

The World of Dairy Ingredients

Bakery Technical Seminar
August 2019

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Health and Wellness Editor
Dairy Foods Magazine

Agenda

- Milk and Grains – Complementary Nutrition
- Proteins and Permeate
 - Composition & Functional Properties
- Adding Dairy Permeate
 - Strategies, Examples, and Formulation Tips
- Advantages of Dairy Protein vs. Non-Dairy Protein
- Adding Dairy Protein
 - Strategies, Examples, and Formulation Tips
- Putting it All Together



MILK AND GRAINS – COMPLEMENTARY NUTRITION

Wholesome Milk:



Major Components of Milk

Water ~ 87%

Fat ~ 4%

Protein ~ 3.5%

Carbohydrate – Lactose ~ 4.7%

Vitamins & Minerals ~ 0.8%

Low consumption of milk and dairy products

Demand for dairy outpaces supply

Milk and whey ingredients can fill the gap

Whey/Dairy Protein is Top Quality

Protein Type	Amino Acid Quality (PDCAAS)	Protein Absorption Value (Biological Value)	Net Protein Utilization	Protein Efficiency Ratio
Whey Protein	1.00	104	92	3.2
Milk	1.00	91	82	2.5
Egg	1.00	100	94	3.9
Soy Protein	1.00	74	61	2.2
Beef	0.92	80	73	2.9
Black Beans	0.75		0	0
Peanuts	0.52			1.8
Wheat Gluten	0.25	64	92	0.8

Dairy Proteins Are a Nutritional Complement to Wheat Protein

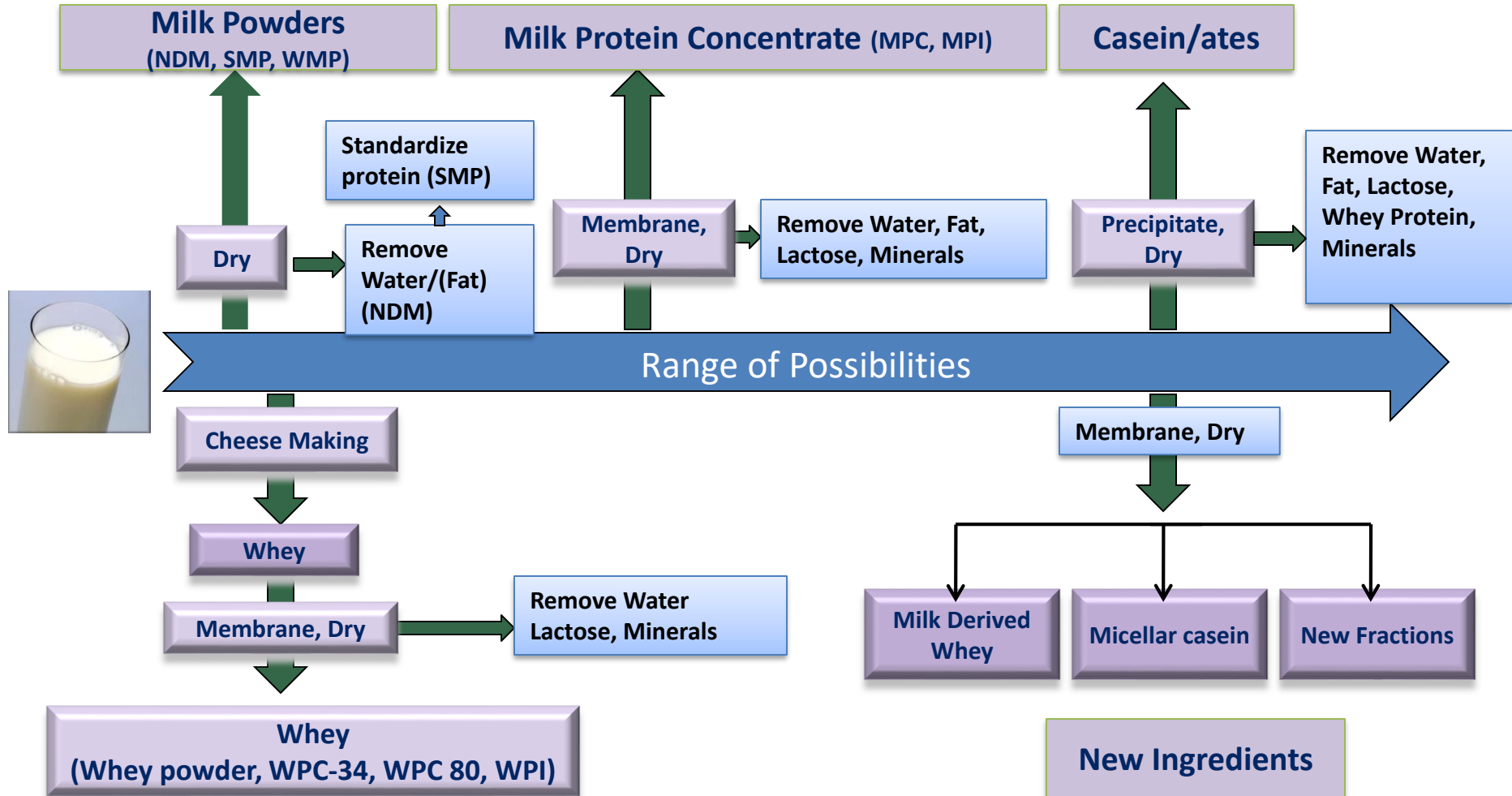
PDCAAS for mixtures ¹ (50:50 protein basis)	
WW + whey ²	1.00
WW + casein	0.91
WW + egg white	0.79
WW + soy protein	0.72
Wheat Flour (WW)	0.41

¹ FAO/WHO report

² Calculated using industry data



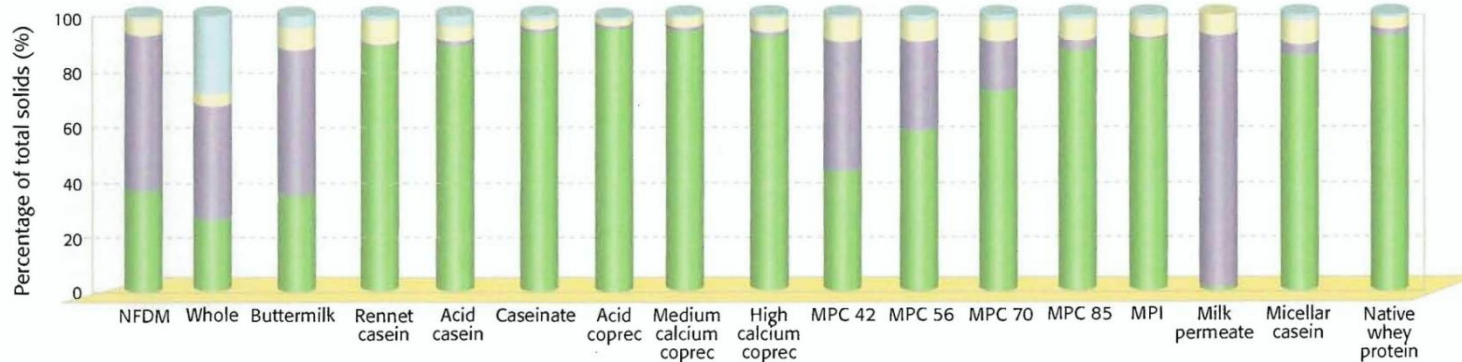
COMPOSITION AND FUNCTIONAL PROPERTIES



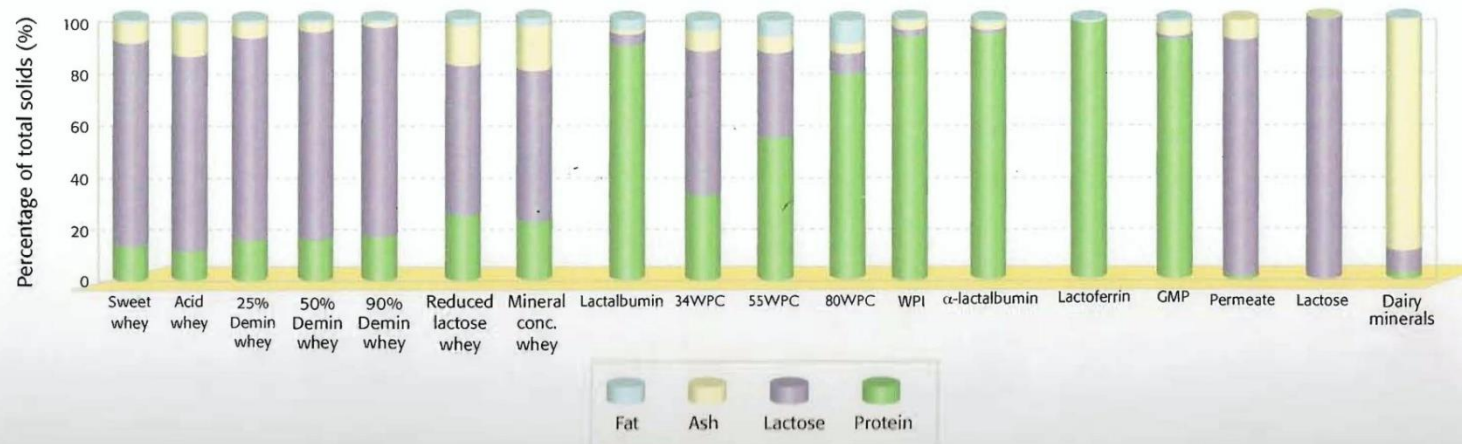
Dairy ingredients landscape

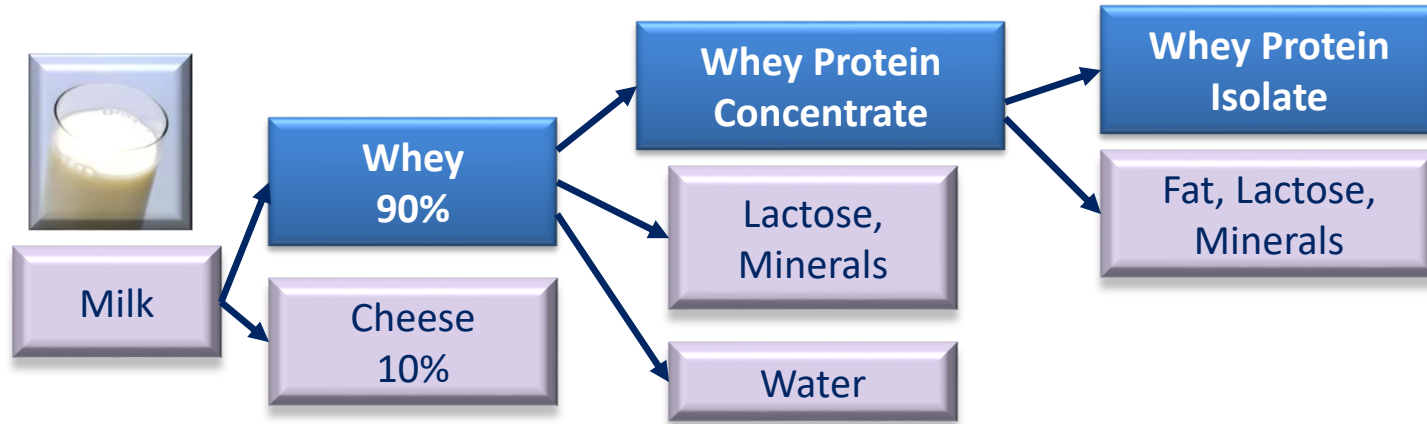
Composition of Dairy Ingredients

Composition of dairy ingredients made from milk



Composition of dairy ingredients made from whey





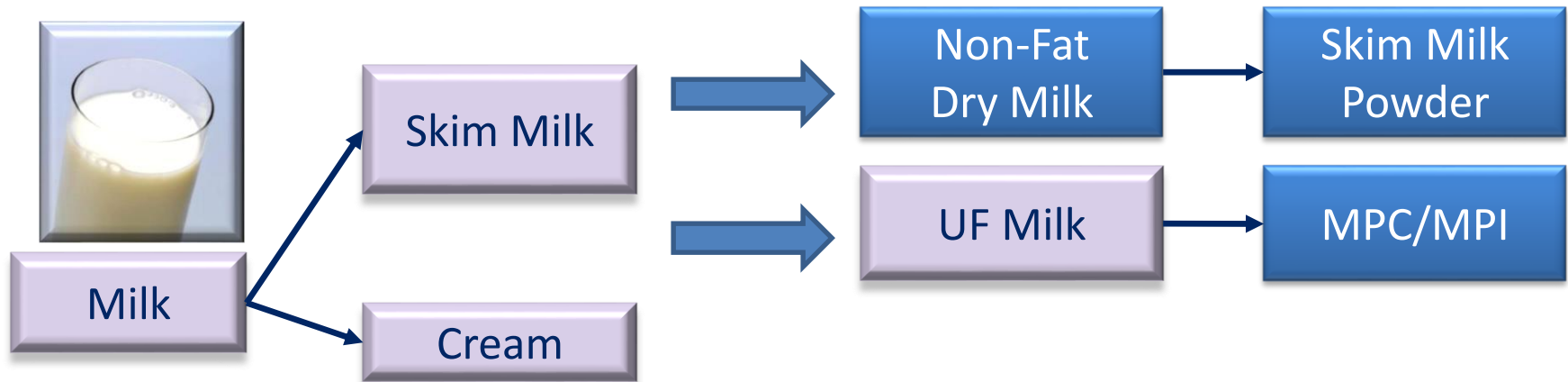
Whey protein ingredients: Different types

	Sweet whey	WPC 34	WPC 80	WPI
Protein	13%	33%	77-80%	90%+
Lactose	73%	52%	9%	2 %
Fat	1%	4%	6%	1%
Minerals	9%	7%	4%	3%
Moisture	4%	4%	4%	4%

Increasing protein concentration

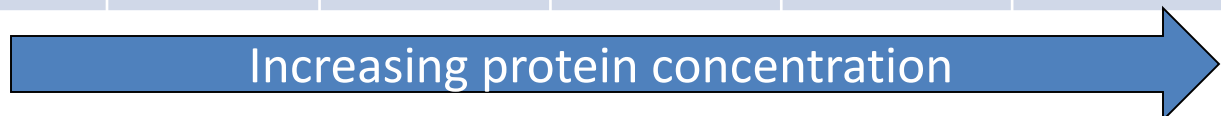
Whey Proteins in Bakery

- Highly Functional
- Mild, Dairy flavor
- Full or Partial Egg Replacement
- Adds Viscosity through Water Binding
- Heat-Denature During Baking
- Add to Post-Bake Volume and Structure



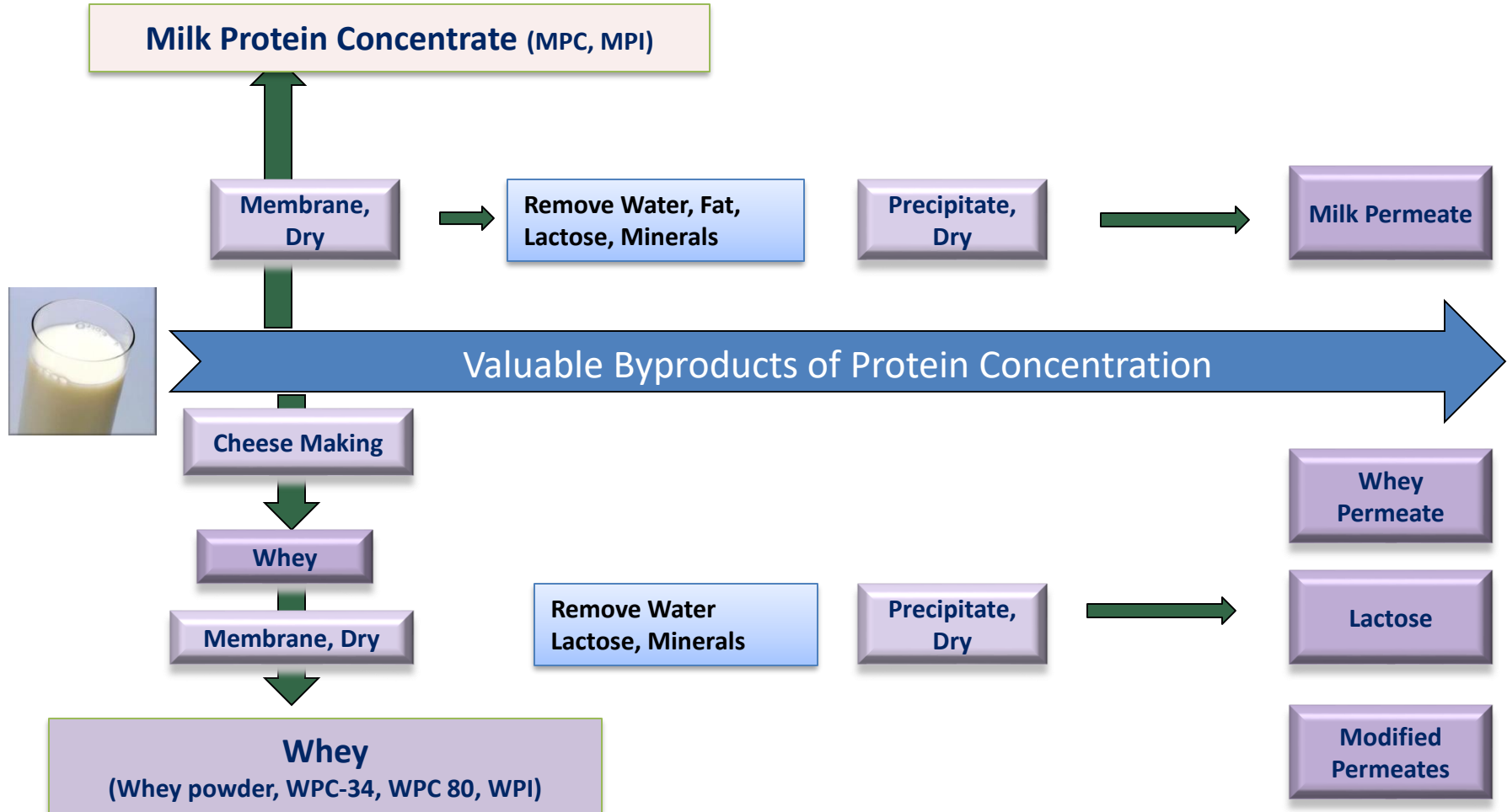
Milk protein ingredients: Different types

	Whole Milk Powder	Skim Milk Powder	MPC-40	MPC-70	MPC-85	MPI
Protein	26	34	40.6	68-70	83	87-90
Lactose	37	52	45.5	18	3.5	0.5
Fat	27	0.8	1	1	1.5	1.5
Minerals	6	9.2	8	7.5	7	6
Moisture	4	4.0	5	5	5	5



Milk Protein Powders in Bakery

- Highly functional, low lactose ingredients
- Ideal for low carbohydrate or high protein products
- Complete dairy protein – both whey and casein
- Mild, dairy flavor, smooth mouth-feel
- Unique combination of fast and slow proteins
- Excellent solubility and hydration properties
- Adds viscosity through water binding capabilities



Dairy Permeates and Lactose

Lactose and Permeate Ingredients Comparison:

	Lactose	Milk Permeate	Whey Permeate
Protein	0.1	3.0	3-4
Lactose	>99.0	80-85	>80
Fat	0	<0.1	<1
Minerals	0.1	>8.5	<9
Moisture	<5	<5	<5
Sugars	Lactose	Lactose	Lactose plus glucose & galactose
Flavor	Clean, bland	Clean, milky	Sweet and Salty with some umami notes





Lactose & Permeates in Baking

- Lactose contributes to Maillard browning
- Lactose not consumed by yeast
- Allows for sodium reduction
- Generates higher dough yields
- Gives dough stability, and shortens ferment time, and improves rheological properties of dough
- Lower sweetness than sucrose
- Allows for fat reduction

Permeate Names

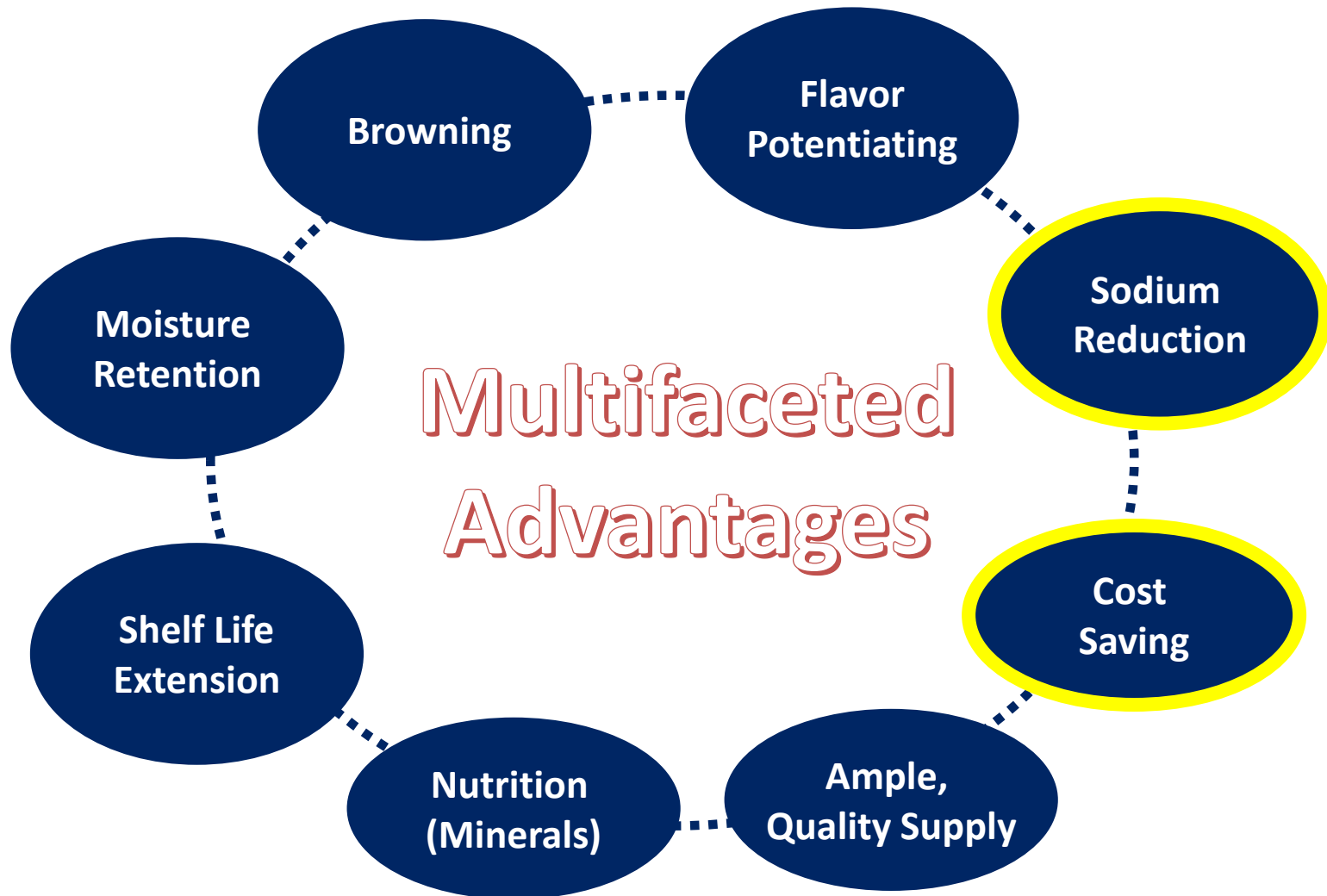
- Harmonized Trade Name
 - Dairy Product Solids
- Codex standard CXS 331-2017 Adopted in 2017
 - Dairy Permeate Powder
 - Whey Permeate Powder
 - Milk Permeate Powder
- You may also see on product labels...
 - Deproteinized Whey
 - Whey Permeate
 - Milk Permeate
 - Modified Whey
 - Specific Brand Names





ADDING DAIRY PERMEATE – STRATEGIES, EXAMPLES AND FORMULATION TIPS

Permeate in the Spotlight



Using Permeate in Baked Goods

- Permeate can improve both color and flavor in baked goods applications
- Contributes to browning by the Maillard reaction of lactose and other reducing sugars present (combined with available protein)
- Browning not only enhances appearance but also imparts a pleasant caramelized flavor
- Lactose content in dough can also produce breads, muffins, cakes and cookies that retain their softness for a longer period of time and extends shelf life
- This softness has been attributed to better emulsification of the fat in the formula and the increase in water-holding capacity



Permeate in Bakery – Global Launches



U.S.
Nabisco
Cookies



UK
Crownfield
Yogurt Slices



VIETNAM
Fox's
Biscuits



MEXICO
Panera El Roble
Donuts



PERU
Costa Cancun
Sponge Cake



MACEDONIA
Elka
Croissants



PHILIPPINES
Fribisco
Cookies



ARGENTINA
Bagley
Cookies

Pillsbury Muffin & Cake Batter

Serving	100g
Calories	372
Protein	6 g
Carbs	44 g
Fiber	g
Sugars	25 g
3 Lb. Tube	Distributor



INGREDIENTS: WATER, ENRICHED FLOUR, SOYBEAN OIL, EGGS, COCOA PWA, MODIFIED CORN STARCH, **MODIFIED WHEY**, BAKING SODA, ...

- **Foodservice**
- **Premium Convenience**
- **Thaw and Portion**
- **TREND – Cost Reduction**

Kroger Toaster Pastries

Serving	52g
Calories	200
Protein	2 g
Carbs	37 g
Fat	5 g
Sugars	16 g
Box of 8	\$1.67



INGREDIENTS: FLOUR, CORN SYRUP, SUGAR, HIGH FRUCTOSE CORN SYRUP, PALM OIL, FRUIT, GLYCERINE, MODIFIED CORN STARCH, **WHEY PERMEATE**, YELLOW CORN MEAL...

- **Good Source of 7 Vitamins & Minerals**
- **Perfect Snack for Any Time of Day**
- **TREND – Convenience**

Pillsbury Crème Cake Mix – 50#

Serving	100 g
Calories	446
Protein	6 g
Carbs	72 g
Fat	15 g
Sugars	42 g
50 # Bag	Distributor



INGREDIENTS: SUGAR, ENRICHED FLOUR, BLEACHED, SOYBEAN OIL, EGG YOLK, MODIFIED CORN STARCH. CONTAINS 2% OR LESS OF: EGGS, MONO AND DIGLYCERIDES, LEAVENING, **MODIFIED WHEY**, VITAL WHEAT GLUTEN, EGG WHITE, SALT, ...**NONFAT MILK**.

- **Wholesale Bakery / Foodservice**
- **Versatile, Moist**
- **Ideal for Suspending Fruit & Nuts**
- **TREND – Convenience**

Panera El Roble Mini Donas Doble Chocolate

Country:	Mexico
Box	\$1.14

INGREDIENTS: BREAD: ENRICHED WHEAT FLOUR, SUGAR, VEGETABLE OIL, SOY FLOUR, COCOA, **SKIMMED MILK, WHEY**, SALT, YOLK, MODIFIED STARCH, VEGETABLE GUMS, SOY LECITHIN, LEAVENING, EMULSIFIER, ARTIFICIAL CHOCOLATE FLAVOR., **COATING:** SUGAR, HYDROGENATED VEGETABLE FAT, MALTODEXTRIN, **MILK PERMEATE POWDER**, PROCESSED COCOA POWDER WITH ALKALI, CAROB FLOUR, SOY LECITHIN, VANILLIN.



- **Mini Donuts, Double Chocolate**

Bauducco Cereale Galleta Integral Con Leche Y Granola

Country:	Nicaragua
Package	\$0.97



INGREDIENTS: WHOLE GRAIN CEREAL (WHEAT FLOUR, OAT FLAKES, WHOLE OAT FLOUR, RICE FLAKES AND WHOLE RYE FLOUR), WHEAT FLOUR, SUGAR, GRANOLA, WHEAT FLAKES, WHEAT BRAN, BROWN SUGAR, RICE FLAKES AND GRATED COCONUT), VEGETABLE FAT PALM BASE, MARGARINE SOY BASE, POLYDEXTROSE, **WHOLE MILK, WHEY PERMEATE**, INVERT SUGAR, SALT FLAVORS, EMULSIFIER: AND RAISING AGENT:

- **Wholegrain Biscuit with Milk and Granola**

Big Y Maple Donuts

Serving	66g
Calories	290
Protein	3 g
Carbs	35 g
Fat	15 g
Sugars	22 g
Box of 6	\$2.99



INGREDIENTS: SUGAR, FLOUR, WATER, VEGETABLE SHORTENING , SOY FLOUR, DEXTROSE, MAPLE SYRUP, LEAVENING, SALT, CORNSTARCH, WHEAT STARCH, WHEAT GLUTEN, **DEPROTEINIZED WHEY, ... MILK PROTEIN CONCENTRATE, ...**

- **Bakery Fresh**
- **TREND – Fresh, Indulgent**

Pillsbury Toaster Strudel Pastries

Serving	55 g
Calories	180
Protein	2 g
Carbs	27 g
Fat	7 g
Sugars	9 g
396 g box	\$2.99

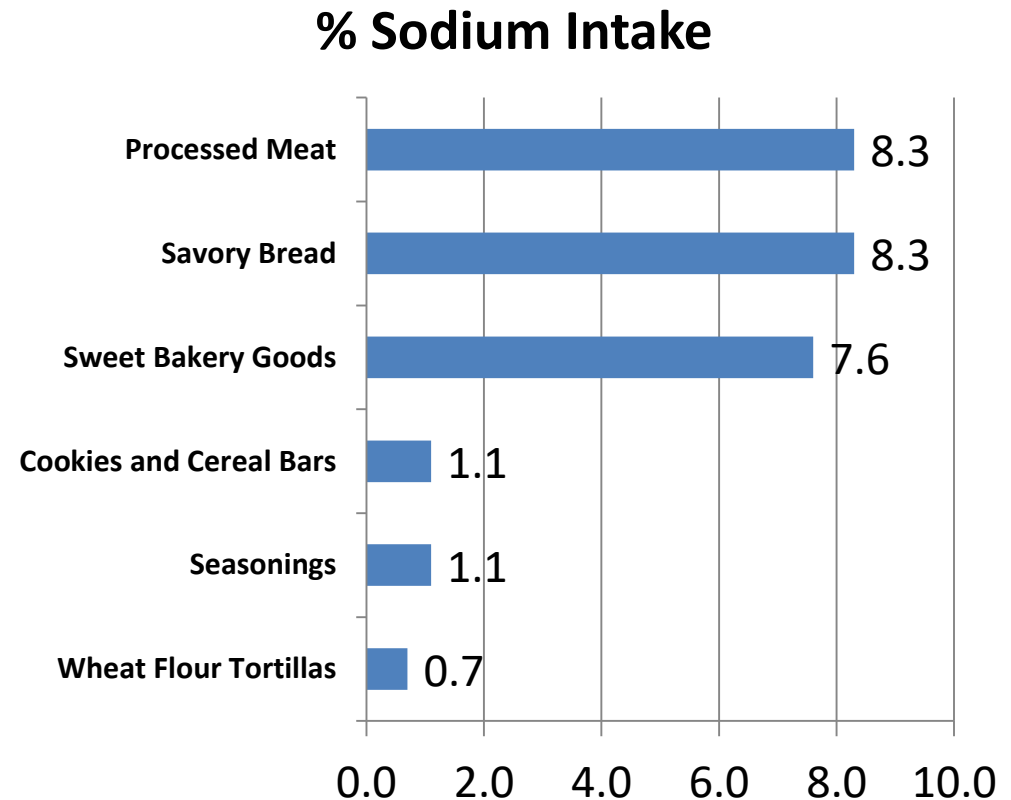


INGREDIENTS: ENRICHED FLOUR BLEACHED, WATER, PALM AND/OR SOYBEAN OIL, CORN SYRUP, SUGAR, MALTODEXTRIN. DEXTROSE, APPLE PUREE, MODIFIED CORN STARCH, CORN STARCH, HYDROGENATED PALM OIL, SALT, DRY YEAST, **MODIFIED WHEY**, ...

- **Great as a snack**
- **Toast or Bake**
- **Gooney, Flakey, Happy**
- **TREND –Indulgent and Convenient**

Excess Sodium in Mexican Diet

- 2017 study analyzed dietary intake of Mexican adults via food record and urinary sodium excretion.
- Together savory bread and sweet bakery goods account for 16% of daily sodium intake.
- Total sodium intake exceeds recommended values



Sodium Reduction – Almond Apricot Muffin

INGREDIENTS	Usage Level (%)	Reduced Sodium (%)
Flour - All Purpose	34.68	34.68
Water	21.27	23.12
Whole Fresh Eggs	12.72	6.43
Dried Apricots, Diced	7.63	7.63
Unsalted Butter, Melted or Vegetable Oil	6.59	6.59
Sugar	5.78	5.78
Sliced Almonds	5.20	5.20
Permeate (milk or whey)	-	4.96
Almond Paste, crumbled	4.45	4.45
Baking Powder	1.16	1.16
Salt	0.52	-
Non-Stick Pan Spray	-	-
TOTAL	100.00	100.00

- 10 – 11 g permeate replaces 1 g salt
- Eliminate added salt
- Sodium reduced from 220 mg to 85 mg per 55 gram muffin
- Reduced egg usage for cost optimization
- Similar formulas at www.thinkusadairy.org

Tips for Sodium Reduction

- Permeate can be used to lower sodium content of a wide variety of bakery foods.
- An added advantage of permeate is its high content of potassium.
- Strategies best involve a gradual lowering of salt levels or substitution with foods that achieve a flavorful taste profile with reduced sodium.
- Subtle change can be made without sacrificing taste.





DAIRY VS. NON-DAIRY PROTEINS

Dairy Protein is Top Nutritional Quality

1919 – PER (Protein Efficiency Ratio)

1998 – PDCAAS (Protein Digestibility Corrected Amino Acid Score)

2013 – DIAAS (Digestible Indispensable Amino Acid Score)

	Whey Protein Isolate	Milk Protein Conc.	Soya Protein Isolate	Pea Protein	Cooked Beans	Cooked Peas	Cooked Rolled Oats	Wheat Bran	Roasted Peanuts	Rice Protein
PDCAAS	1.00	1.00	1.00	0.89	0.65	0.60	0.67	0.53	0.51	0.42
DIAAS ^{1,2.}	1.25	1.18	0.97	0.82	0.58	0.58	0.54	0.41	0.43	0.37

PDCAAS undervalues animal proteins, which have high levels of essential amino acids
 PDCAAS overestimates plant proteins, which have anti-nutritional factors.

DIAAS use “ileal digestibility” which is more accurate than “fecal digestibility.”

DIAAS is a newer and more accurate method of measuring protein quality.

1. FAO Expert Consultation, Dietary Protein Quality Evaluation in Human Nutrition, 2013.
2. Rutherford and Moughan, Riddet Institute, 2015

Wisconsin Center for Dairy Research Study

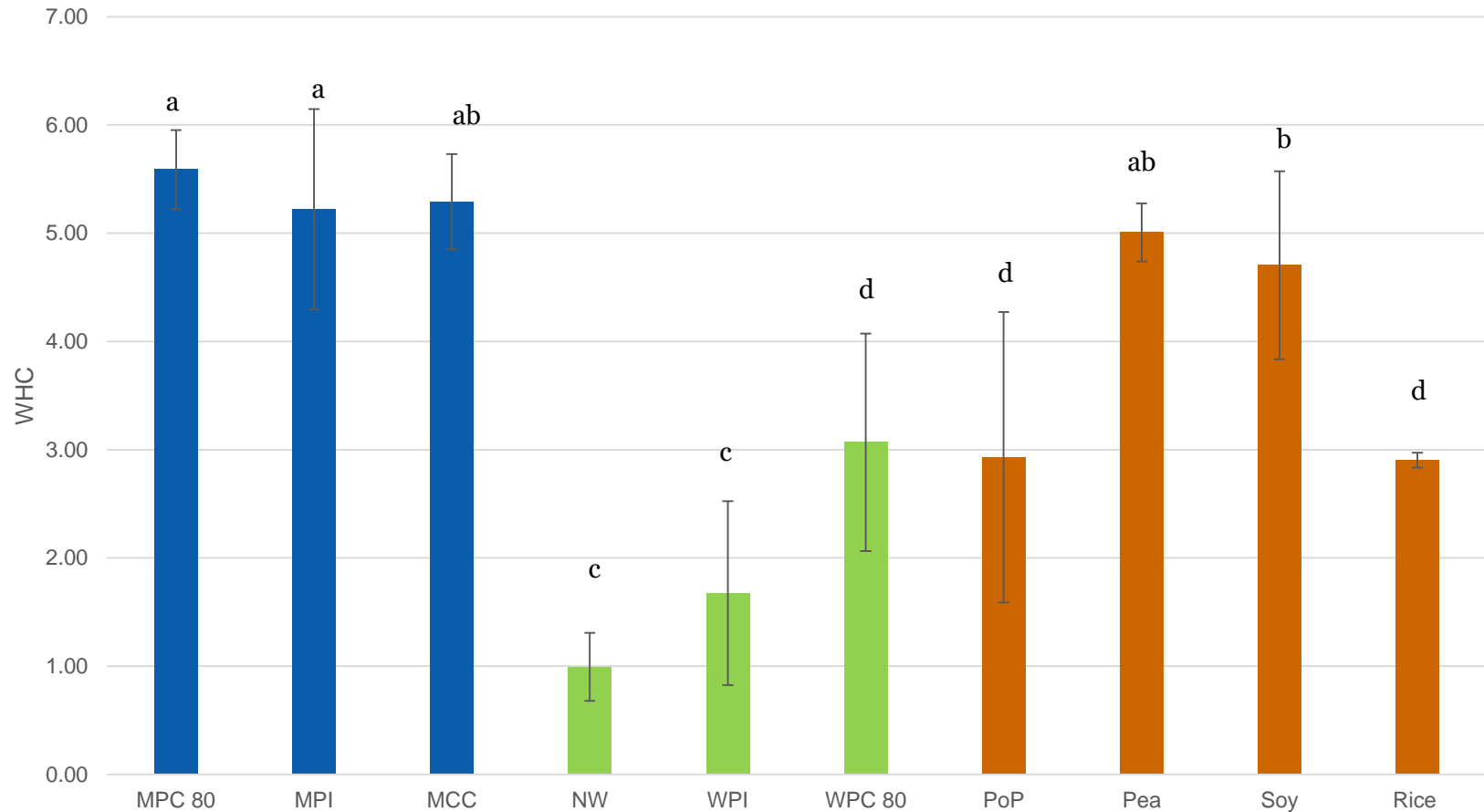
Dairy Proteins

- **Milk Proteins**
 - Milk Protein Concentrate (**MPC80**) (3)
 - Milk Protein Isolate (**MPI**) (3)
 - Micellar Casein (**MCC**) (4)
- **Whey Proteins**
 - Whey Protein Concentrate (**WPC80**) (3)
 - Whey Protein Isolate (**WPI**) (4)
 - Milk Derived Whey Protein (**NW**) (1)

Plant Proteins

- **Potato Protein-77-89%** protein (**PoP**) (3)
- **Pea Protein-76-70%** protein (**Pea**) (4)
- **Soy Protein-80-90%** protein (**Soy**) (4)
- **Rice Protein-83%** protein (**Rice**) (1)

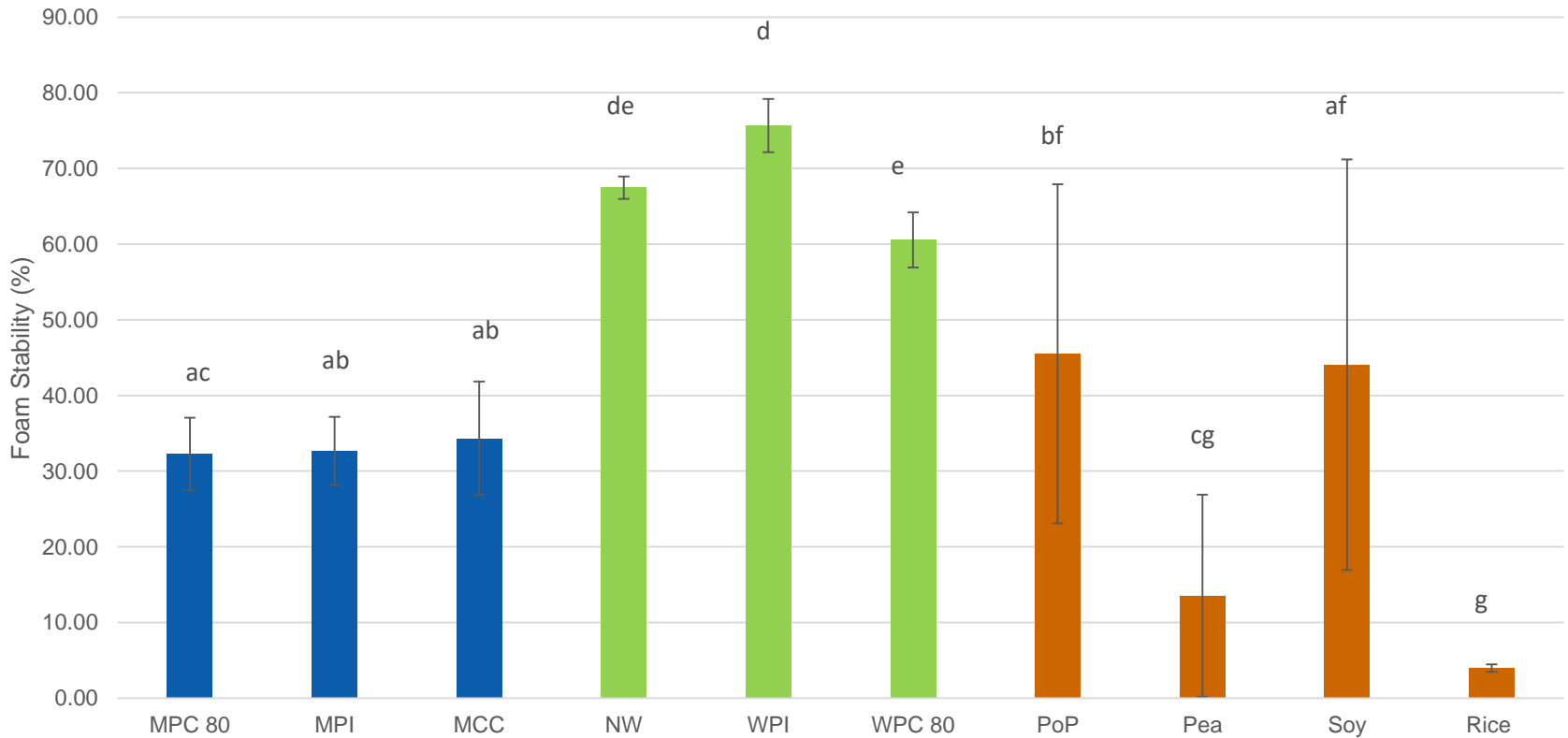
WCDR Study - Water Holding Capacity



(*Means with different letters were significantly different (P < 0.05).)

Milk ~ Soy ~ Pea > Whey ~ Potato ~ Rice

WCDR Study - Foam Stability

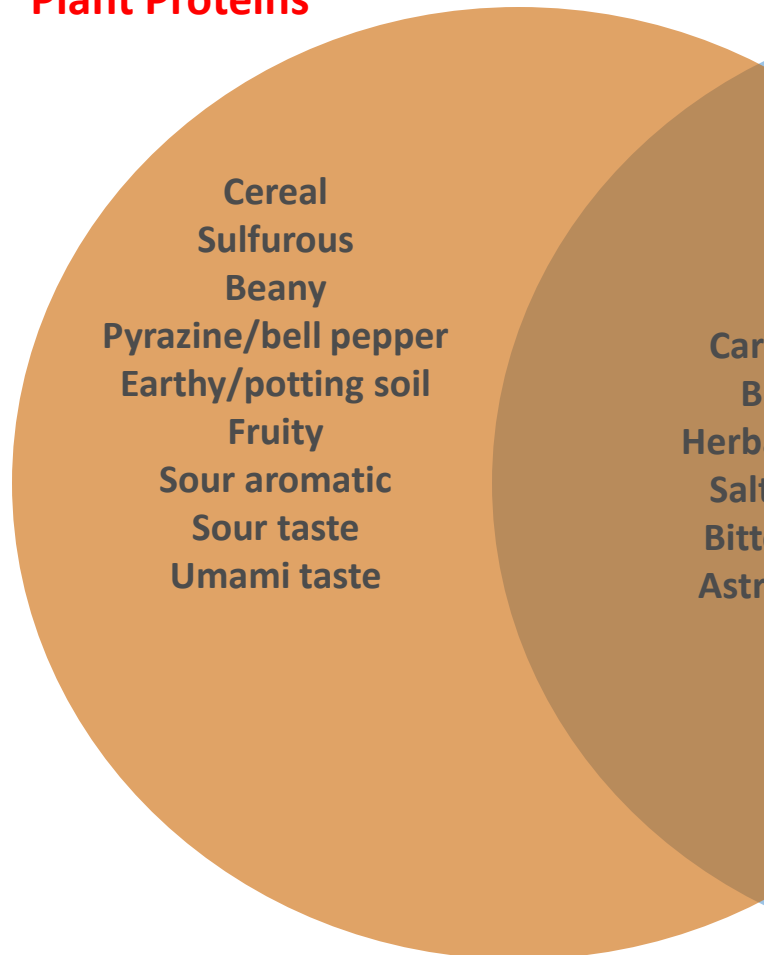


(*Means with different letters were significantly different (P < 0.05).)

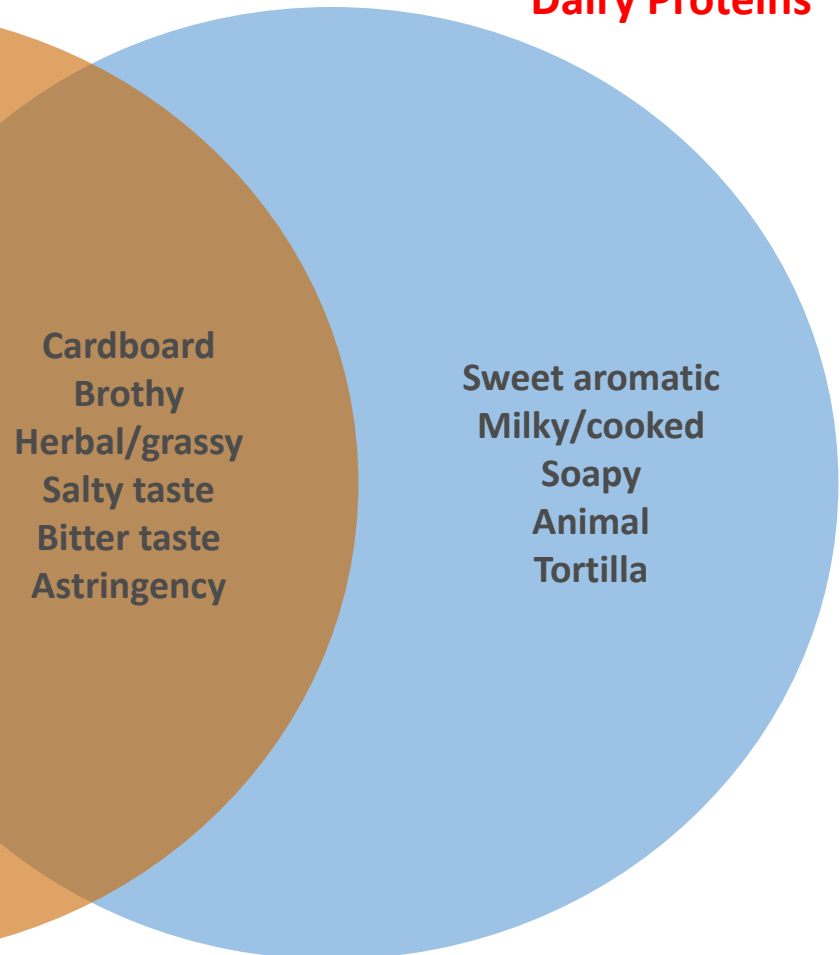
Whey protein > Milk protein > Soy and Potato proteins > Pea protein > Rice Protein

Flavor Differences - Plant vs. Dairy Proteins

Plant Proteins



Dairy Proteins



Summary of Results – WCDR Study

- **Different food proteins offer unique functional properties in foods**
- **Overall, between milk proteins and whey proteins, dairy proteins offer a comprehensive solution to end users when compared to plant proteins**
 - Functional testing should be selected based on the desired end use application as well as keeping the manufacturing process in mind.
 - Protein hydration has a marked effect on their functional properties (critical for beverage applications, but not bakery)
 - There is still a large variability among food protein manufacturers within similar group of proteins
- **When compared to plant proteins, dairy proteins offer a superior sensory experience**
 - No prevalence of beany, sulfurous and sour notes and significantly lower intensities on notes such as cardboard, brothy, herbal/grassy, bitter taste and astringency

Combine Plant and Animal Protein

- Achieve “Complete Protein”
- Whey is “Gold Standard” for athletes
- Consumer friendly label
- Optimal cost efficiency
- Excellent flavor
- Good functional properties

All Purpose Flour 50% / Misc 50%



Number of Servings: 1 (100 g per serving)
Weight: 100 g

Amino Acid	Actual Ratio	Ideal Ratio	=	Score	25	50	75	100%
Histidine	22.99	÷ 18	=	127%				
Isoleucine	34.48	÷ 25	=	137%				
Leucine	68.97	÷ 55	=	125%				
Lysine	22.99	÷ 51	=	45%				
Methionine + Cystine	38.31	÷ 25	=	153%				
Phenylalanine + Tyrosine	80.46	÷ 47	=	171%				
Threonine	26.82	÷ 27	=	99%				
Tryptophan	11.49	÷ 7	=	164%				
Valine	40.23	÷ 32	=	125%				

All Purpose Flour 50% / WPC80 10% / Misc 40%

Number of Servings: 1 (100 g per serving)
Weight: 100 g

Amino Acid	Actual Ratio	Ideal Ratio	=	Score	25	50	75	100%
Histidine	22.32	÷ 18	=	124%				
Isoleucine	48.50	÷ 25	=	193%				
Leucine	92.38	÷ 55	=	167%				
Lysine	66.20	÷ 51	=	129%				
Methionine + Cystine	40.80	÷ 25	=	163%				
Phenylalanine + Tyrosine	63.13	÷ 47	=	134%				
Threonine	53.89	÷ 27	=	199%				
Tryptophan	17.71	÷ 7	=	252%				
Valine	50.81	÷ 32	=	158%				



ADDING DAIRY PROTEIN – STRATEGIES, EXAMPLES AND FORMULATION TIPS

Three Reasons to Add Protein To Bakery Products



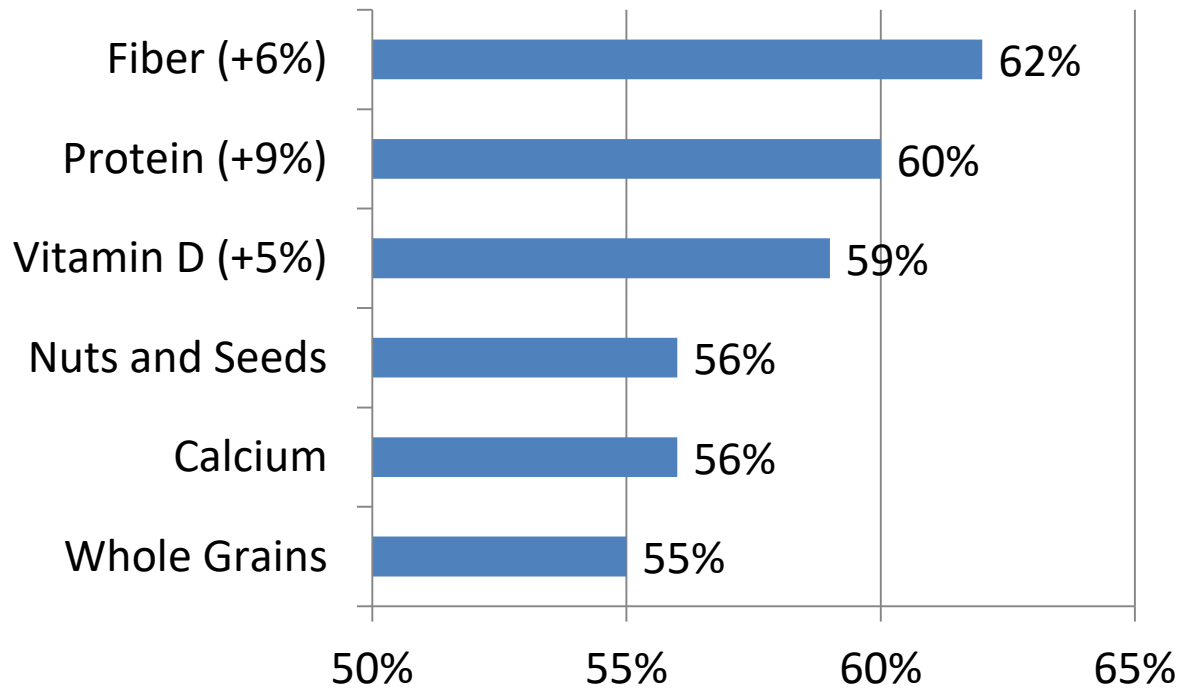
Make Protein
Claims

Egg Replacement

Fortify Gluten-
Free Foods

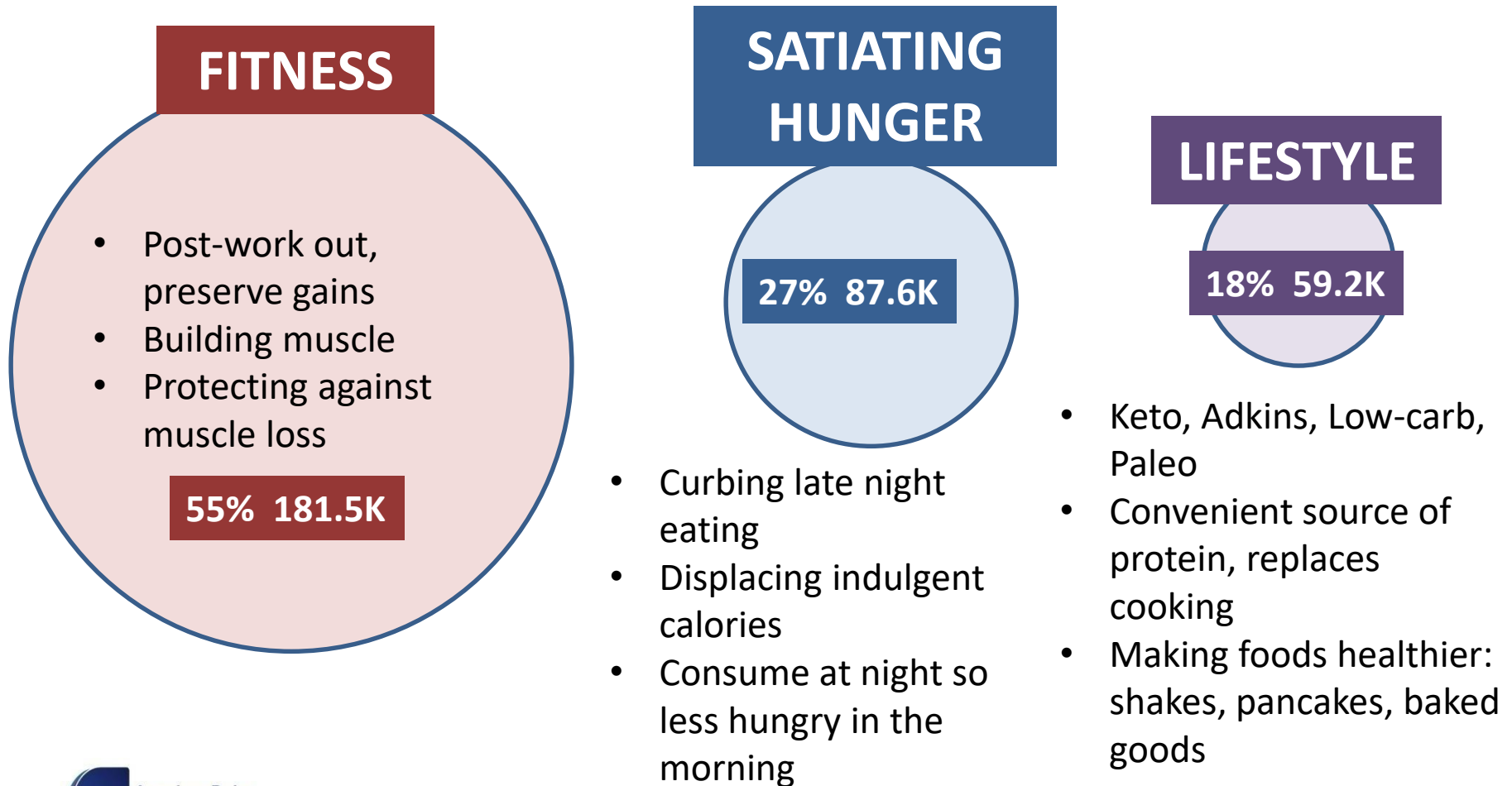
Consumers are Seeking More Protein

Ingredients Consumers are Adding/Increasing in Diet

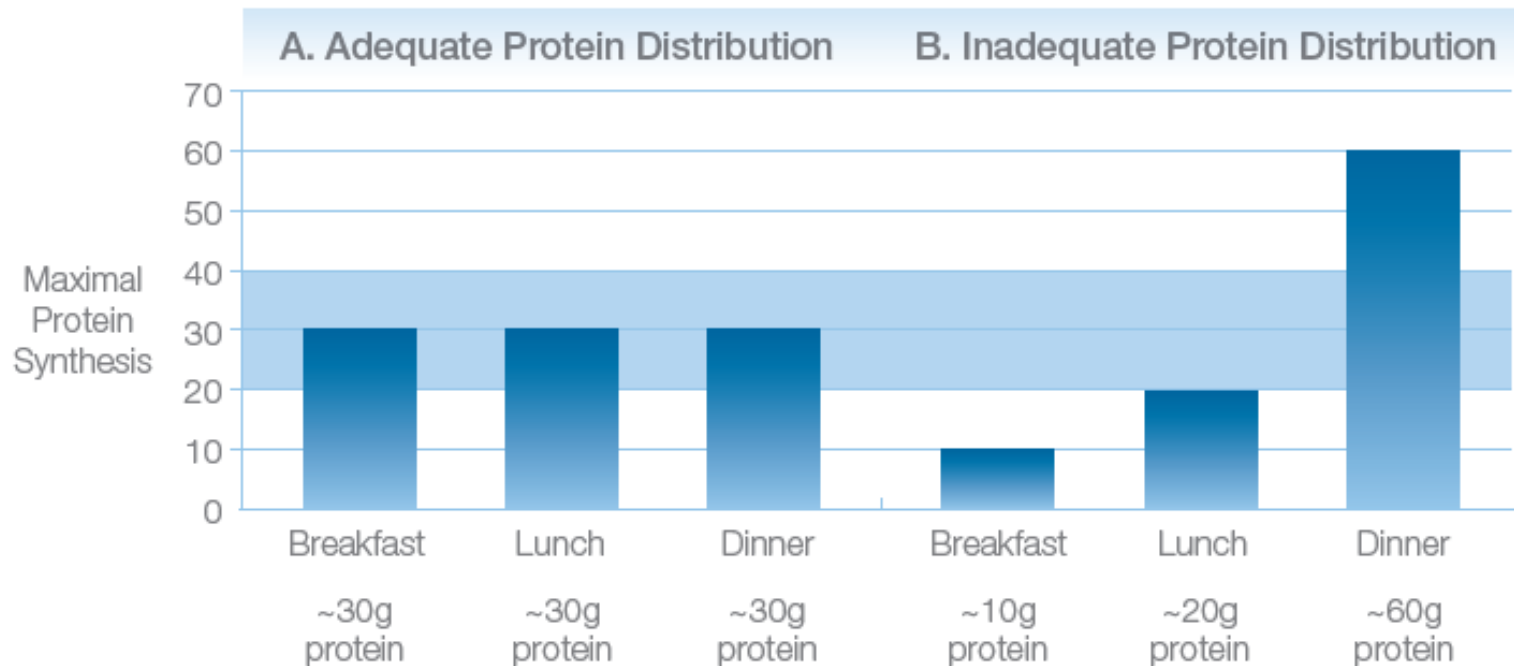


Source: Hartman Group's Health + Wellness 2019 Report. Nationally representative survey of 1900 U.S. consumers fielded Q1 2019. Increase trended to 2013.

Protein Seekers - consumer benefit segmentation



Spread Protein Consumption Throughout Day



Dairy proteins can boost the protein content of breakfast, a meal where protein intake is typically low.

flapJacked Mighty Muffin (Microwaveable)

Serving	55g
Calories	220
Protein	20 g
Carbs	23 `g
Fiber	5 g
Sugars	10 g
1 Container	\$2.50



INGREDIENTS: OATS, WHEY PROTEIN CONCENTRATE (MILK), PEA PROTEIN, WHITE CHOCOLATE, ..., BUTTERMILK, ..., BUTTER, ... STEVIA EXTRACT, ... PROBIOTIC

Company also makes: Soft Baked Cookie Bars, Protein Cookie Baking Mix, and Pancake Mix

- **Add Water and Microwave**
- **20 g Protein**
- **Ready in 30 seconds**
- **TREND – Satisfy Cravings and Fitness Goals**

BelVita Protein Biscuit

Serving	50g
Calories	200
Protein	10 g
Carbs	22 g
Fiber	2 g
Sugars	11 g
6 Packages	\$24.37

INGREDIENTS: INGREDIENTS: PROTEIN CRISPS (SOY CRISPS **WHEY CRISP (FROM MILK) (WHEY PROTEIN ISOLATE, WHEY PROTEIN CONCENTRATE,** TAPIOCA STARCH)], SUGAR, CANOLA OIL, WHOLE GRAIN WHEAT FLOUR, HYDROLYZED WHEAT GLUTEN, INVERT SUGAR, WATER, ...



- **10 g protein per 50 g serving**
- **Soft Baked Biscuit**
- **TREND – Delicious way to get protein with your morning snack**

Quest Protein Cookies

Serving	49g
Calories	250
Protein	15 g
Carbs	19 g
Sugars	<1 g
Sugar Alcohol	6 g
Package of 12	\$23.99

INGREDIENTS: PROTEIN BLEND (MILK PROTEIN ISOLATE, WHEY PROTEIN ISOLATE), BUTTER (CREAM, NATURAL FLAVOR), SOLUBLE CORN FIBER, ERYTHRITOL, PALM OIL, ...



- **Decadent**
- **15 g Protein**
- **9 g Fiber**
- **Soft & Chewy**
- **TREND – Protein You Deserve**

P28 High Protein Bagels

Serving	1 Bagel, 94 g
Calories	260
Protein	28 g
Carbs	25 g
Fat	7 g
Sugars	5 g
Package of 6	\$6.99

INGREDIENTS: WATER, WHOLE WHEAT FLOUR, P28 PROTEIN BLEND (**WHEY PROTEIN ISOLATE**, WHEAT PROTEIN ISOLATE, WHEAT GLUTEN, SOYEAN OIL), SUGAR, ...

Company also makes pancake mix, spreads, and wraps (tortillas).



- 28 g protein per bagel
- Made with Whey Isolate
- Natural Ingredients
- TREND – Protein at breakfast

Birch Benders Protein Toaster Waffles

Serving	2 waffles, 62 g
Calories	180
Protein	11 g
Carbs	17 g
Fat	8 g
Sugars	4 g
Package of 6	\$4.49



INGREDIENTS: WATER, FLOUR, SUNFLOWER OIL, EGGS, **WHEY PROTEIN CONCENTRATE**, OATMEAL, HYDROLYZED WHEAT GLUTEN,, ...

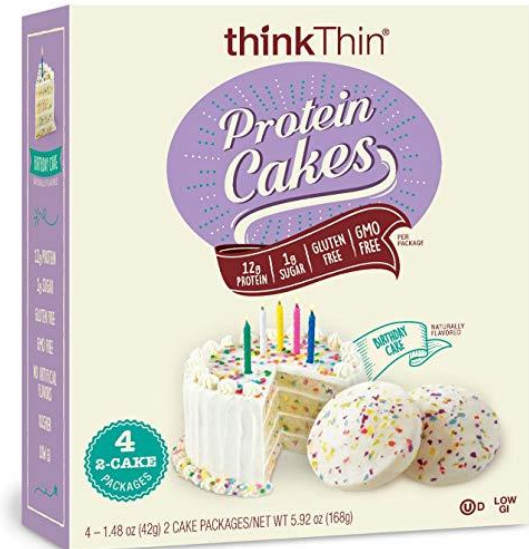
Company also makes protein pancake mix.

- **11 g protein per waffle**
- **Supercharge your mornings**
- **Easy to eat on-the-go**
- **TREND – Protein at breakfast**

thinkThin® Protein Cakes

Serving	42g
Calories	170
Protein	12 g
Carbs	19 g
Sugars	13 g
Sugar Alcohol	11 g
Package of 4	\$10.95

INGREDIENTS: PROTEIN BLEND (MILK PROTEIN CONCENTRATE, WHEY PROTEIN ISOLATE, MILK PROTEIN ISOLATE) COATING (MALTITOL,, PALM KERNEL OIL, WHEY PROTEIN CONCENTRATE, ...), VEGETABLE GLYCERIN, CHICORY ROOT FIBER ...



- **Decadent Protein Snack**
- **Gluten Free / GMO Free**
- **12 g Protein**
- **1 g Sugar.**
- **TREND – Weight Management**

Protein Instant Oatmeal

Serving	62 g
Calories	240
Protein	10 g
Carbs	41 g
Fat	
Sugars	13 g
	\$

INGREDIENTS: OATS, SUGAR, **WHEY PROTEIN CONCENTRATE**, ALMONDS, DRIED CRANBERRIES, **WHEY PROTEIN ISOLATE**, SALT, MALTODEXTRIN ...

Now also available in cups



- **Helps Keep You Full**
- **10 g Protein**
- **41 g Whole Grains**
- **Heart Healthy**
- **TREND – Breakfast Protein**

3-INGREDIENT BIRTHDAY CAKE PROTEIN PASTRY

- Protein Pastry
 - 70g [Syntha-6 Birthday Cake Protein Powder](#) (Whey Protein Concentrate, Whey Protein Isolate, Calcium Caseinate, Micellar Casein, Milk Protein Isolate, Egg Albumen, Glutamine Peptides),...
 - 21g Coconut Flour
 - 57g Fat Free Greek Yogurt plain or vanilla
- Pastry Filling
 - 23g [Syntha-6 Birthday Cake Protein Powder](#)
 - 28g Fat Free Greek Yogurt plain or vanilla
- Frosting/Topping
 - 28g Fat Free Greek Yogurt plain or vanilla
 - 1.5 g Low Cal Sweetener (Splenda)
 - 5.0 g Sprinkles
- Instructions
 - Mix the dry ingredients together in a large bowl.
 - Add the 27 g Greek yogurt to the dry ingredients
 - Bake at 175°C on parchment linked cookie sheet



Serving	57 g
Calories	160
Protein	14 g
Carbs	16 g
Fat	4 g

ISOPURE Chocolate Protein Cake

Serving	
Calories	110
Protein	7.5 g
Carbs	16 g
Fat	2 g



INGREDIENTS: WHOLE EGGS, SKIM OR ALMOND MILK, WHOLE WHEAT FLOUR, SUCRALOSE, **WHEY PROTEIN ISOLATE**, APPLESAUCE, VANILLA FLAVOR, BAKING SODA, ...

Ingredient	%
Whole egg	29.1
Unsweetened skim or almond milk	22.0
Whole Wheat Flour	17.5
Sweetener, Sucralose, Splenda	11.6
Ispure Zero Calorie Dutch Chocolate Powder	9.7
Applesauce, unsweetened	8.9
Flavor, vanilla extract	0.8
Baking Soda	0.5

Mexican Launches with Dairy Protein



Tega PWRSNACK – 10 g Protein
“Milk Protein Concentrate”



Onnae Punch! Bar –
10 g protein
“Milk Protein”



Quaker Breakfast Biscuits – “Milk Protein Concentrate” in Yogurt Coating



PrimalThin Whey Protein Bar – 20 g protein, “Organic grass fed whey protein.”

Egg Replacement

To Replace	
100 g Dry Whole Egg	60 g WPC80 plus 40 g oil.
100 g Dry Egg White	100 g WPC80. (In low-fat applications, use 100 g WPI.)
100 g Raw or Frozen Whole Eggs	15 g WPC80 plus 10 g oil plus 75 g water.
Raw or Frozen Egg White	14 g WPC80 plus 86 g water. (or WPI and water.)



Replace egg ingredients with whey ingredients based on an equal protein level. Adjust water and oil as needed.

Specialty Whey Ingredients for Egg Replacement

White Sponge Cake

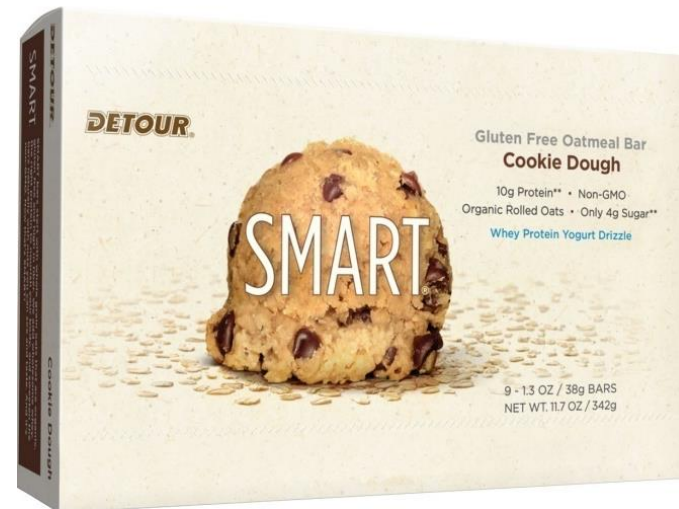
	Control	With Egg Replacer
Liquid Whole Eggs	24.17	18.13
Water	12.72	12.72
Vanilla	0.26	0.26
Eggstend 300		6.04
Sugar	31.80	31.80
High Temp Skim	1.27	1.27
Salt	0.38	0.38
Emulsifier (optional)	0.76	0.76
Wheat or Corn Starch	2.55	2.55
Yellow Color (optional)	0.05	0.05
Soda	0.15	0.15
Baking Powder	0.45	0.45
Cake Flour	25.44	25.44
	100.00	100.00

- Check with your U.S. supplier for whey ingredients specifically formulated for egg replacement.



Detour Smart Gluten Free Oatmeal Bar

Serving	1 Bar, 38 g
Calories	150
Protein	10 g
Carbs	18 g
Fat	4 g
Sugars	4 g
9 Bars	\$14.99



INGREDIENTS: OATS, SMART PROTEIN BLEND, (WHEY PROTEIN CONCENTRATE, WHEY PROTEIN ISOLATE, CALCIUM CASEINATE, HYDROLYZED WHEY PROTEIN), CHOCOLATE CHIPS, GLYCERINE, INULIN, NON-GMO SOY PROTEIN ISOLATE, GELATIN, WATER, ORGANIC SUNFLOWER OIL, YOGURT COATING (SUGAR, PALM KERNEL OIL, WHEY POWDER, SKIM MILK POWDER, YOGURT POWDER,) ,

- **Good Source of Fiber**
- **10 g Protein**
- **TREND – Gluten Free with Protein**

NOTE – Many Gluten Free Products are low in protein

Bimbo Bakeries / Churro Flavored Little Bites

Serving	1 Pouch, 47 g
Calories	190
Protein	2 g
Carbs	29 g
Fat	8 g
Sugars	19 g
Box - 234 g	\$3.99



INGREDIENTS: SUGAR, FLOUR, WATER, SOYBEAN OIL, EGGS, CARNAUBAWAX, MODIFIED CORNSTARCH, DEXTROSE, **WHEY, ... WHEY PROTEIN CONCENTRATE.**

- **WPC added for functional benefit**
- **#1 Selling Mini Muffin**
- **TREND – Using Real Ingredients**

Tips for Adding Dairy Protein

- Position as a single serving of “Healthy Indulgence.”
- Ideal for breakfast or snack.
- Anticipate shelf life constraints.
- Humectants such as glycerin or maltitol are useful in packaged goods.
- Consider natural humectants such as applesauce, dates, or yogurt.
- Combine with whole grains or other healthy components.



Kodiak Flapjack & Waffle Mix

Serving	53 g mix
Calories	190
Protein	14 g
Carbs	30 g
Fat	
Sugars	3 g
Box	\$5.50

INGREDIENTS: 100% WHOLE GRAIN WHEAT FLOUR, 100% WHOLE GRAIN OAT FLOUR, WHEAT PROTEIN ISOLATE, BROWN SUGAR, **WHEY PROTEIN CONCENTRATE, MILK PROTEIN CONCENTRATE, BUTTERMILK POWDER, ...**

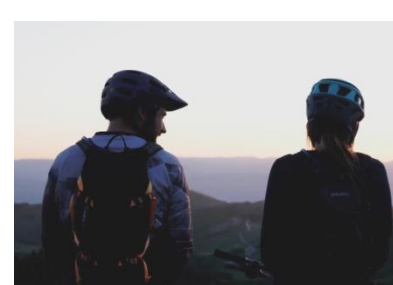
Company also makes: Soft Baked Cookie Bars, Protein Cookie Baking Mix, Pancake Mix, Frozen Pancakes.



- **Made with 100% whole grains**
- **14 grams of high quality protein to keep you full**
- **TREND – Great tasting nourishment to take on day**

Putting It All Together

- Build a brand ...
- Tell a story ...
- Success in Mexican market...
- www.kodiakcakes.com



Global Innovation – A Team Approach



Questions?

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I. Baked product- Pineapple pastry (1/7)



1. Preparation of samples

Mix butter, permeate and powdered sugar together until fluffy and pale at medium speed

Mix egg yolk, condensed milk, salt and parmesan cheese powder

Mix sifted cake flour and powdered milk. Beat until just combine (do not over mix) and knead to smooth dough

Divide the dough into small round balls (25g each), flattened dough and wrap with pineapple filling (20g each).

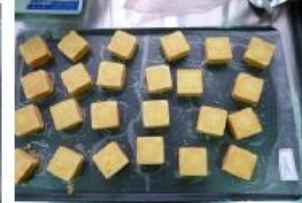
Insert into pineapple tart mould.

Place the mould filled with pineapple onto a baking pan lined with baking paper. Bake in preheated oven 150 °C for about 27 minutes or light golden brown.



Formulation of pineapple pastry dough

Pastry dough	Control(%)	Permeate(%)
Butter		
Condensed milk		
Egg yolk	119%	119%
Powdered milk		
Parmesan cheese powder		
Cake Flour	100%	100%
Powdered sugar	15%	9%
Salt	1%	0%
Permeate	0%	7%



I. Baked product- Pineapple pastry (7/7)



Summary

1. The permeate can be added into the preparation of the pineapple pastry as a substitute for salt and sugar in the pastry crust.
2. For water activity analysis, no significant differences were found between the control group and permeate groups. (see p.5)
3. For color, the just noticeable difference (ΔE) between the control group and permeate groups is less than a factor of 5, which showed no significant chromatic aberration. This finding indicated no significant difference between the appearances of the control and permeate groups, as observed by the naked eye. (see p.6)
4. For physical property analysis, the hardness and work of shearing for control group are greater than those for permeate groups. (see p.7)
5. For sensory evaluation, the appearance, taste and consistency of the control group and permeate groups revealed no significant differences; the sensory score for each group is at least six points. (see p.8)
6. For microbiological analysis, mean counts for Total Plate Count (TPC), coliform, *E. coli*, yeast and mold in pineapple pastry were less than 10 CFU/g. (see p.9)

I. Baked product-

Taiwanese-style sweetbread (1/9)



1. Formulation

Ingredient	Control (%)	Permeate-1 (%)	Permeate-2 (%)	Permeate-3 (%)
High gluten flour				
Water	171.2	171.2	171.2	171.2
Yeast				
Butter				
Sugar	8	4	4	4
Salt	1	0	0	0
Powdered milk	5	0	0	0
Permeate	0	10	10	10
Total	185.2	185.2	185.2	185.2

※The Direct Method of Bread Baking (Straight Dough Method)

1. The Direct Method is one in which all the ingredients are mixed in a single phase.
2. We used the bread machine in this experiment.
3. All the ratios of ingredients were expressed as the 250g of high gluten flour per batch of operating volume.

Panasonic
ideas for life



Panasonic SD-BM103T

I. Baked product-

Taiwanese-style sweetbread (2/9)



2. The evaluation of fermentation process of doughs (Dough rising graphs) AACC 89-01.01 Standard method

Treatment	Maximum development volume (mm)	Maximum development time (min)	Development volume of the dough at the end of the test (mm)	% Drop in development 3hr of the dough (%)
Control	41.7±0.7 ^b	110	36.4±1.4 ^a	12.7±2.1 ^b
Permeate-1	48.5±0.9 ^a	115	37.7±4.6 ^a	22.1±9.9 ^{ab}
Permeate-2	46.0±1.6 ^a	113	32.9±2.9 ^a	28.3±7.1 ^{ab}
Permeate-3	46.3±1.9 ^a	105	31.7±1.6 ^a	31.2±6.3 ^a

(Different letters in the same column indicate different means, $p < 0.05$)



Control

Permeate-1

Permeate-2

Permeate-3