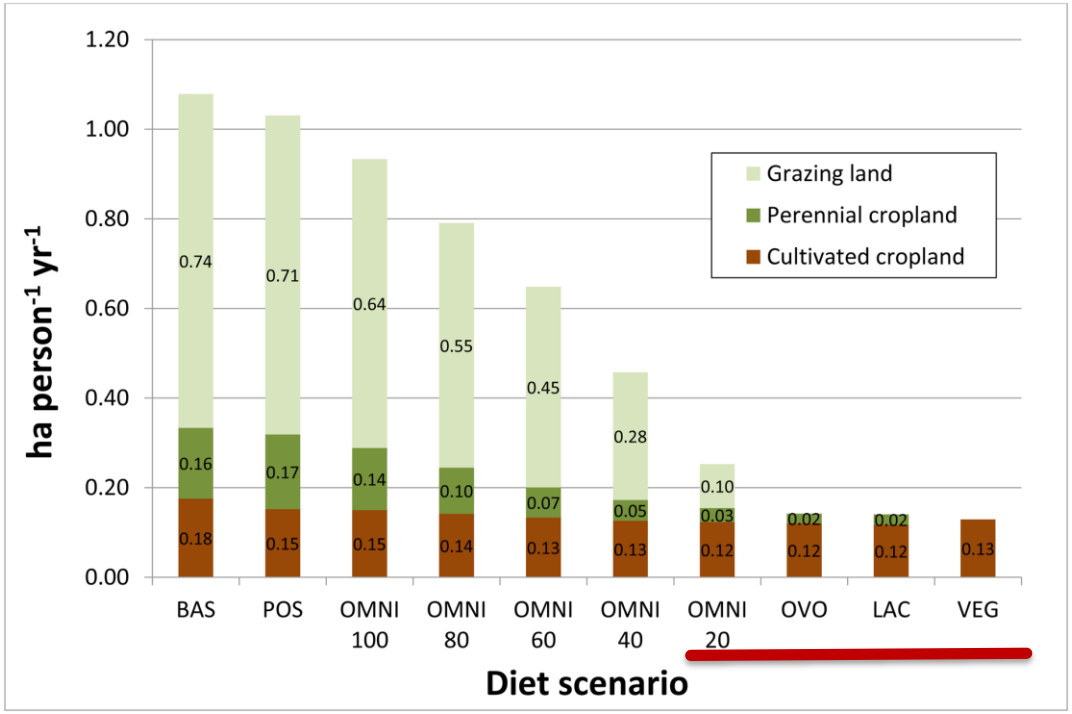

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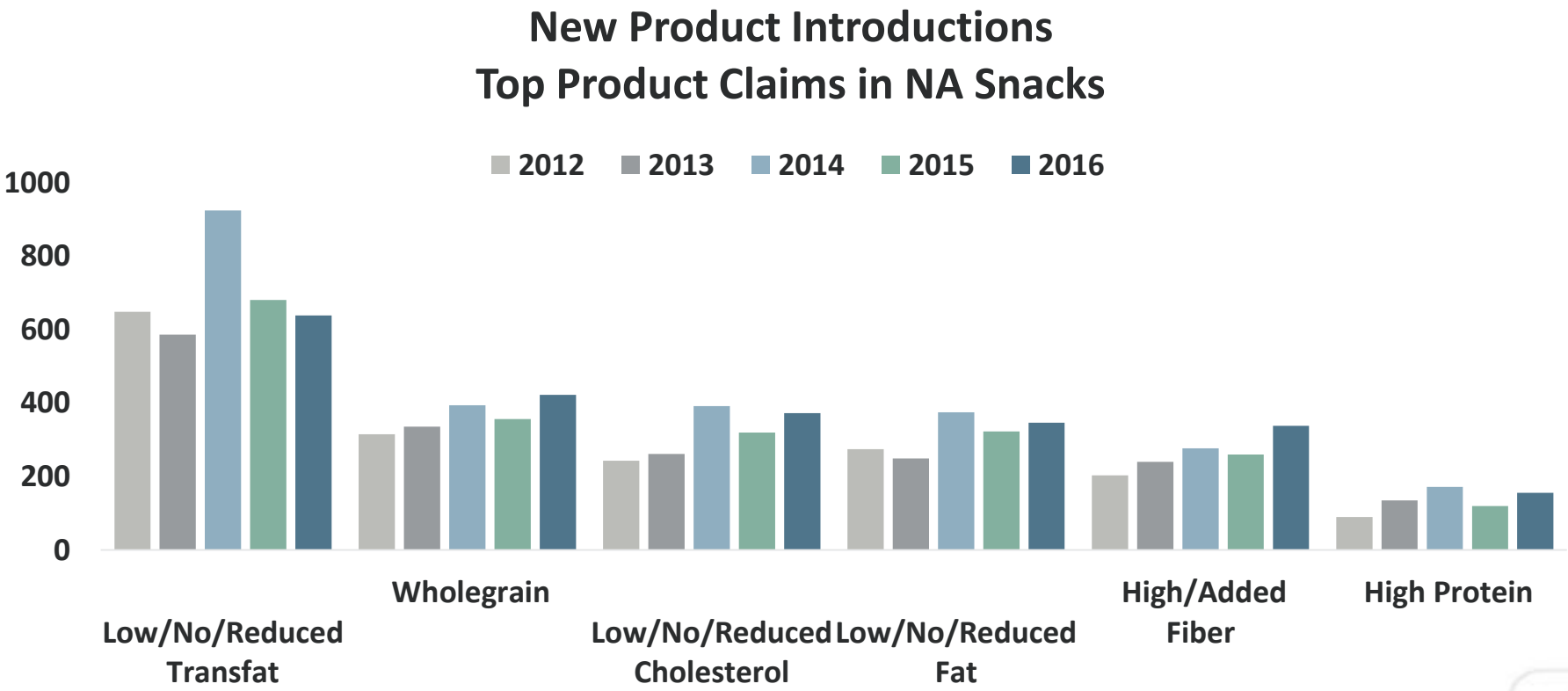
Why Just Innovate When You Can BeanOvate?

Nutrition Attributes As Purchase Drivers



Source: Mintel; n=~39k claims; Plant Based includes: vegan, vegetarian, no animal products

Beans Put the *BETTER* in "Better-for-You"

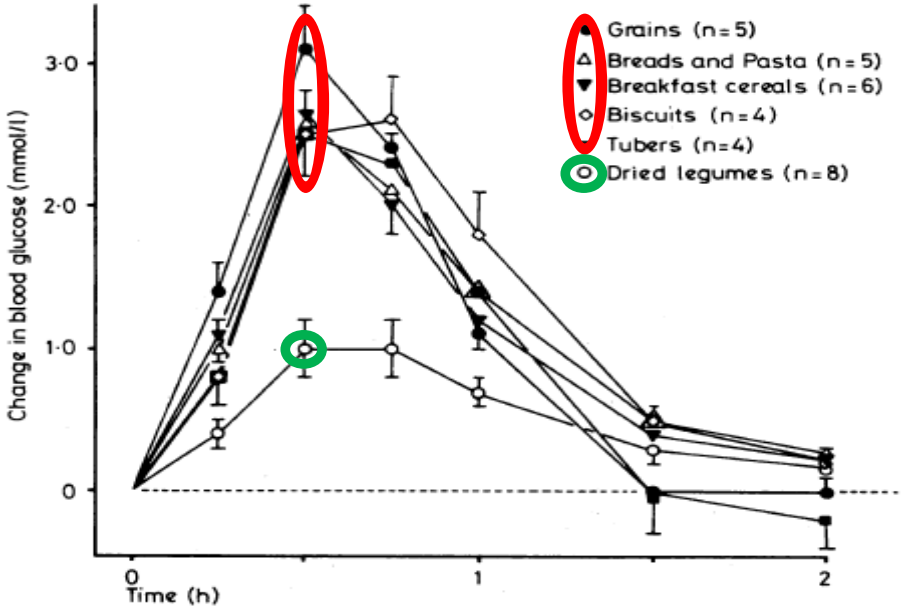
100g dry grain	Corn	Wheat	White Rice	Brown Rice	Quinoa	Navy Beans	Black Beans	Chickpeas
Calories	365	340	365	367	368	337	341	378
Fat (g)	5	2	0.6	3	6	2.7	2.6	7
Protein (g)	9.4	10.6	7	7.5	14	**21.3**	**22**	**20.3**
Carbohydrates (g)	74	75	80	76	64	69	66	65
Fiber (g)	7.3	**12.7**	1.3	3.6	7	**32.5**	**30.2**	**16.2**
Potassium (mg)	287	435	115	250	563	**1185**	**1483**	718
Iron (mg)	2.7	5.3	4.3	1.2	4.5	**5.5**	**5**	**4.3**
Magnesium (mg)	127	90	25	116	**197**	**175**	**171**	79

Data from the USDA National Nutrient Database/Medallion Labs

Highlighted Text ≥ 20% DV Bold text ≥ 10% DV

ADM

Not All Carbs Are Created Equal



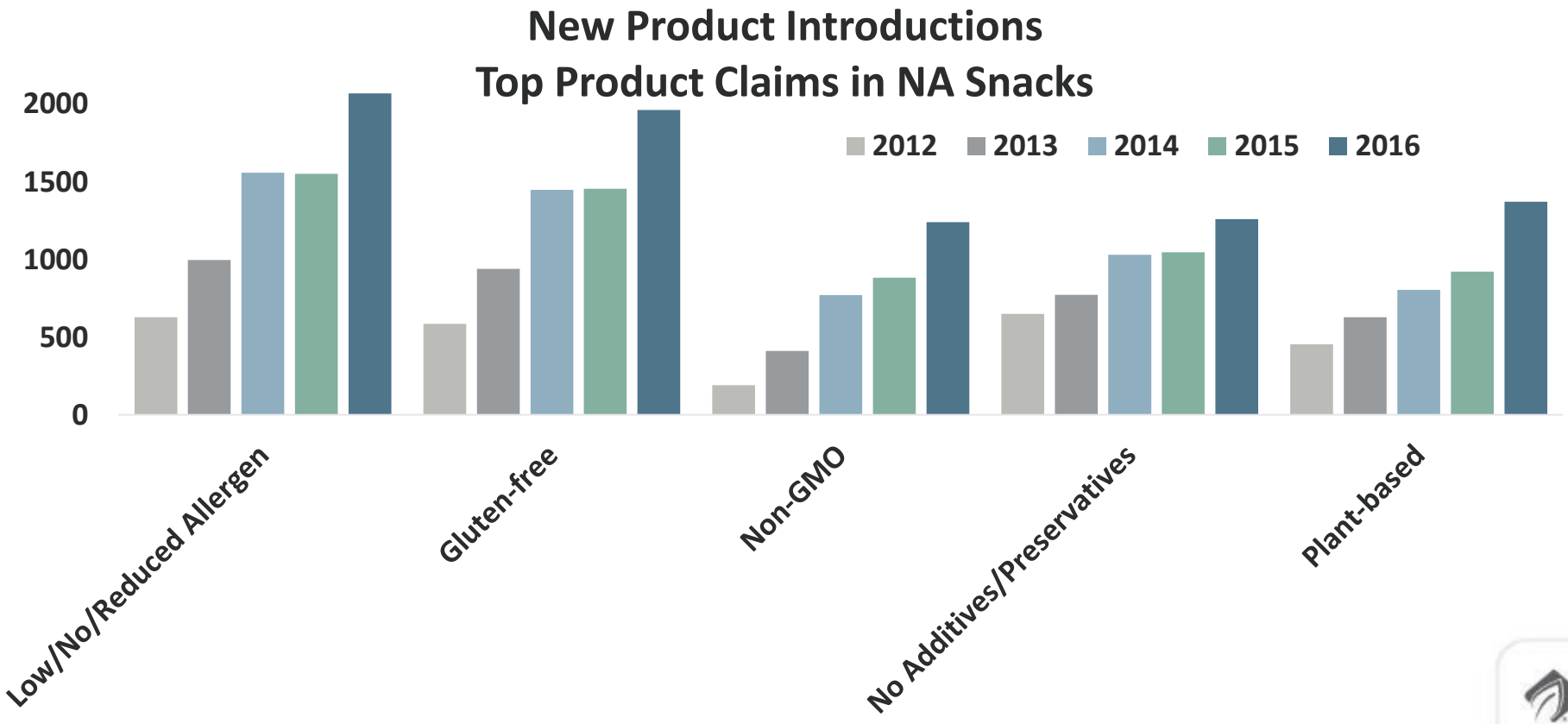
Change in blood glucose concentration after eating 50-g carbohydrate portions of individual grains, breads and pasta, breakfast cereals, biscuits, tubers, and dried legumes.
Conversion: SI to traditional units— Glucose: 1 mmol/l ≈ 18 mg/100 ml.

Many Health Benefits

- Low GI → "Second meal effect"
- SCFA production → stable GLU
- Prebiotic: high fiber & resistant starch
- High antioxidant phytochemicals
- Many studies show high satiety effect

Jenkins, DJA, *et al*. (1980) BMJ. 281(6240): 578-580.
McCrory, MA, *et al.* (2010) Adv Nut. 1: 17-30.

Lifestyle Attributes As Purchase Drivers



Source: Mintel; n=~39k claims; Plant Based includes: vegan, vegetarian, no animal products

Beans: All of Today's Trends In One Whole Food Ingredient

ECO-FRIENDLY

- Beans are vital to sustainable agriculture systems
- Grown in rotation with staple crops, beans reduce fertilizer and water input
- GMO-free
- USA-grown

CLEAN-LABEL

- Whole beans are cooked, dehydrated and ground
- Process mimics home cooking
- Solvent-free
- No allergen statement
- Gluten-free

- Extrusion
- Sheeted Snacks
- Baking & Mixes
- Beverages
- Meats & Meals

High water binding, neutral flavor/color

HIGH VERSATILITY

- High fiber
- High protein
- High potassium
- Makes the health benefits of beans easy and delicious for consumers to enjoy

EASY NUTRITION

Non-GMO

Non-Allergen

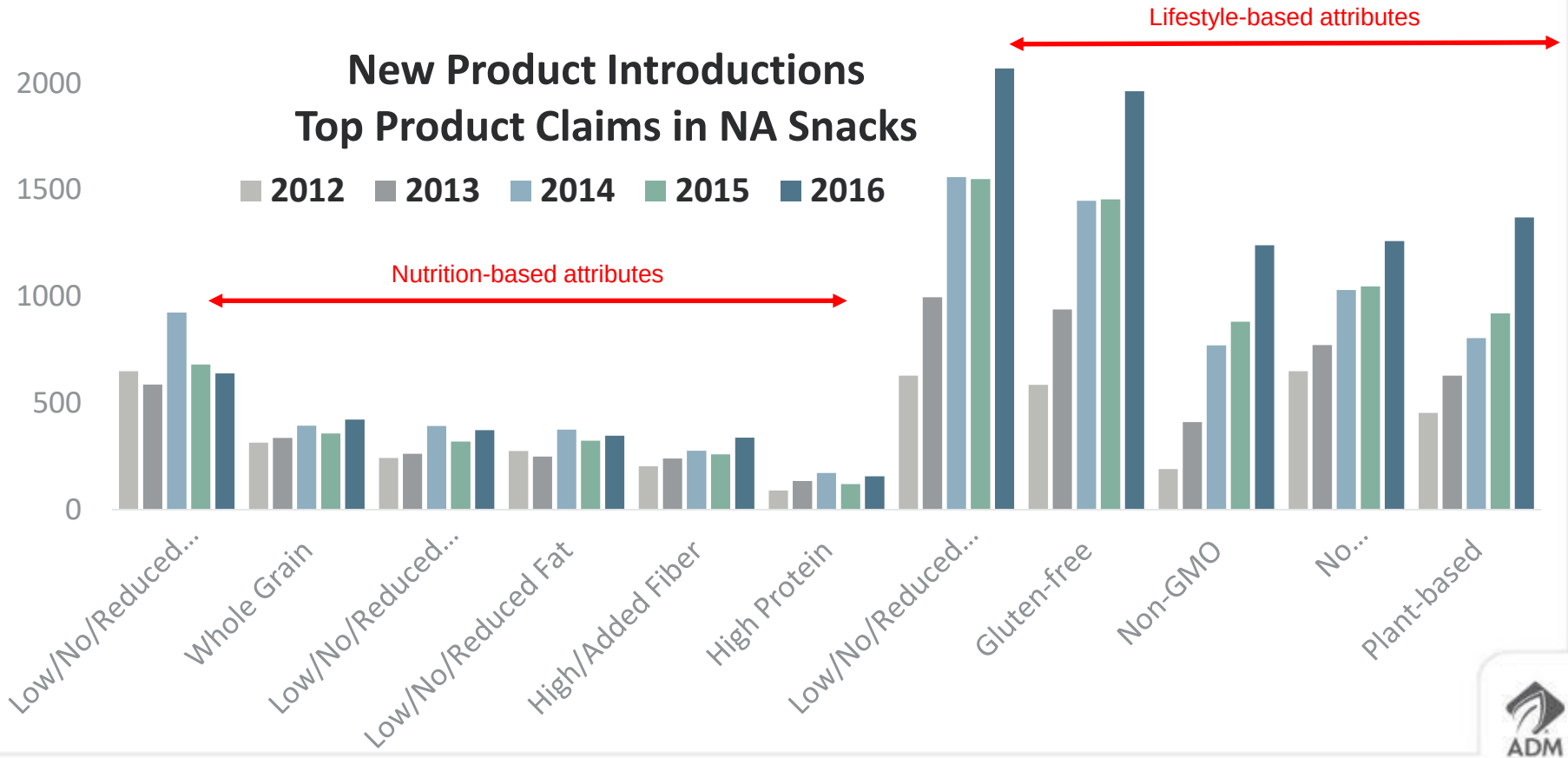
Gluten Free

Whole Food

Plant Based

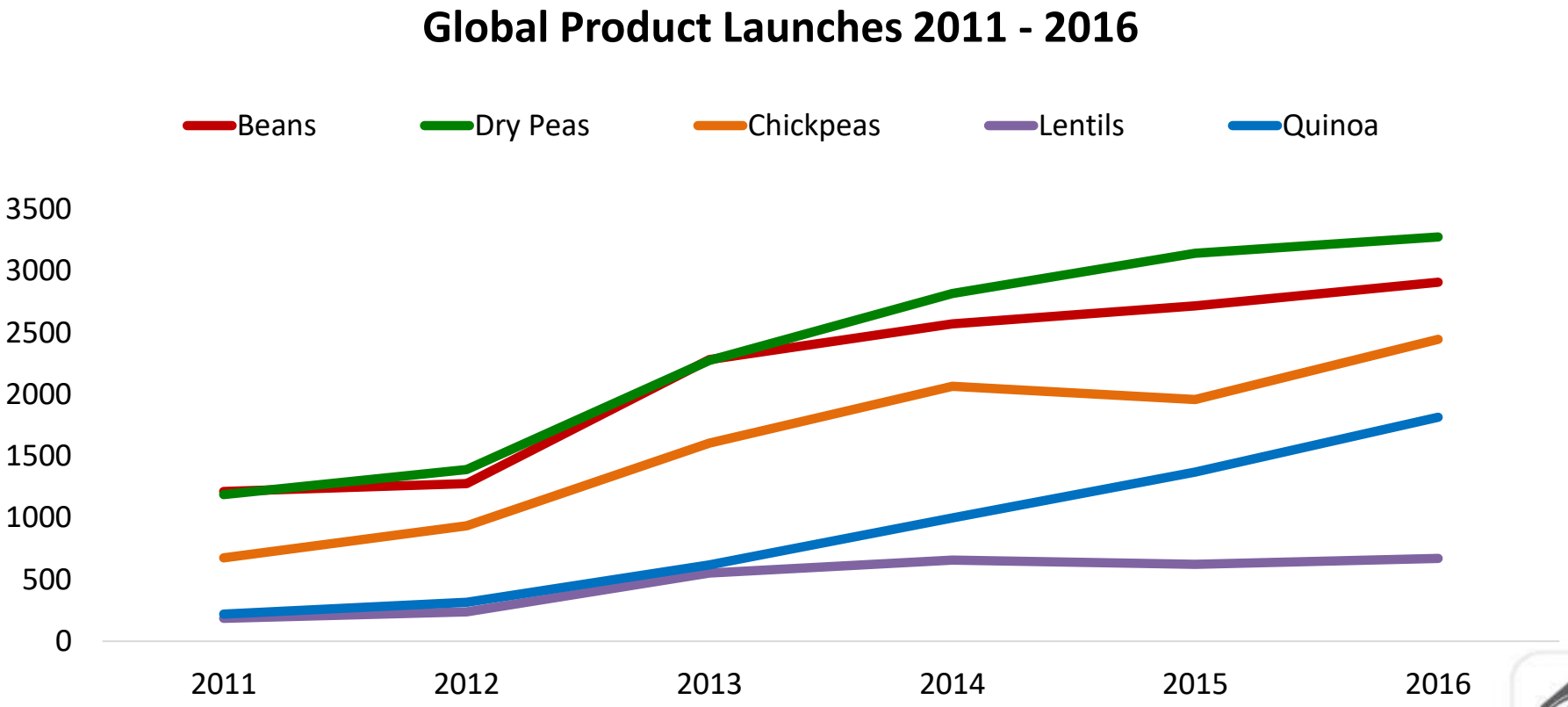
ADM

Lifestyle Attributes More Influential Drivers



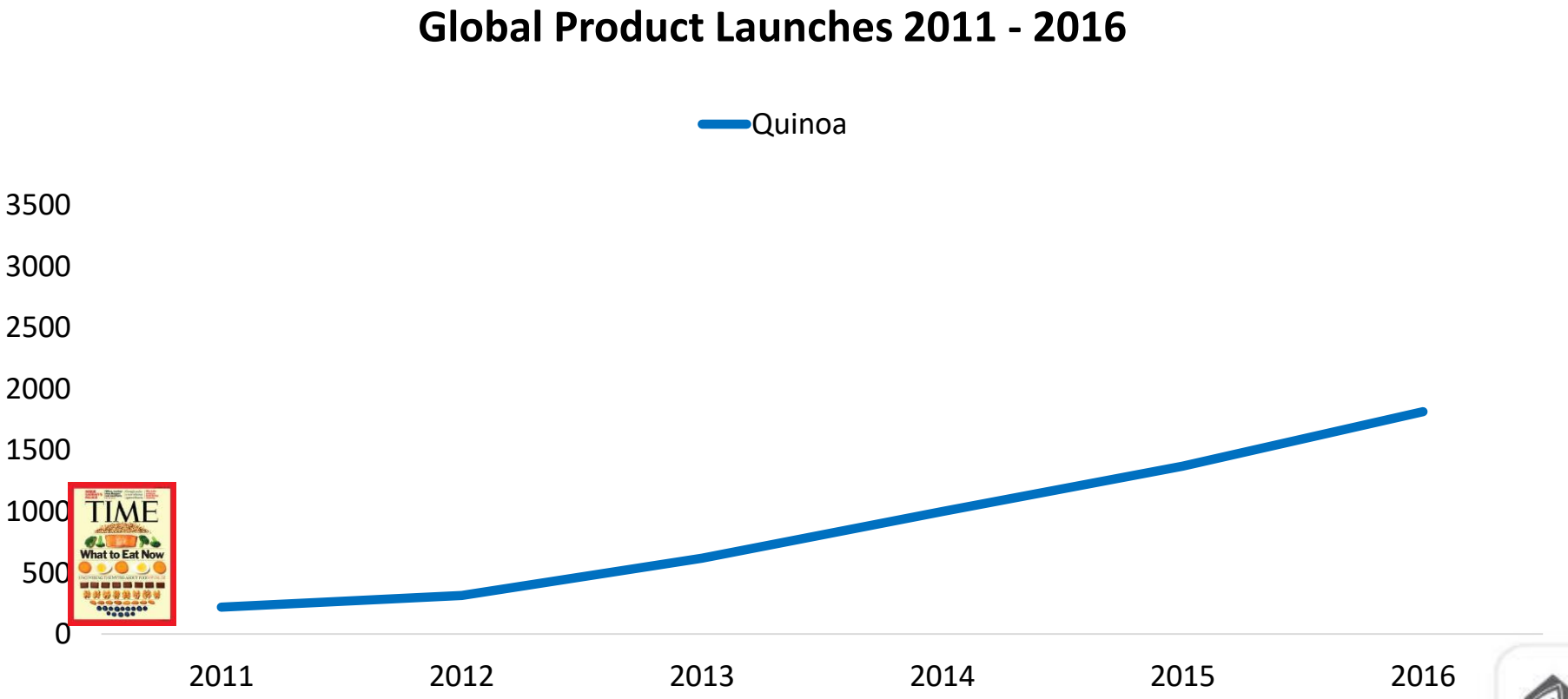
Source: Mintel; n=~39k claims; Plant Based includes: vegan, vegetarian, no animal products

Quinoa Set the Trend – How do beans compare?



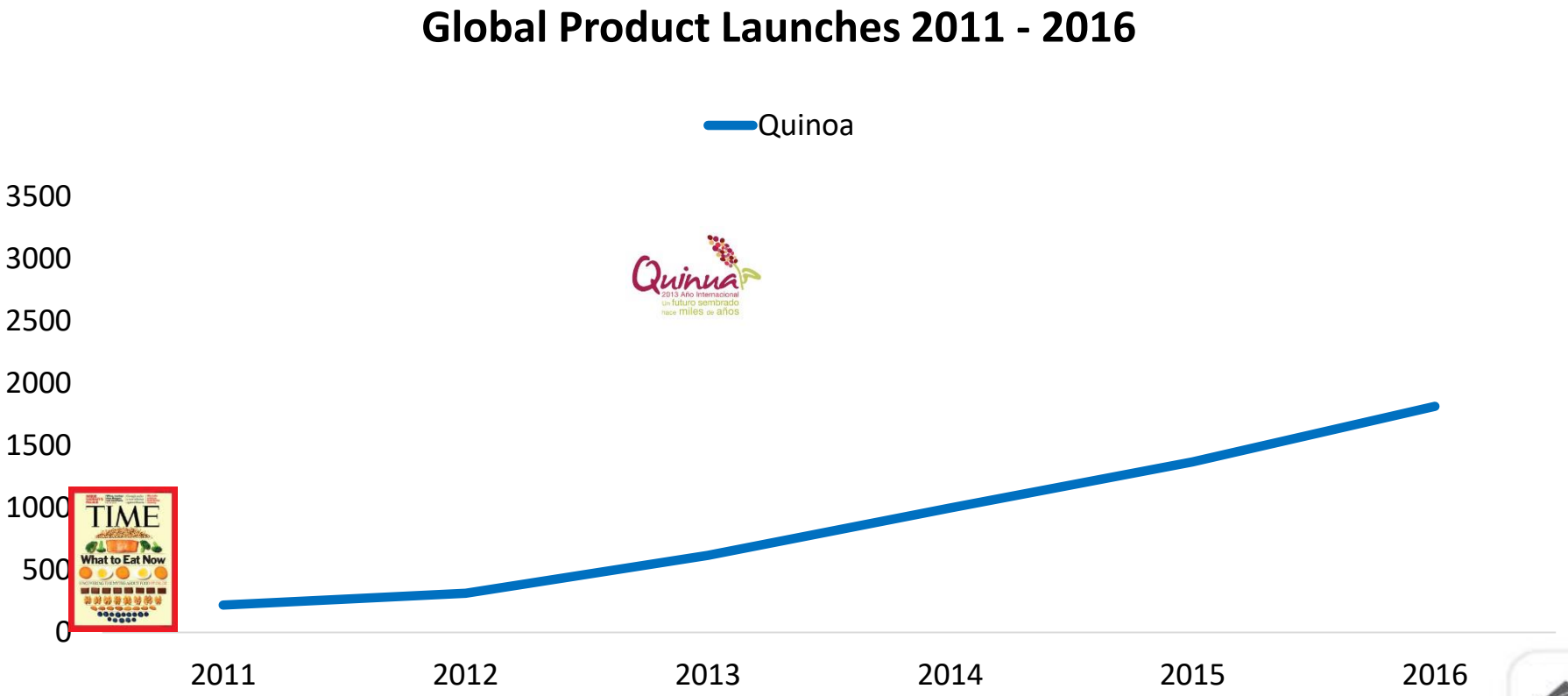
Source: Mintel; n=~1000k NPL

Quinoa: A closer look



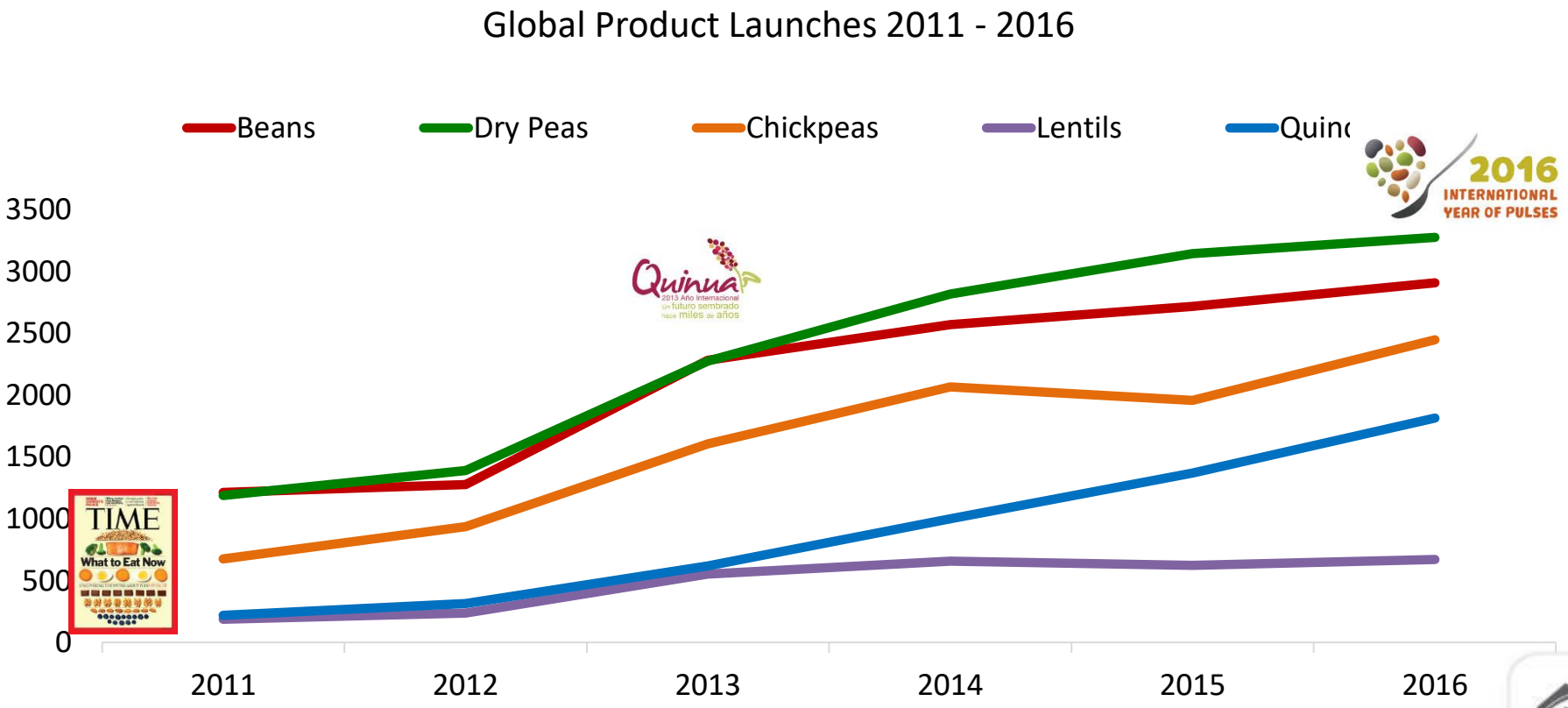
Source: Mintel; n=~1000k NPL

Quinoa: A closer look



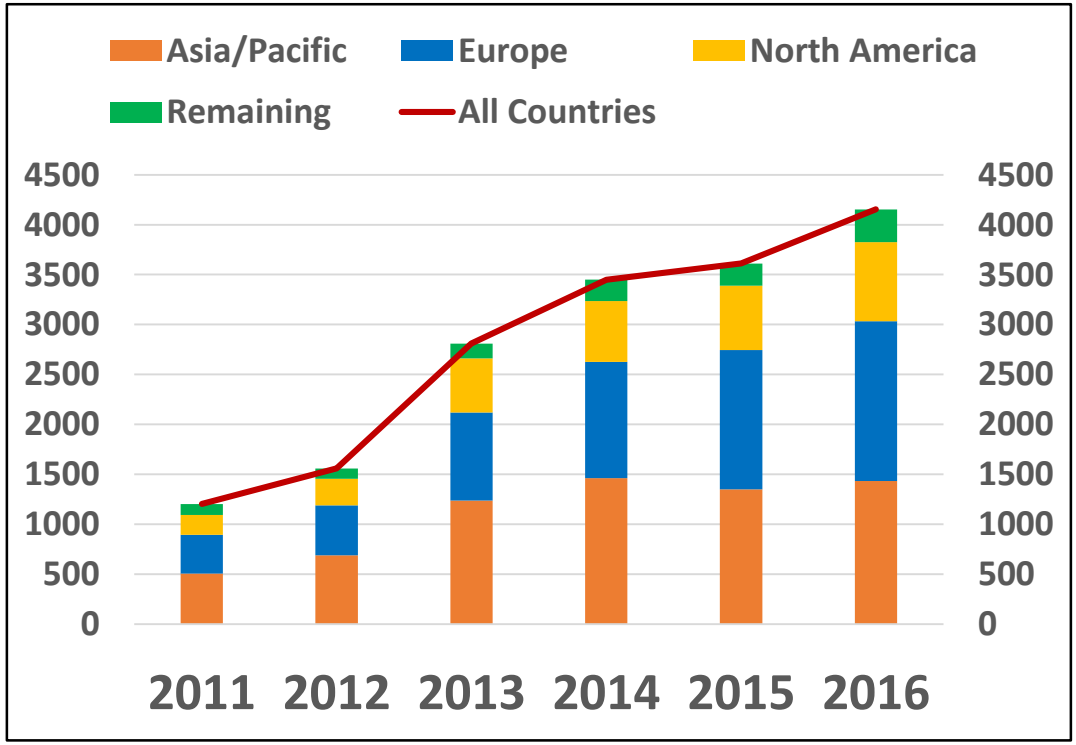
Source: Mintel; n=~1000k NPL

Beans are poised for similar growth



Source: Mintel; n=~1000k NPL

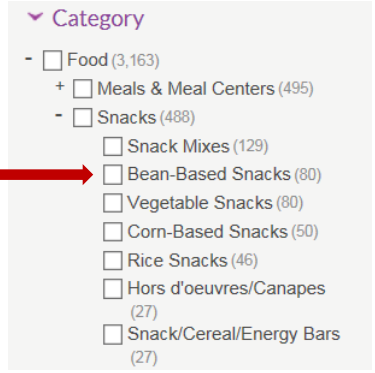
Global “Pulse” Product Launches: 2011-2016



Category	Global Launches[1]	2011-16 CAGR
Snacks	3537	21%
Meals	3121	24%
Fruit & Vegetables	2775	25%
Savory Spreads	1716	28%
Bakery	1646	17%

1: Mintel GNPD, All pulse product launches 2005-2016

2017



The Possibilities Are Endless

Exciting Trends in BeanOvation

ADM

Beans + Almonds = NEW OPPORTUNITIES

- ✓ Complimentary Amino Acid Profiles
- ✓ Complimentary Health Messages
- ✓ Product Differentiation Potential

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Thank you!


california
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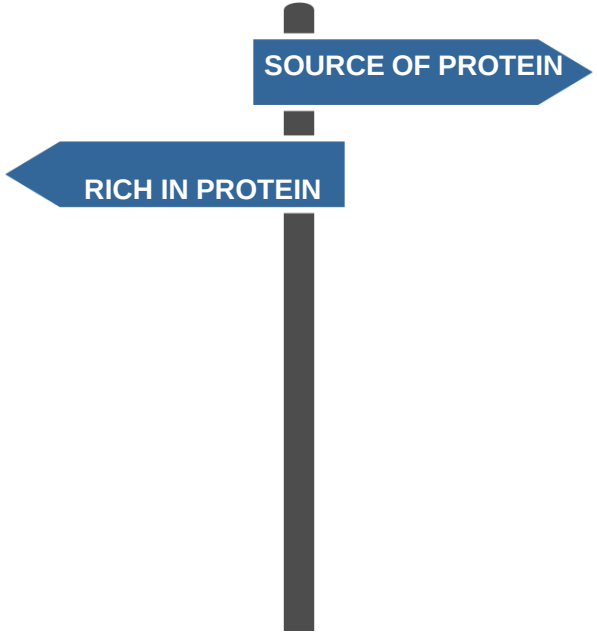
Almond Board of California


growing
ADVANTAGE
The Almond Conference

ALMOND PROTEIN CLAIMS
Potential Avenues for the US market

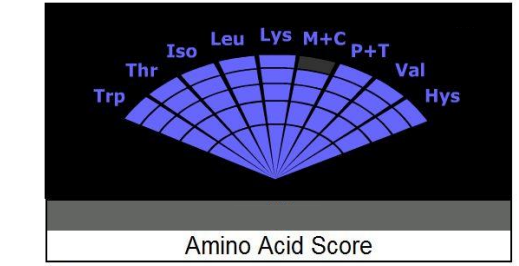


Dr. Swati Kalgaonkar
Senior Manager, Nutrition Research Program

Almond Protein update: A quick recap

Limiting AA score
+ Protein Digestibility

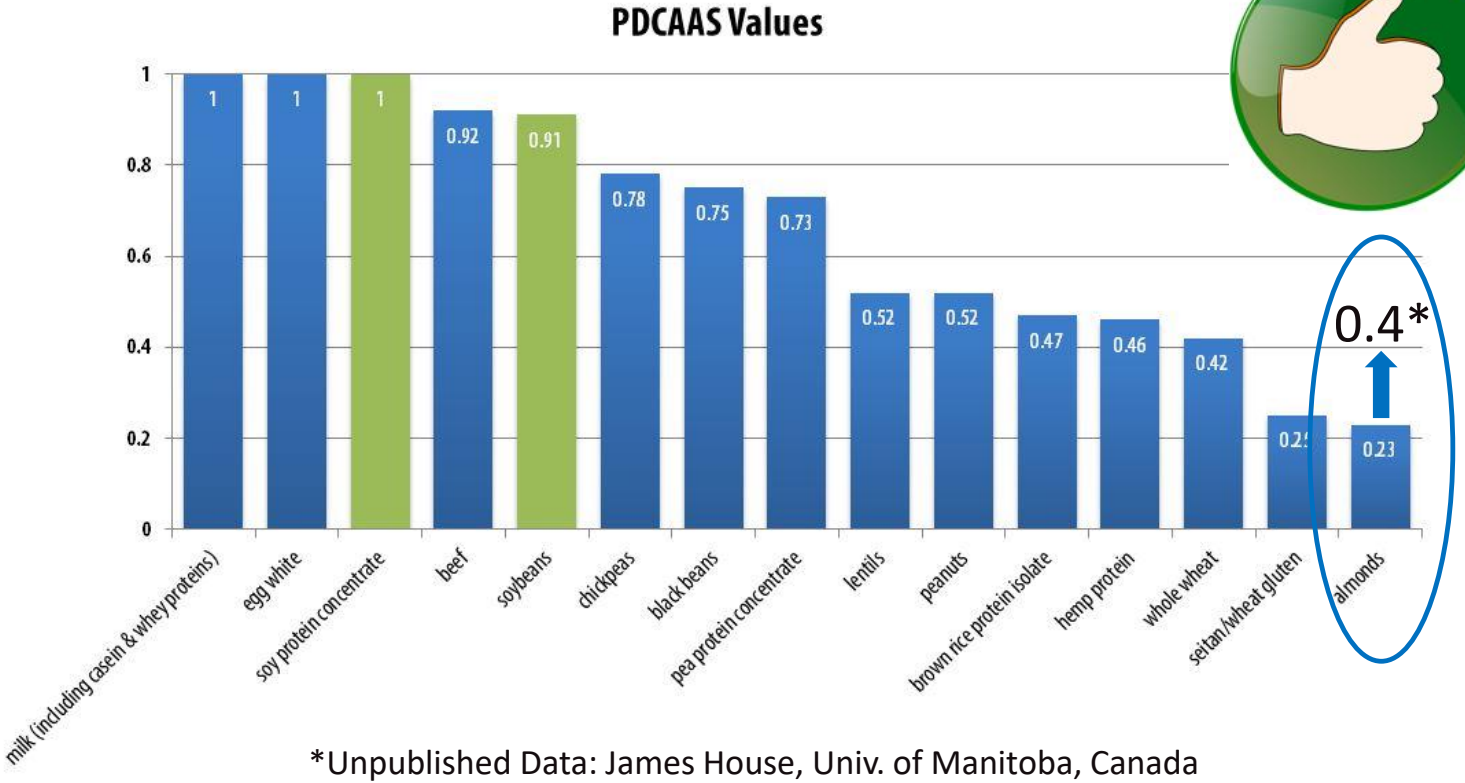
= PDCAAS



Increase in %DV:
2.88% to 5.5% !!

When Claiming

Protein quality of almonds:
Newer method reveals twice the value!!



*Unpublished Data: James House, Univ. of Manitoba, Canada

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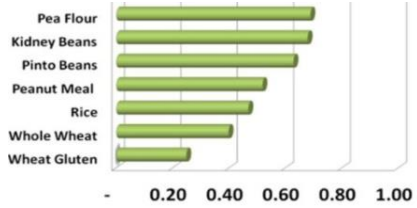
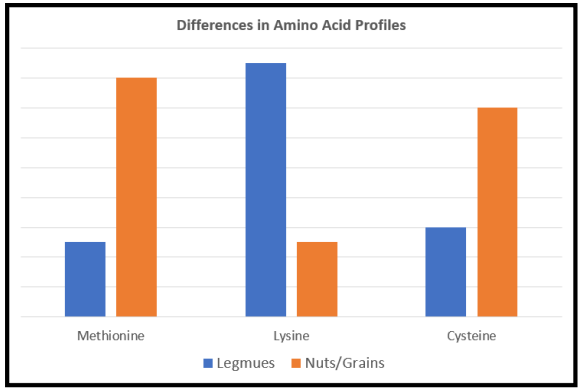
Where do we go from here?

PDCAAS Values of some other plant proteins:





Almond amino acid profile:

Amino Acid	Level in Almonds (mg/g of protein)[a]	Amino Acid Pattern for Pre-school Aged Children (mg/g Protein)	Amino Acid Score
Threonine	2.49	3.4	0.732
Valine	2.89	3.5	0.827
Methionine+Cysteine	2.05	2.5	0.819
Isoleucine	2.59	2.8	0.924
Leucine	5.76	6.6	0.872
Phenylalanine+Tyrosine	7.25	6.3	1.150
Histidine	1.86	1.9	0.980
Lysine	2.67	5.8	0.460
Tryptophan	0.92	1.1	0.833

Limiting Amino Acid

- The amino acids that are most limited in plant proteins are lysine, methionine, and cysteine.
- Legumes tend to be deficient in methionine and cysteine.
- Grains, nuts, and seeds can be deficient in lysine but high in methionine and cysteine.

Complementary Proteins

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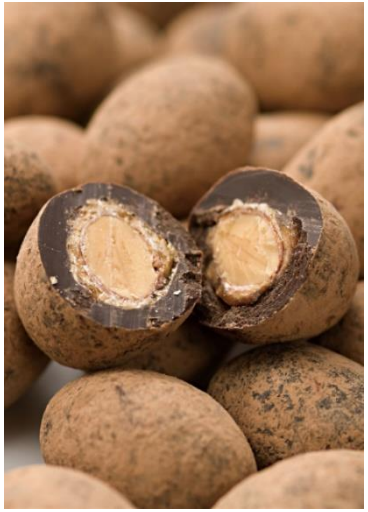
Future protein claim potential: plant protein partnership (P^3)







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Future potential: extrude & combine with complimentary protein

Protein

Extrusion

TEXTURED PROTEIN EXTRUSION AND ITS VARIOUS APPLICATIONS

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Summary

- Almond PDCAAS reassessed
- New data has higher potential
- Plant-protein partnership is of the essence.

Potential Next Steps

- Data publication
- USDA database update
- Exploration of various avenues

What's Next

Tuesday, December 5 at 3:00 p.m.

- Come See What's Happening in D.C.! – Room 306-307
- How to Manage a Young Orchard – Room 308-309
- Research Update: Soil Health, Aerial Almond Mapping and Almond Lifecycle Assessment – Room 312-313
- Technology in the Food Safety World: Tools Such as Whole Genome Sequencing – Friend or Foe? – Room 314


Use #AlmondConf to be part of the conversation on Facebook and Twitter

State of the Industry

Tuesday at 4:30 p.m. in Hall C

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