




**Nutrition with a Mission: Fermented Dairy Foods
in a Healthy, Affordable Diet**
Nebraska Academy of Nutrition and Dietetics
April 26, 2019


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#DairyNourishesLife

1

Today's Presenters



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2

Learning Objectives

1. Distinguish between fermented foods and probiotics
2. Discuss the growing body of scientific evidence supporting consumption of fermented dairy foods within healthy dietary patterns and:
 - a. Reduced risk of type 2 diabetes (T2DM)
 - b. Reduced risk of cardiovascular disease (CVD)
 - c. Emerging evidence on yogurt's role in reducing inflammation
3. Describe the benefits of dairy food / fermented dairy matrix
4. Provide practical examples for building healthy and appealing eating patterns, which incorporate fermented dairy foods



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3

**Fermented Foods:
What is old is new again**



https://commons.wikimedia.org/wiki/File:Egyptian-woman-painting_Beer.jpg

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4

Americas

Hawaii
Poi



Mexico
Pozol



Colombia
Guarapo



Peru
Champus



5

Asia

Korea
Kimchi



Japan
Natto



Tibet
Jun



India
Lassi



6

Africa

Ethiopia
Injera



Ethiopia
Ayib



South Africa
Incwancwa



Nigeria
Iru



7

Europe

Germany
Sauerkraut



Eastern Europe
Smetana



Iceland
Skyr



Central Europe
Kefir



8

The History of Yogurt

~10,000 BC: Herdsman in the Middle East kept milk in goatskin bags, which transformed into a tangy custard.

2,000 BC: Yogurt became a popular way to preserve milk of domesticated animals.

1072: The Turks were the first to evaluate yogurts medicinal use in a comprehensive dictionary, *Diwan Lughat al-Turk*.

1208: Genghis Khan, is reputed to have fed his army yogurt, based on the belief it instilled strength and bravery.

1905: *Lactobacillus bulgaricus*, responsible for milk fermentation is discovered.

1909: Metchnikoff's theory on yogurt's "Life-extending" properties.

1919: Yogurt is commercialized through pharmacies.

NationalDairyCouncil.org | Modified from: *Yogurt in Nutrition. Complete History of Yogurt Making* | @NIDairyCouncil | NDC NATIONAL DAIRY COUNCIL | 9

9

Fermented Foods: Topping the Trends Lists

Pickled, fermented foods are great for gut health.

Go with your gut: Why fermented foods could be next superfood trend.

Health Beat: Fermented food boosts health.

Who Knew? Fermented Ingredients Also Do Amazing Things for Your Skin Care.

Source: Pollack Today's Dietitian. What's Trending in Nutrition. 2019.

NationalDairyCouncil.org | https://www.leolockpr.com/trends/ | https://www.todaydietitian.com/news/122018_news.shtml | @NIDairyCouncil | NDC NATIONAL DAIRY COUNCIL | 10

10

What are fermented foods?

A fermented food or beverage is a type of food made by extensive microbial growth. These foods are nothing new. They've been around for thousands of years. To understand how fermented foods are made, let's look at yogurt.

Yogurt is a fermented food made from milk. During yogurt fermentations, lactic acid-producing bacteria grow on the sugars and other nutrients in milk. As they multiply, the bacteria produce compounds that change the flavor, texture, and nutrients in the milk to give us what we know as yogurt.

The value of fermented foods:

- Source of live, active microbes
- Improve food taste, texture, and food digestibility
- Increase concentrations of vitamins and bioactive compounds in foods
- Remove/reduce toxic or anti-nutrients in raw foods
- Increase food safety and shelf-life

International Scientific Association for Probiotics and Prebiotics

NationalDairyCouncil.org | https://isapscience.org/wp-content/uploads/2017/01/Marco-health-benefits-fermented-foods-ISAPP-rev-17.pdf | @NIDairyCouncil | NDC NATIONAL DAIRY COUNCIL | 11

11

NationalDairyCouncil.org | https://www.discoverundernaturallydairy.com/curriculum | @NIDairyCouncil | NDC NATIONAL DAIRY COUNCIL | 12

12

Fermented Food or Probiotic?

Fermented Foods

- ✓ Made with microorganisms
- ✓ May or may not contain live active cultures at a level to confer a health benefit
- ✓ Most cheeses are fermented foods



The voluntary Live & Active Culture seal indicates a significant amount of the good bacteria remain alive after the fermentation process is complete.

Probiotics

- ✓ Should meet FAO definition: "Probiotics are *live microorganisms* that, when administered in *adequate amounts* confer a *health benefit*"
- ✓ Yogurts can be considered probiotic for people with lactose intolerance because traditional cultures, *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, have been well studied for their ability to help with lactose digestion

13

Fermented Foods and Gut Health

- The human digestive tract contains approximately 100 trillion bacterial cells = gut microbiota¹
- An imbalance between "good" bacteria and "bad" bacteria = dysbiosis²
- Factors influencing the gut microbiota composition²
 - Vaginal birth vs. Cesarean
 - Breast vs. formula feeding infants
 - Diet and intake of fiber
 - Antibiotic use
 - Hygiene levels
 - Genetic background
- Some diseases are characterized by microbial colonization patterns that differ from healthy controls³
- Fermented foods *may* contain living cultures that can add beneficial bacteria to the digestive tract³
- Eating fermented foods helps maintain a balance between good and bad bacteria
→ contributing to a healthier microbiota³

14

Dairy Foods and Health Outcomes

15

Cheese*: 6 essential nutrients

- Protein
- Calcium
- Phosphorus
- Vitamin B12
- Niacin
- Vitamin A

Milk: 9 essential nutrients

- Protein
- Calcium
- Vitamin D
- Phosphorus
- Vitamin A
- Riboflavin
- Pantothenic acid
- Niacin
- Vitamin B12

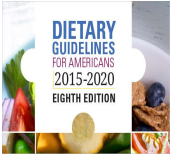
Yogurt: 7 essential nutrients

- Protein
- Calcium
- Phosphorus
- Vitamin B12
- Pantothenic Acid
- Riboflavin
- Zinc

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16

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




DIETARY GUIDELINES FOR AMERICANS 2015-2020 EIGHTH EDITION

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.

Dietary Guidelines for Americans, 2015-2020

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

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17

17

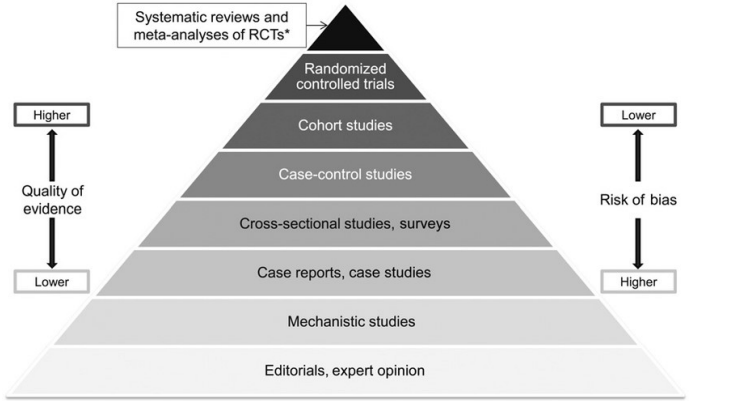
Fermented Dairy Foods and Health Outcomes

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18

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19

Adapted from A Yetley, et al. Options for basing Dietary Reference Intakes (DRIs) on chronic disease endpoints: report from a joint U.S./Canadian-sponsored working group. *American Journal of Clinical Nutrition*. 2016;105(1): 10-3945/ajcn.116.139097.

19

Fermented Dairy Foods & Type 2 Diabetes

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20

Visit Science Summaries at nationaldairycouncil.org



20

Dairy Foods are Linked to Reduced Risk of Type 2 Diabetes and Neutral Outcomes

The American Journal of CLINICAL NUTRITION

Dairy products and the risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies^{1,2}

PLOS ONE
A peer-reviewed, open access journal

Dairy Products Consumption and Risk of Type 2 Diabetes: Systematic Review and Dose-Response Meta-Analysis

What does 400g of dairy a day look like?

- 1 cup fluid milk = 245g
- 1 oz cheese = 28g
- 1, 6-oz container yogurt = 170g
- TOTAL = 443g or 3 servings**

6% reduced risk of type 2 diabetes associated with consuming 30g/d of dairy

7 Cohort Studies ~178,000 subjects

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21

Consistent Evidence Demonstrates Eating Yogurt is Associated with Reduced Risk for Type 2 Diabetes

BMC Medicine

Dairy consumption and risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis

The American Journal of CLINICAL NUTRITION

Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies^{1,2}

14 Prospective Cohort Studies >450,000 participants

22 Cohort Studies >570,000 individuals

Yogurt intake (one serving/day) associated with a 17% reduced risk for type 2 diabetes

14% reduced risk per 80 g/day (~1/3-1/2 cup per day) compared to 0 g/day yogurt intake

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22

Changes in Diet and Lifestyle and Long-Term Weight Gain in Women and Men

The NEW ENGLAND JOURNAL of MEDICINE

Dariusz Mozaffarian, M.D., Dr.P.H., Tao Hao, M.P.H., Eric B. Rimm, Sc.D., Walter C. Willett, M.D., Dr.P.H., and Frank B. Hu, M.D., Ph.D.

3 Cohort Studies (NHS I & II, HPFS) >120,000 women and men

Each serving of yogurt/d was associated with -0.82 lb. weight change over a 4 year period

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23

Fermented Dairy Foods & Cardiovascular Disease

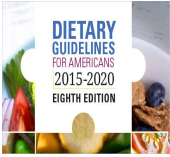
Visit Science Summaries at nationaldairyCouncil.org

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24

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

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



The 2015 DGA states that...


At least 10 systemic reviews/ meta-analyses & 13 cohort studies published between 2009-2017 suggest dairy food consumption – regardless of fat content – is not linked with higher risk for CVD, CHD or stroke.

Dairy intake was also linked to improved bone health, especially in children and adolescents.

Dietary Guidelines for Americans, 2015-2020

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Source: NDC Science Brief on Whole and Reduced-Fat Dairy Foods and Cardiovascular Disease



25

25

Cheese Consumption does not Impact Cholesterol Levels

2 or more risk factors for MetS


139 Subjects

Regular Cheese
80 g/d

Reduced Fat Cheese
80 g/d

Control

14% kcal from SFA 11% kcal from SFA 9% kcal from SFA
1 oz cheese = 28g; 80g cheese = ~3 oz



High intake of regular-fat cheese compared with reduced-fat cheese does not affect LDL cholesterol or risk markers of the metabolic syndrome: a randomized controlled trial^{1,2}

Forbes, Raziani, Theobald, Marlow, D. Kivimaki, Maki, L. Innes, Christian, Hill, Ann, Aramp, and Ann Rubin


Randomized Controlled Trial
139 subjects

Results: No differences in total, LDL and HDL cholesterol

Conclusion: "A high daily intake of regular-fat cheese for 12 weeks did not alter LDL cholesterol or metabolic syndrome risk factors."

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Raziani et al. *AJCN*. 2016; 104(4):973-81.



26

26

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

Decreased risk Increased risk

CVD
10% reduced risk


CHD
14% reduced risk

Stroke
10% reduced risk

0

Increased 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.



27

27

Hypertension Results: Yogurt and DASH Scores

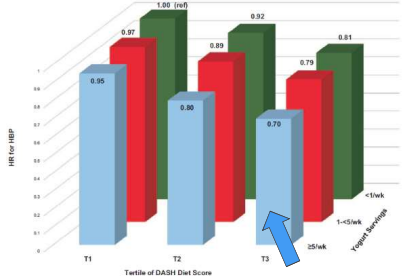



FIGURE 1 Pooled analysis of yogurt servings per week cross-classified with tertiles of a Dietary Approaches to Stop Hypertension diet score and risk of incident hypertension. Total intake servings were classified into three categories of intake reflecting low, medium, and high intakes. DASH diet scores were classified into tertiles of the score across the three cohorts. Analyses were adjusted for age, race, physical activity, energy intake, smoking, and family history of HBP. DASH, Dietary Approaches to Stop Hypertension; HBP, high blood pressure.



Long-term yogurt consumption and risk of incident hypertension in adults


Justin R. Buman, Yanying Li, Frank E. Hu, Howard J. Cabral, M. Loring Bradlee, Paula A. Quatromoni, Martha R. Singer, Gary C. Curhan, and Lynn S. Moore

3 Cohort Studies (NHS I & II, HPFS)
~184,000 participants

"Higher total dairy intake (3 to <6 servings/day), especially in the form of yogurt (at least 5 servings/week), was associated with lower risk of incident HBP in middle-aged and older adult men and women."

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Buendia JR et al. *J of Hypertension*. 2018;36(8):1671-79.



28

28

Yogurt Consumption Associated with Reduced Cardiovascular Disease Risk in Adults with Hypertension

METHODOLOGY

How many people participated?
Data from more than 55,000 females in the Nurses' Health Study and 18,000 males in Health Professionals Follow-up Study was analyzed.

What did the researchers study?
The association between eating yogurt and CVD risk (myocardial infarction and stroke) among adults with high blood pressure.

AJH AMERICAN JOURNAL OF HYPERTENSION

Regular Yogurt Intake and Risk of Cardiovascular Disease Among Hypertensive Adults

Austin S. Buendia¹, Yanying Li², Frank B. Hu¹, Howard A. Cohen¹, Yi-Ling Boushey¹, Patricia A. Gianfrancesco, Umberto B. Sirtori³, Gary C. Curhan¹, and Lynn S. Moore¹

2 Cohort Studies (NHS & HPFS)
~74,000 participants

RESULTS

Eating at least 2 cups of yogurt per week

30%
reduction in risk of having a heart attack in females

19%
reduction in risk of having a heart attack in males

"Hypertensive men and women who consumed ≥ 2 servings/week of yogurt, especially in the context of a healthy diet, were at lower risk for developing CVD."

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Buendia JR et al. *Am J Hypertension*. 2018; 31(5): 557 – 65. infographic adapted from Bell Institute. <https://twitter.com/bellinstitute/status/968546334163767296>

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29

Fermented Dairy Foods & Inflammation

Inflammation

- ✓ Eating dairy foods does not seem to be linked to increased inflammation
- ✓ In some cases eating dairy foods has been linked to reduced indicators of systemic inflammation

Critical Reviews in Food Science and Nutrition
Dairy products and inflammation: A review of the clinical evidence
Alessandra Bordon, Francesca Danesi, Dominique Dardevet, Didier Dupont, Aida S. Fernandez, Doreen Gille, Claudia Nunes dos Santos, Paula Pinto, Roberta Re, Didier Rémond, Danit R. Shahar & Guy Vergères

Systematic Review of 52 Clinical Trials

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30

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

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 (MIU/mL)

| | |
|------------|------|
| Yogurt NW | 6 |
| Yogurt OB | 3.5 |
| Control NW | -1.7 |
| Control OB | -0.7 |

BJN BRITISH JOURNAL OF NUTRITION

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

Randomized Controlled Trial
128 premenopausal women

12 ounces (1.5 servings) of low-fat yogurt/day x 9 weeks = reduced biomarkers of chronic inflammation and improved markers for gut integrity - compared with a non-dairy control food

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

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31

Economic Model Predicts Increased Yogurt Consumption Could Reduce Health Care Costs

Estimated UK population cost savings

Increasing average yogurt consumption by 100g/d could result in 388,000 fewer people developing T2D, which could save the UK £2.3bn

BMC Nutrition

RESEARCH ARTICLE Open Access

An economic model for the use of yoghurt in type 2 diabetes risk reduction in the UK

Irene Lousier-Wijnkoop¹, James Major¹, Lindsay Cantor¹, Alicia Woodard¹, Andrew Pentecost¹ and Nick Free¹

Patient Simulation Model

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Lousier-Wijnkoop et al. *BMC Nutrition* (2016) 2:77


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32

Dairy Foods Matrix



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| 33

33

Dairy Foods' Matrix is Unique: Whole is Greater than the Sum of its Parts







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| 34


34

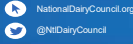
Fermented Dairy Foods Matrix

DELIVERY OF LIVE FERMENTS TO THE GI TRACT


- +** **Microorganisms in the diet**
The consumption of 'living' fermented foods potentially increases the numbers of microorganisms by up to 10 000-fold¹⁰⁹.
It could be equivalent to introducing new, albeit transient, bacteria into the indigenous, intestinal microbiota¹¹⁰.
- +** **Practical vehicle**
The delivery of microorganisms to the GI tract is supported by the food matrix, which promotes the long-term survival of microorganisms during distribution and storage¹¹¹.
The consumption of "live yogurt cultures in yogurt contributes to improve digestion of lactose in individuals with lactose maldigestion"¹¹².







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| 35

For full list of references, visit: <http://www.yogurtinnutrition.com/live-ferments-fermentation-of-milk-into-yogurt/>

35

People are Asking...

Is this good for my body?



Is this good for the animals?



Is this good for the planet?





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| 36

36



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37

37

Use this slide if you don't play the previous video

Ensuring Milk, Cheese and Yogurt are Free of Antibiotics

- FDA prohibits antibiotics in milk
- Numerous checkpoints in place as milk moves from farm to dairy case
- Any milk that tests positive is rejected and does not enter the food supply




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38

38



Recombinant Bovine Somatotropin (rbST): A Safety Assessment

Initially presented at the Joint Annual Meeting of the American Dairy Science Association*, Canadian Society of Animal Science, and American Society of Animal Science

Montreal, Canada
July 14, 2009

Updated on March 22, 2010

“...food products from cows treated with rbGH are safe for consumption by human.”

“The FDA’s review of rbGH has been scrutinized by both the Department of Health and Human Services’ Office of Inspector General (OIG) and by GAO, as well as by JECFA.”

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39

39



In Only 70 Years, We’ve Reduced our Impact...

- 90% less land
- 65% less water
- 76% less manure
- 63% less GHG

The dairy community has a voluntary commitment to further reduce GHG 25% by 2020

US Dairy Stewardship Commitment
Capper J. Cady A. Bauman D. 2009. The environmental impact of dairy production, 1944 compared with 2007. Journal of Animal Science. 87:2160-2167

40

From Research to Resources and Recipes

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41

Safety & Storage to Minimize Food Waste

| Cheese | Yogurt |
|--|--|
| Do not leave at room temperature for ≥ 2 hours, 1 hour if $\geq 90^\circ$ F Keep refrigerator at 35-40° F | |
| <p>Factor 20-30 minutes to come to room temp</p> <ul style="list-style-type: none"> ▪ Soft Cheeses: Toss after 2 hours ▪ Hard Cheeses: Can sit out for 2 hours then wrap well; refrigerate to use again <p>Mold?</p> <ul style="list-style-type: none"> ▪ Soft Cheeses: Don't eat ▪ Hard Cheeses: Cut $\geq 1"$ around and below the mold spot, re-cover the cheese in fresh wrap <p>What about freezing?</p> <ul style="list-style-type: none"> ▪ Softer cheese freeze well when shredded ▪ Aged cheese may become crumbly ▪ Thaw 24-28 hours in refrigerator | <p>Stored properly, shelf-life: 7-14 days</p> <p>Store tightly covered in original container on top shelf of refrigerator</p> <p>Eating only a portion of a carton? Spoon out what you intend to eat and return the carton to the refrigerator</p> <p>If separation occurs, stir the liquid (aka: whey) back into the yogurt</p> <p>What about freezing?</p> <ul style="list-style-type: none"> ▪ Changes texture. May lose active cultures ▪ Won't significantly impact nutritional value |

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42

Safety & Storage to Minimize Food Waste

Cheese

- Do not leave at room temperature for ≥ 2 hours, 1 hour if $\geq 90^\circ$ F
- Keep refrigerator at 35-40° F
- Factor 20-30 minutes to come to room temp
 - **Soft Cheeses:** Toss after 2 hours
 - **Hard Cheeses:** Can sit out for 2 hours then wrap well; refrigerate to use again



Mold?

- **Soft Cheeses:** Don't eat
- **Hard Cheeses:** Cut $\geq 1"$ around and below the mold spot, re-cover the cheese in fresh wrap

What about freezing?

- Softer cheese freeze well when shredded
- Aged cheese may become crumbly
- Thaw 24-28 hours in refrigerator

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43

Safety & Storage to Minimize Food Waste

Yogurt

- Do not leave at room temperature for ≥ 2 hours, 1 hour if $\geq 90^\circ$ F
- Keep refrigerator at 35-40° F
- Stored properly, shelf-life: 7-14 days
- Store tightly covered in original container on top shelf of refrigerator
- Eating only a portion of a carton?
 - Spoon out what you intend to eat and return the carton to the refrigerator



If separation occurs, stir the liquid (aka: whey) back into the yogurt

What about freezing?

- Changes texture; may lose active cultures
- Won't significantly impact nutritional value

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44

Quick Tips for Adding More Fermented Dairy to Your Plate

Breakfast

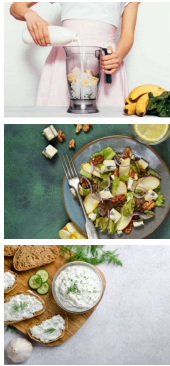
- Add yogurt, kefir or buttermilk to your smoothies, granola or oatmeal
- Create a savory breakfast bowl and top with yogurt and shredded cheese

Lunch/Dinner

- Use yogurt in place of mayonnaise on your sandwiches
- Try a yogurt-based salad dressing or make your own ranch using buttermilk
- Top salads with flavorful cheeses to add depth

Snacks

- Create your own dips using buttermilk or yogurt as the base
- Create yogurt parfaits by layering yogurt with granola & fresh fruit



45

Bringing Science to the Table



Visit www.nationaldairyCouncil.org/recipes for inspiration on how to bring the benefits of fermented dairy foods to the table



RECIPE

9 Simple Ways to Help You Get 3 Servings of Dairy



LUNCH

Grilled Shrimp with Yogurt Cilantro Salsa



BREAKFAST

14 Tasty Twists on Overnight Oats



APPETIZER

Roasted Red Pepper Yogurt Dip

46

Conclusions

- Current Dietary Guidelines for American 9 years and older recommend 3 daily servings of dairy foods as part of healthy diet patterns
- Fermented dairy food consumption is on the rise and is associated with lower risk of type 2 diabetes and cardiovascular disease as part of healthy diet patterns
- Emerging evidence suggest a reduction in post-meal and chronic inflammation may be one of the mechanisms mediating these beneficial effects
- Foods are more than just the sum of their individual nutrients; the dairy foods/fermented dairy matrix is unique and needs to be considered collectively when looking to understand these health benefits

47

Dairy Nourishes — NETWORK —

Dairy Nourishes Network members will receive:

- Quarterly updates
- Advance notice of webinars
- Recipe ideas/meal tips
- Engaging contests
- Opportunities to be highlighted on NDC's social
- In-person educational and networking events

www.NationalDairyCouncil.org/DairyNourishesNetwork

48

Questions?



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