Slide 1

DAIRY NOURISHES LIFE | Helping people thrive at every age

WEBINAR SERIES

Reminders for today's webinar:
- Please test your computer by using the link provided in the chat window to ensure that you can hear the speakers via streaming audio
- We recommend the latest version of **Google Chrome or Firefox** to minimize the chance of system issues during the live webinar
- Continuing education certificates and handouts will be emailed within 24 hours
- The reminder email had a link to the slides as a handout
- Suggested Learning Needs Codes:
  - 2070: Macronutrients: carbohydrate, fat, protein, fiber water
  - 8018: Environmental, agricultural & technologic influences on food systems
  - 8090: Menu planning and development, nutrient analysis

#DairyNourishesLife

1

Slide 2

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The Dairy Matrix:

More Than The Sum of its Nutrients

July 15, 2020

2

Slide 3

Webinar Reminders

During the webinar
- A copy of the slides is available via a link in the reminder email
- Preferred browsers for optimal viewing and audio: Google Chrome or Firefox
- Please type questions into the chat window
- Follow along with **#DairyNourishesLife**

After the webinar
- Continuing education certificates and handouts will be emailed within 24 hours
- Webinar recording will be available next week on www.USDairy.com

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3

Slide 4

Find the **slides** in the reminder email sent on July 14.

Find the **CE Certificates** in the post webinar email

4

Slide 5

Dairy Nourishes Life Webinar Series
Achieved on USDairy.com. Search: "webinar"

Fat or Fiction: The Science of Whole Milk Dairy Foods within Healthy Eating Patterns — May 14, 2019

A World Well-Nourished: Dairy's Role in Health and Sustainable Food Systems — February 7, 2019

Get Cultured on Fermented Dairy Foods — September 17, 2020

Dairy DYK: Your Top Questions Answered — December 12, 2019

Protein: Plant? Animal? Health? Planet?

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5

Slide 6

Acknowledgements

EMF European Milk Forum

Programme
The Dairy Matrix: a new approach to understanding the health effects of food
Saturday – 2 November 2019
11:15 to 12:45 – Room MOA 1-2
Within the framework of the EFAD CONGRESS

USDairy.com @NtlDairyCouncil #DairyNourishesLife   http://www.milknutritiousbynature.eu/home/   NDC

6

Slide 7

Today's Speakers

Sally Cummins, MS, RDN, LDN
Vice President,
Sustainable Nutrition Affairs
National Dairy Council

sally.cummins@dairy.org
@SallyCumminsRD

Katie Brown, EdD, RDN
Senior Vice President,
Sustainable Nutrition
National Dairy Council

Katie.brown@dairy.org
@Katiebrownrdn

Carrie Hamady, EdD, MS, RD, FAND
Director of Undergraduate Program in
Nutrition and Dietetics and Instructor
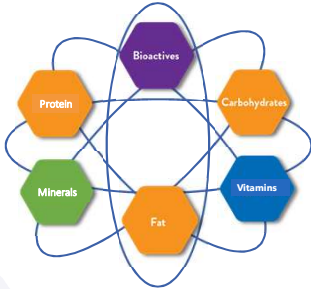Bowling Green State University

carrieh@bgsu.edu
@carrierd

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7

Slide 8

Today's Discussion

- Review the history of nutrition science
- Explore the emerging concept of the food matrix
- Consider examples of how the matrix may be responsible for unexpected results
- Apply to your practice

Bioactives, Protein, Carbohydrates, Minerals, Fat, Vitamins

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8

Slide 9

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The Food Matrix:
More Than The Sum of its Nutrients

9

Slide 10

thebmj

History of modern nutrition science—implications for current research, dietary guidelines, and food policy

The History of Modern Nutrition Science

Dariush Mozaffarian, DrPh, MD, MPH

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Mozaffarian D, et al. BMJ. 2018. 361:k2392.

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10

Slide 11

Nutrition is a Young & Vibrant Science
The first vitamin was isolated less than a century ago
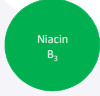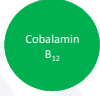
Thiamin Vitamin B1

Vitamin C

Niacin B3

Cobalamin B12

Vitamin D

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Mozaffarian D, et al. BMJ. 2018. k239.

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11

Slide 12

Nutrition is a Young & Vibrant Science
The first vitamin was isolated less than a century ago

Thiamin Vitamin B1 — Beriberi

Vitamin C — Scurvy
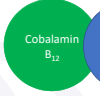
Niacin B3 — Pellagra

Cobalamin B12 — Pernicious anemia

Vitamin D — Rickets

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Mozaffarian D, et al. BMJ. 2018. k239.

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12

Slide 13

Focus on Prevention of Deficiencies through Fortification

Image: https://history.rockfordpubliclibrary.org/localhistory/?p=55092

Image: https://www.mortonsalt.com/heritage-era/roaring-20s-and-beyond/

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Dietary Reference Intakes: Guiding Principles for Nutrition Labeling and Fortification. Institute of Medicine. 2003.

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13

Slide 14

Fortification, enrichment and supplementation plays an important role in human health

Pellagra Deaths in the United States (1929-1955)

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Park, et al. Amer J Pub Hlth. 2000. 90:727-738.

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14

Slide 15

Reductionist Perspective Carried Through to Reduction of Chronic Diseases

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15

Slide 16

Systematic reviews and meta-analyses of RCTs*

Large Trials that Look at Diet and Disease Outcome- 1990s

Randomized controlled trials

Cohort studies

Case-control studies

Cross-sectional studies, surveys

Case reports, case studies

Early Vitamin Discovery- 1900s

Mechanistic studies

Editorials, expert opinion

Higher — Quality of evidence — Lower

Lower — Risk of bias — Higher

*Meta-analyses and systematic reviews of observational studies and mechanistic studies are also possible.

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Adapted from: Yetley, et al. American Journal of Clinical Nutrition 2016. 105(1).

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16

Slide 17

Protective Effects of Fruit Not Explained by Beta-Carotene Alone

IJC International Journal of Cancer

Beta-carotene supplementation and cancer risk: a systematic review and metaanalysis of randomized controlled trials

Nathalie Druesne-Pecollo, Paule Latino-Martel, Teresa Norat, Emilie Barrandon, Sandrine Bertrais, Pilar Galan, Serge Hercberg

Meta-analysis of 13 RCTs

" ...Beta-carotene supplementation has not been shown to have any beneficial effect on cancer prevention... This study adds to the evidence that **nutritional prevention of cancer through beta-carotene supplementation should not be recommended**. "

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Druesne-Pecollo N, et al. Int J Cancer. 2010. 127(1): 172-184.

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17

Slide 18

Heart Health Effects of Fish Not Explained by EPA/DHA Alone

Cochrane Database of Systematic Reviews

Omega-3 fatty acids for the primary and secondary prevention of cardiovascular disease

Cochrane Systematic Review - Intervention | Version published: 30 November 2018 see what's new

https://doi.org/10.1002/14651858.CD003177.pub4

Meta-analysis of 79 trials (>112,000 people) Data current to April 2017

" ...Moderate- and high-quality evidence suggests that increasing EPA and DHA has little or no effect on mortality or cardiovascular health (evidence mainly from supplement trials)... **There is evidence that taking omega-3 capsules does not reduce heart disease, stroke or death**."

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Abdelhamid, et al. Cochrane Database Syst Rev. 2018. 11.

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18

Slide 19

Food Matrix
food ma·trix

noun
The nutrient and non-nutrient components of foods and their molecular relationships, i.e. chemical bonds, to each other.
-*USDA*

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https://agclass.nal.usda.gov/mtwdk.exe?k=glossary&l=60&w=6026&v=5&t=2

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19

Slide 20

Food Matrix
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The nutrient and non-nutrient components of foods and their molecular relationships, i.e. chemical bonds, to each other.
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https://agclass.nal.usda.gov/mtwdk.exe?k=glossary&l=60&w=6026&v=5&t=2

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20

Slide 21

Food Matrix Transformation

Chew · Chop · Homogenize · Heat · Ferment · Puree

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21

Slide 22

The Carrot Matrix

Physical Matrix
Solid
• 88% water, 12% solid

Nutrient Matrix*
• Carbohydrate
• Fiber
• Vitamins
   • Vitamin A
      • Beta-carotene
      • Alpha-carotene
   • Vitamin B6
   • Vitamin C
   • Folate
• Minerals
   • Potassium
• Anthocyanins
   • Lutein
• Antioxidants
   • Lycopene

+ Preparation

* Includes, but not limited to

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Nutrition Data sourced and calculated from FoodData Central: 11124

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22

Slide 23

The Carrot Matrix Impacts Absorption of Carotenoids

EJCN
European Journal of Clinical Nutrition

Estimation of carotenoid accessibility from carrots determined by an *in vitro* digestion method

E Hedrén[1]*, V Diaz[2] and U Svanberg[1]

Form of carrots	Total carotenoids Recovered[1]
Raw, bitesize chunks	3%
Cooked, bitesize chunks	6%
Pulped, raw	21%
Pulped, raw with canola oil	28-34%*
Pulped, cooked	27%
Pulped, cooked with canola oil	38-45%*

* Total carotenoids dependent upon amount of oil addition.

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Hedren E, et al. Eur J Clin Nutr. 2002. 56(5): p. 425-30.

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23

Slide 24

The Almond Matrix

Physical Matrix
Solid
• 4.4% water, 95.6% solid

Nutrient Matrix*
• Protein
• Fatty Acids
• Fiber
• Phytosterols
• Vitamins
   • Vitamin E
   • Riboflavin
   • Niacin
• Minerals
   • Calcium
   • Copper
   • Magnesium
   • Phosphorus
   • Potassium
   • Zinc
• Phenolic Compounds
• Flavonoids

+ Cooking & Grinding

* Includes but not limited to

Image: Int'l J Food Sci & Tech 2016

USDairy.com @NtlDairyCouncil #DairyNourishesLife

Nutrition Data sourced and calculated from FoodData Central: 170567

NDC

24

Slide 25 — The Almond Matrix

The Almond Matrix

Physical Matrix
Solid
- 4.4% water, 95.6% solid

Nutrient Matrix*
- Protein
- Fatty Acids
- Fiber
- Phytosterols
- Vitamins
  - Vitamin E
  - Riboflavin
  - Niacin
- Minerals
  - Calcium
  - Copper
  - Magnesium
  - Phosphorus
  - Potassium
  - Zinc
- Phenolic Compounds
- Flavonoids

+ Cooking & Grinding

* Includes but not limited to

Image: Int'l J Food Sci & Tech 2016

USDairy.com @NtlDairyCouncil #DairyNourishesLife   Nutrition Data sourced and calculated from FoodData Central: 170567   NDC

25

Slide 26 — Almond Matrix Impacts Amount of Calories Digested

Almond Matrix Impacts Amount of Calories Digested

Food & Function

Food processing and structure impact the metabolizable energy of almonds††‡

Sarah K. Gebauer,[a] Janet A. Novotny,[b] Gail M. Bornhorst[c] and David J. Baer[d]

Image: Almond Board of California

123 of 164 — 25% Fewer Calories Absorbed
WHOLE UNROASTED ALMONDS
123 calories are absorbed versus the current 164 calories shown on the nutrition label.

138 of 170 — 19% Fewer Calories Absorbed
WHOLE ROASTED ALMONDS
138 calories are actually absorbed versus the current 170 calories as currently shown on the nutrition label.

141 of 170 — 17% Fewer Calories Absorbed
CHOPPED ROASTED ALMONDS
141 calories are absorbed versus the 170 calories currently shown on the nutrition label.

174 of 174 — 0% Fewer Calories Absorbed
ALMOND BUTTER
Absorbed calories of almond butter were found to be similar to what would be found on the nutrition label.

USDairy.com @NtlDairyCouncil #DairyNourishesLife   Gebauer, SK, et al. Food & Function. 2016. 7, 4231.   NDC

26

Slide 27 — The Dairy Matrix

NDC

The Dairy Matrix

27

Slide 28 — The Dairy Matrix

The Dairy Matrix

The American Journal of CLINICAL NUTRITION

Whole dairy matrix or single nutrients in assessment of health effects: current evidence and knowledge gaps[1,2]

Tanja Kongerslev Thorning,[3] Hanne Christine Bertram,[5] Jean-Philippe Bonjour,[6] Lisette de Groot,[7] Didier Dupont,[8] Emma Feeney,[9] Richard Ipsen,[4] Jean Michel Lecerf,[10] Alan Mackie,[11] Michelle C McKinley,[12] Marie-Caroline Michalski,[13,14] Didier Rémond,[15] Ulf Risérus,[16] Sabita S Soedamah-Muthu,[17] Tine Tholstrup,[3] Connie Weaver,[18] Arne Astrup,[3]* and Ian Givens[19]

Funded by European Milk Forum

USDairy.com @NtlDairyCouncil #DairyNourishesLife   Thorning, TK, et al. Amer J Cli Nutr. 2017. 1033–1045.   NDC

28

Slide 29 — Whole Milk's Composition

Whole Milk's Composition

~87% Water

~13% Solids
~4.8% Carbohydrate (98-99% lactose)

~3.25% Fat (over 400 types of fatty acids)
65% saturated | 29% monounsaturated | 6% polyunsaturated
Short, medium, long, odd, branched chain, trans fatty acids
[contained within the milk fat globule membrane (MFGM)]

3.2% *Complete* Protein
82% casein | 18% whey

https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=131.110

29

Slide 30 — The Whole Milk Matrix

The Whole Milk Matrix

Liquid Matrix

87% WATER   13% SOLIDS

Macronutrients
Minerals
Vitamins
Bioactives

- Milk is a good or excellent source of 9 essential nutrients
- Vitamin D is added to milk.
- Vitamin A is naturally occurring in whole milk and added to reduced-fat, low-fat and fat-free milks.

USDairy.com @NtlDairyCouncil #DairyNourishesLife   Nutrition Data sourced and calculated from FoodData Central: 602770   NDC

30

Slide 31

The Whole Milk Matrix

Liquid Matrix

87% WATER (shown) 13% SOLIDS

- Macronutrients
- Minerals
- Vitamins
- Bioactives

* Milk is a good or excellent source of 9 essential nutrients
• Vitamin D is added to milk.
** Vitamin A is naturally occurring in whole milk and added to reduced-fat, low-fat and fat-free milks.

USDairy.com @NtlDairyCouncil #DairyNourishesLife   Nutrition Data sourced and calculated from FoodData Central: 602770   NDC

31

Slide 32

The Whole Milk Matrix

Liquid Matrix

87% WATER (shown) 13% SOLIDS

- Macronutrients
- Minerals
- Vitamins
- Bioactives

* Milk is a good or excellent source of 9 essential nutrients
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USDairy.com @NtlDairyCouncil #DairyNourishesLife   Nutrition Data sourced and calculated from FoodData Central: 602770   NDC

32

Slide 33

The Whole Milk Matrix

Liquid Matrix

87% WATER (shown) 13% SOLIDS

- Macronutrients
- Minerals
- Vitamins
- Bioactives

* Milk is a good or excellent source of 9 essential nutrients
• Vitamin D is added to milk.
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33

Slide 34

Milk Bioactives

"Bioactives are constituents in foods, other than those to meet basic nutritional needs, that are responsible for a change in human health."
-Office of Disease Prevention & Health Promotion, National Institutes of Health

- Bioactive Fatty Acids
- Bioactive Peptides
- Bioactive Carbohydrates

USDairy.com @NtlDairyCouncil #DairyNourishesLife   NIH, Office of Dietary Supplements. Federal Register Vol. 69 No. 179 FR Dec 04–20892, Sept. 16, 2004   NDC

34

Slide 35

Potential Bioactive Peptides
Emerging Research

Summary of Oregon State University Milk Bioactive Peptide Database (MBPDB)		
Class	Reported Biological Function	# entries
ACE-inhibitory peptides	• Blood pressure-reducing effects	420
Antimicrobial peptides	• Anti-microbial activity across 49 species of bacteria, fungi, parasites • potential utility as an alternative to chemical preservatives	207
Dipeptidyl peptidase IV (DPP-IV)-inhibitory peptides	• Inhibition of enzymes that inactivate incretin hormones • Help maintain normal blood glucose levels	172
Antioxidant peptides	• Prevent or scavenge free radicals • Prevent lipid oxidation during meat processing (shelf-life extension)	47
Anti-inflammatory peptides	• Inhibition of nuclear factor-ĸB (NF- ĸB) signal in macrophages (activation promotes transcription of pro-inflammatory cytokines)	10
Immunomodulatory peptides	• Stimulates lymphocyte activity, promote antibody formation	9
Opioid peptides	• Modulate gastrointestinal transit time, motility	40

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35

Slide 36

Potential Bioactive Lipids
Emerging Research

Milk Fat Globular Membrane

Lipid Classes Within the Milk Fat Globular Membrane (MFGM)
- Short, medium and long chain fatty acids
- Naturally occurring trans fatty acids
- Branched chain fatty acids
- Polar Lipids
  - Phospholipids
  - Sphingolipids

Glycolipids (cerebrosides, gangliosides)
Butryophilin
Glycophospholipids (PE, PC, PI, PS)
Sphingomyelin
Triacylglycerols
Glycosylated Proteins
MILK FAT GLOBULE MEMBRANE

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36

Slide 37

Potential Bioactive Lipids
Emerging Research

Lipid Classes Within the Milk Fat Globular Membrane (MFGM)
- Short, medium and long chain fatty acids
- Naturally occurring trans fatty acids
- Branched chain fatty acids
- Polar Lipids
  - Phospholipids
  - Sphingolipids

Active Research Areas
- Supportive of weight management
- Mechanistic role in reducing risk for type 2 diabetes
- Anti-inflammatory properties
- Mechanistic role in health-promoting metabolic and blood lipid effects
- MFGM lipids and potential anti-pathogenic activity in the gut

USDairy.com @NtlDairyCouncil #DairyNourishesLife

National Dairy Council. *SCIENCE BRIEF: The Complexity of Milk.* 2019.

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37

Slide 38

Potential Bioactive Carbohydrates
Emerging Research

Classes
- Oligosaccharides
- Glycolipids
- Mucins

Active Research Areas
- Prebiotic properties
- Antipathogenic activity (in vitro)
- Other areas

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38

Slide 39

Milk Matrix Transformation:
Fermentation ➡ Cheese and Yogurt

Gel Matrix

Solid Matrix

Short chain fatty acids

Bioactive Peptides

81% WATER

19% SOLIDS

36% WATER

64% SOLIDS

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Yogurt- Food Data Central: 171304
Cheese- Food Data Central: 170899

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39

Slide 40

Whole Milk May Not Negatively Affect Markers of Cardiovascular Disease or Type 2 Diabetes

EJCN

Table 3 Results after skimmed milk and whole milk periods

	Skimmed	Whole	P
Total cholesterol (mmol/L)	4.31 ± 0.15[a]	4.45 ± 0.15	0.06
LDL cholesterol (mmol/L)	2.27 ± 0.11	2.33 ± 0.11	0.54
HDL cholesterol (mmol/L)	1.63 ± 0.10	1.69 ± 0.10	0.04
Total:HDL cholesterol	2.74 ± 0.13	2.73 ± 0.12	0.82
Triacylglycerols (mmol/L)	0.98 ± 0.08	1.06 ± 0.08	0.24
Insulin (pmol/L)[b]	41.99 ± 4.13	45.66 ± 4.23	0.22
Glucose (mmol/L)	5.24 ± 0.07	5.32 ± 0.09	0.38
HOMA-IR[b]	1.37 ± 0.14	1.50 ± 0.14	0.23

HOMA-IR homeostasis model assessment—insulin resistance
[a]All values are mean ± SE. Statistical differences are based on linear mixed models with baseline values as covariates and adjustments for sex, age, BMI, and waist circumference (n = 17)

Effect of whole milk compared with skimmed milk on fasting blood lipids in healthy adults: a 3-week randomized crossover study Sara Engel · Mie Elhauge · Tine Tholstrup

Randomized crossover control trial
n= 17 healthy adults
Consumed 0.5 L/d of either milk

"...The content of calcium and protein were similar in the two milk types, but whole milk has a higher content of milk fat globule membranes (MFGM), which encloses the fat.... Thus, one could speculate that an expected higher LDL cholesterol concentration after whole milk may be modified by a dairy matrix effect of MFGM."

Funded by Danish Dairy Research Foundation

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Engel S, et al. *Eur J Clin Nutr.* 2018. 72:249–254.

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40

Slide 41

Meta-Analysis: Cheese Consumption is Associated with Reduced CVD Risk

EJCN

Decreased risk   Increased risk

CVD
10% reduced risk

CHD
14% reduced risk

Stroke
10% reduced risk

-1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8

Cheese consumption and risk of cardiovascular disease: a meta-analysis of prospective studies

15 Prospective Observational Studies ~340,000 participants

""This meta-analysis of prospective studies suggests a nonlinear inverse association between cheese consumption and risk of CVD."

"...the largest risk reductions observed at the consumption of approximately 40 g/d (~1.3 oz)"

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Chen, et al. *Eur J Nutr.* 2017. 56(8):2565-75.

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41

Slide 42

Yogurt is Associated with Reduced Risk for Type 2 Diabetes

ASN EST. 1928

Systematic Review of the Association between Dairy Product Consumption and Risk of Cardiovascular-Related Clinical Outcomes[1–3]

Jean-Philippe Drouin-Chartier,[a] Didier Brassard,[a] Maude Tessier-Grenier,[a] Julie Anne Côté,[a] Marie-Eve Labonté,[a] Sophie Desroches,[a] Patrick Couture,[a,b] and Benoît Lamarche[a]

Type 2 diabetes

Relative Risk of 1 = No Risk
< 1 = reduced risk
> 1 = increased risk

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Drouin-Chartier JP, et al. *Adv Nutr.* 2016. 7:1026–40.

Funded by Dairy Research Consortium

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42

Slide 43

Yogurt is Associated with Reduced Risk for Type 2 Diabetes

Systematic Review of the Association between Dairy Product Consumption and Risk of Cardiovascular-Related Clinical Outcomes[1-3]

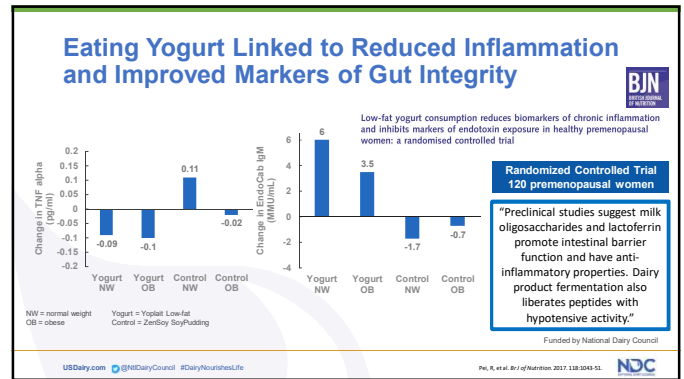Jean-Philippe Drouin-Chartier,[a] Didier Brassard,[a] Maude Tessier-Grenier,[a] Julie Anne Côté,[a] Marie Eve Labonté,[a] Sophie Desroches,[a] Patrick Couture,[a,7] and Benoît Lamarche[a,*]

Type 2 diabetes

Total dairy

Low-fat

Dairy fat

Milk

Cheese

Yogurt
- Tong et al. 2011 (9)
- Gao et al. 2013 (14)
- Aune et al. 2013 (18)
- Chen et al. 2016 (25)

Fermented

Lower Risk

Relative Risk of 1 = No Risk
< 1 = reduced risk
> 1 = increased risk

Relative risk: 0.40 0.60 0.80 1.00 1.20 1.43

Funded by Dairy Research Consortium

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Drouin-Chartier JP, et al. Adv Nutr. 2016; 7:1026–40.

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Slide 44

Eating Yogurt Linked to Reduced Inflammation and Improved Markers of Gut Integrity

BJN

Low-fat yogurt consumption reduces biomarkers of chronic inflammation and inhibits markers of endotoxin exposure in healthy premenopausal women: a randomised controlled trial

Change in TNF alpha (pg/ml)
- Yogurt NW: -0.09
- Yogurt OB: -0.1
- Control NW: 0.11
- Control OB: -0.02

Change in EndoCab IgM (MMU/mL)
- Yogurt NW: 6
- Yogurt OB: 3.5
- Control NW: -1.7
- Control OB: -0.7

NW = normal weight
OB = obese

Yogurt = Yoplait Low-fat
Control = ZenSoy SoyPudding

Randomized Controlled Trial 120 premenopausal women

"Preclinical studies suggest milk oligosaccharides and lactoferrin promote intestinal barrier function and have anti-inflammatory properties. Dairy product fermentation also liberates peptides with hypotensive activity."

Funded by National Dairy Council

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Pei, R, et al. Br J of Nutrition. 2017; 118:1043-51.

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Slide 45

Whole Fat Dairy Foods Linked with Lower Risk of Metabolic Syndrome

BMJ Open Diabetes Research & Care

Association of dairy consumption with metabolic syndrome, hypertension and diabetes in 147812 individuals from 21 countries

Prospective Study
147,812 participants (35-70 years) from 21 countries across 5 continents

"…intake of dairy products, especially whole fat products, is associated with lower prevalence of MetS…and a lower risk of hypertension and diabetes… If our findings are confirmed in sufficiently large and long term trials, then increasing dairy consumption may represent a feasible and low cost approach to reducing MetS, hypertension, diabetes, and ultimately cardiovascular disease events worldwide"

> 2 daily servings of whole fat dairy foods linked to

28% Lower Prevalence → **Metabolic Syndrome**

3 daily servings of dairy foods linked to

~14% Lower Prevalence → **High Blood Pressure & Diabetes**

Funded by Population Health Research Institute and contributions from numerous companies organizations including an unrestricted grant from National Dairy Council

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Bhavadharini B, et al. BMJ Open Diabetes Research and Care. 2020.

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Slide 46

The Matrix Supports Food-based Dietary Guidance

JACC
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY

Saturated Fats and Health: A Reassessment and Proposal for Food-based Recommendations: JACC State-of -the-Art Review

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Review Paper 130 papers

"A food-based approach to guiding saturated fat intake is warranted particularly since foods have a complex matrix, and their health effects cannot be predicted by the content of any individual nutrient. "

Previous Advice: Restrict SFA intake to reduce risk of CVD

Current Evidence Base: Health effects of SFAs depend on the interacting effects from naturally occurring food components and from unhealthy compounds introduced by processing

Whole-Fat Dairy Unprocessed Red Meat Dark Chocolate = Complex food matrix with high SFA content but also other nutrients and non-nutritive components (e.g. proteins, micronutrients, phospholipids, probiotics) = No increased CVD or diabetes risk

New recommendations should emphasize food-based strategies that translate for the public into understandable, consistent, and robust recommendations for healthy dietary patterns.

Funded by Nutrition Coalition.

USDairy.com @NtlDairyCouncil #DairyNourishesLife

Astrup et al. J Amer Col Card. 2020.

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Slide 47

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Making the Matrix Meaningful
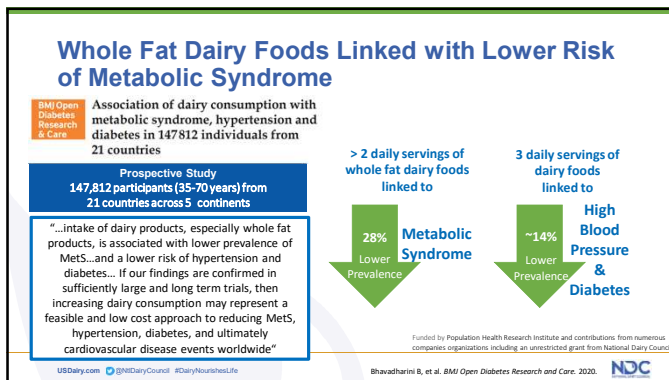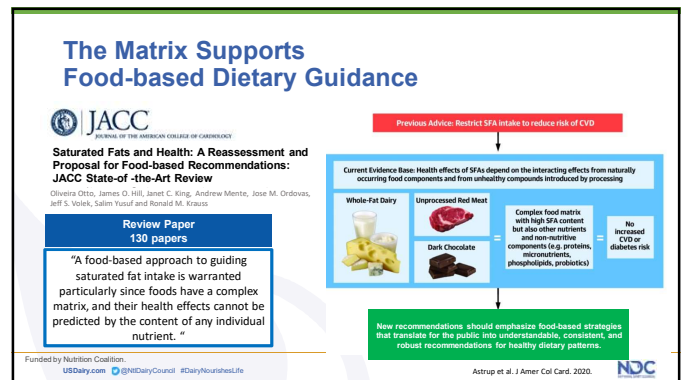
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Slide 48

Disclosures

- Employer: Bowling Green State University, Ohio
- National Dairy Association Ambassador
- Group Lead, Nutrition Care Process and Research Outcome (NCPRO) Committee's ANDHII Subcommittee
- Chair-elect, Council on Professional Issues (CPI), Ohio Academy of Nutrition and Dietetics

Slide 49

*"To be a intelligent **reductionist**, one's ultimate purpose must involve appreciation of, and application to, the **whole**, which is often greater than the sum of the parts. And in order to be intelligently **holistic**, one must acknowledge the contribution of the reductionist…"*
- Barbara Burlingame, PhD

Reductionist
- Examines singe parts of the diet
- Single food components
- Major focus of early nutrition research
- Not looking at the whole picture

Holistic
- Explores the relationship of foods and health
- Looks at the entire food, not just one component
- Difficult to understand specific nutrients in food

49

Slide 50

https://medium.com/disruptive-design/tools-for-systems-thinkers-the-6-fundamental-concepts-of-systems-thinking-379cdac3dc6a

50

Slide 51

Be Curious and Critical

51

Slide 52

2005, 2010, 2015* Dietary Guidelines Recommend 3 Daily Servings of Dairy Foods for Those >9 Years

The 2015 DGA states that healthy eating patterns, including low-fat or fat-free dairy foods, are associated with **reduced risk for several chronic diseases, including cardiovascular disease** (strong evidence) and **type 2 diabetes** (moderate evidence). Research has also linked dairy intake to **improved bone health**, especially in children and adolescents

*3 servings for Americans 9 years an older in the Healthy U.S.-Style and Healthy Vegetarian Eating Patterns.

Dietary Guidelines for Americans, 2015-2020

52

Slide 53

You Cannot Mimic the Matrix

https://www.usdairy.com/news-articles/how-milk-compares-to-various-plant-based-alternative-beverages

53

Slide 54

Plant-Based Dairy Alternatives:

Not Recommended for Young Children as "Nutrient Content Varies Widely"

https://healthydrinkshealthykids.org/app/uploads/2019/09/HDHK_One_Pager_Plant-Based-Non-Dairy-Milks.pdf

54

9

Slide 55

HEALTHY DRINKS. HEALTHY KIDS.

American Academy of Pediatrics
eat right. Academy of Nutrition and Dietetics
American Heart Association
AMERICA'S PEDIATRIC DENTISTS
THE BIG AUTHORITY on little teeth

Plant-Based Dairy Alternatives:

Not Recommended for Young Children as "Nutrient Content Varies Widely"

See the full guidelines and learn more at
HEALTHYDRINKSHEALTHYKIDS.ORG

TECHNICAL SCIENTIFIC REPORT
Healthy Beverage Consumption in Early Childhood
Recommendations from Key National Health and Nutrition Organizations
Healthy Eating Research

HEALTHY DRINKS. HEALTHY KIDS.
Healthy Beverage Consumption in Early Childhood
Recommendations from Key National Health and Nutrition Organizations

plant-based, non-dairy milks

Why aren't these products recommended for young children?
Plant-based, non-dairy milks aren't recommended as a complete dairy milk replacement for young children as the nutrient content of these milks varies widely. With the exception of fortified soy milk, these milks are not adequate nutritional substitutes for dairy milk, which has many nutrients essential for healthy growth and development.

Some plant-based, non-dairy milks have added nutrients, such as calcium and vitamin D, but the amounts vary by type and brand, and evidence suggests that our bodies may not absorb nutrients from plant milks as well as it can from dairy milk.

Unsweetened and fortified non-dairy milks may be a good choice if your child is lactose intolerant or allergic to dairy milk, or if your family has chosen not to eat animal products. Be sure to consult with your pediatrician or a registered dietitian nutritionist to choose a milk substitute for your child and discuss how to make sure his or her overall diet has enough of the key nutrients found in milk, such as protein, calcium, and vitamin D.

To learn more about what experts recommend at different stages for kids five and under, visit HealthyDrinksHealthyKids.org.

https://healthydrinkshealthykids.org/app/uploads/2019/09/HDHK_One_Paper_Plant-Based-Non-Dairy-Milks.pdf

55

Slide 56

Nearly 9 in 10 Americans Fall Short on both Dairy and Vegetable Recommendations

Intake Below Recommendation or Above Limit
Intake At/Above Recommendation or Below Limit

Vegetables
Fruit
Total Grains
Dairy
Protein Foods
Oils
Added Sugars
Saturated Fat
Sodium

100 80 60 40 20 0 20 40 60 80 100
% Population Below Recommendation or Limit   % Population Above Recommendation or Limit

Dietary Guidelines for Americans, 2015-2020

56

Slide 57

Overview of the Food Matrix and Nutrition Practice

Guiding Principles

1. One food alone does not drive the nutritional value of a diet or meal (molecular relationships)

2. Focus on balance of foods and macronutrients meal by meal, not by the day

57

Slide 58

Teach by Tech

- Establish a baseline:
  - Eating Patterns
  - Habits
  - Preferences
  - Allergies
  - Accessibility

fitbit
myfitnesspal

58

Slide 59

Focus on Food Flexibility and Inclusion

1. Teach the Parts of the Plate
   - At least 20-30 grams of protein per meal/10 grams per snack
   - Whole grains
   - Healthy fats, especially omega-3s
   - Half the plate fruit and vegetables
   - Dairy foods can be on the plate or in a cup

59

Slide 60

Focus on Food Flexibility and Inclusion

2. Focus on the positive
   - Encourage the addition of foods or lifestyle changes, not the elimination
3. Food pairing
   - Prevent sharp changes in blood sugar
   - Lessen that afternoon slump
   - Improve mental clarity
   - Decrease hunger between meals

60

SET yourself up for fat flexibility

Swap less nutritious sources of fat for fuller-fat, nutrient-rich dairy foods

Ensure snacks stack up
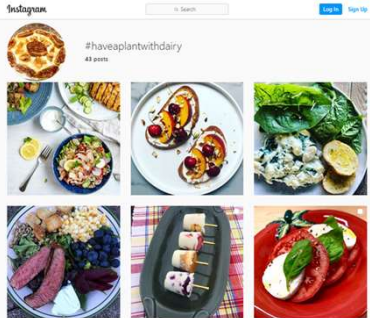
Think about portions

61

Words Matter

• Life can be challenging, make eating and nutrition fun again!
  • Convenience vs. Processed
  • Meals vs. Macros
  • MyPlate vs. Counting Calories
  • Activity or Movement vs. Exercise
  • Fruits and Vegetables vs. Fresh

62

Simple Complexity

Join the movement
#HaveAPlantWithDairy

63

64

U.S. Dairy is an environmental solution

Set environmental stewardship goals for air, land and water

• Become **carbon neutral or better**
• **Optimize water use** while maximizing recycling
• **Improve water quality** by optimizing utilization of manure and nutrients

65

Conclusion

• Nutrition science continues to evolve
• Foods are more than the sum of their nutrients
• The dairy food matrix and its unique combination of nutrients and bioactives may help explain why:
  • dairy foods are associated with positive health outcomes,
  • we see unexpected results with whole fat dairy foods
• Food-based guidance is a positive and realistic approach

66

11

67

68

69