

From Last Time:

Science of Cooking – BCBT100
Spring 2014 - Bodwin

Fermentation

Yogurt

Bacteria “digestion” of lactose
 Impact on lactose intolerance?
 Produces lactic acid
 Impact on properties?
 Streptococcus salivarius – thermophilus
 More active at lower acid concentration (higher pH)
 Lactobacillus delbrueckii – bulgaricus
 More active at higher acid concentration (lower pH)
 High acetaldehyde production – green apples

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Yogurt properties

Stabilizes milk for storage
 Lactoglobulin (a whey protein)
 facilitate casein networks
 Similar to fat globules in whipped cream
 Casein networks hold aqueous phase rather than air
 Probiotic bacteria
 Contributes to and enhances intestinal flora
 Aids digestion
 Read the label!

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What should yogurt contain?

Potassium	3,500mg	375g
Total Carbohydrate	300g	30g
Dietary Fiber	25g	

INGREDIENTS: CULTURED PASTEURIZED NONFAT MILK, PEACHES, MODIFIED CORN STARCH, CONCENTRATED PEACH PUREE, WHEY PROTEIN CONCENTRATE, NATURAL FLAVORS, GELATIN, TRICALCIUM PHOSPHATE, CITRIC ACID, MALIC ACID, PECTIN, AGAR, SUCRALOSE, ACESULFAME POTASSIUM, TURMERIC AND ANNATTO EXTRACTS (FOR COLOR), VITAMIN A PALMITATE, VITAMIN D3.
 *SET WITH ACTIVE CULTURES
 L. ACIDOPHILUS AND B. BIFIDUM
 CONTAINS: MILK
 DISTRIBUTED BY THE KROGER CO. CINCINNATI, OHIO 45202
 PROCESSED AT LOCATION SHOWN ON CONTAINER.
 **MEETS NATIONAL YOGURT ASSOCIATION CRITERIA FOR LIVE AND ACTIVE CULTURE YOGURT.

Image: <http://cheeseforum.org/forum/index.php?topic=546.0>
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What should yogurt contain?

INGREDIENTS: MILK (SKIM MILK, CONCENTRATED SKIM MILK, MILK SOLIDS), WATER, FRUIT 7.5% (STRAWBERRY), HALAL GELATINE, MODIFIED STARCH (1442), FRUCTOSE, NATURAL COLOURS (120,163), FLAVOURS, SWEETENERS (951,950), ENZYME (LACTASE), PRESERVATIVE (202), FOOD ACID (331), LIVE YOGURT CULTURES (CONTAINS ACIDOPHILUS AND BIFIDUS CULTURES), PREBIOTIC/OLIGOSACCHARIDES, CONTAINS PHENYLALANINE.

STRAWBERRY LOW FAT FRUIT YOGURT 200g

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What should yogurt contain?

INGREDIENTS: CULTURED GRADE A MILK. CONTAINS ACTIVE YOGURT AND L. ACIDOPHILUS CULTURES.

** MEETS NATIONAL YOGURT ASSOCIATION CRITERIA FOR LIVE AND ACTIVE CULTURE YOGURT

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KEEP REFRIGERATED

Image: <http://bare5.com/grocery-labels/ingredients-guide/>
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Why all the thickeners?

- Texture
- Smoother
- Limit separation
- Fat replacement

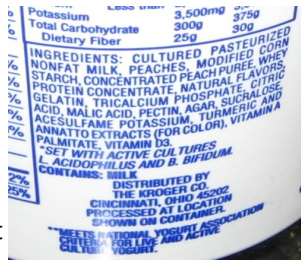


Image: <http://cheseforum.org/forum/index.php?topic=546>
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Making Yogurt

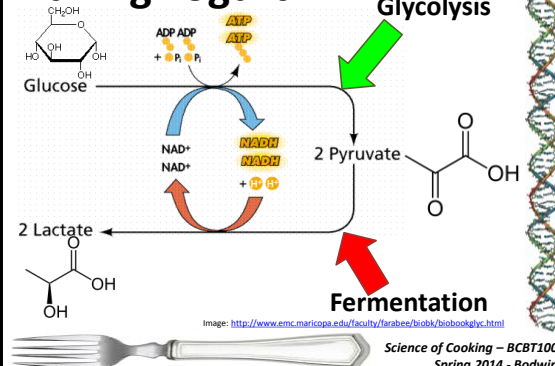


Image: <http://www.emc.maricopa.edu/faculty/farabee/biobk/biobookglyc.html>
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Sugar Metabolism

Glycolysis

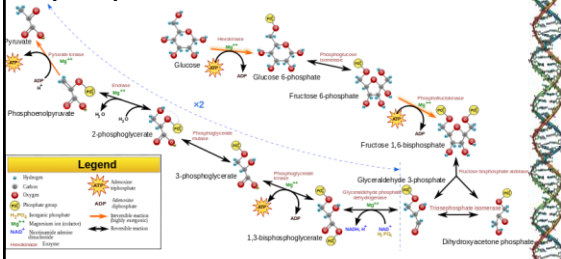
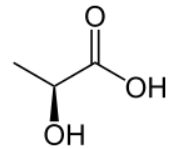


Image: <http://en.wikipedia.org/wiki/File:Glycolysis2.png>
 Image: <http://cheseforum.org/forum/index.php?topic=546>
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Making yogurt

Role of Lactic Acid

- Denatures casein micelles
- Re-form as protein networks
- Acidifies
- Preservative
- Sour flavor



{figure on p45 of McGee}

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Yogurt or Sour Cream?



- Mesophilic**
lactococci, leuconostoc
 "particles of pasturage"
 ~85°F/30°C
- Thermophilic**
lactobacilli, streptococci
 More lactic acid
 ~113°F/45°C

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Exam 1

- "Good" science
- Many fields involved in cooking
- Food molecules
 - Water
 - Inorganics
 - Small organics
 - Macromolecules

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Exam 1

Small Organics

Vitamins, sugars, metabolites

Macromolecules - Fats/Lipids

Long carbon/hydrogen chains

Hydrophobic

Fatty acids, triglycerides, phospholipids

Saturated vs. Unsaturated



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Exam 1

Proteins – polymers of amino acids

Side chain/Side group tunes properties

Structure determines function

Formed by dehydration/condensation

Carbohydrates – C/H/O molecules

“Simple” sugars – monosaccharides

“Simple” sugars – disaccharides

Polysaccharides – sugar polymers



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Exam 1

Polysaccharides

Starch – glucose polymer, plants

Amylose – unbranched

Amylopectin - branched

Binds water, thickening agent

Formed by dehydration/condensation

Broken down by amylase (hydrolysis)



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Exam 1

Polysaccharides

Glycogen – glucose polymer, animal

Highly branched, compact

Binds water, thickening agent

Formed by dehydration/condensation

Broken down by hydrolysis



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Exam 1

Polysaccharides

Cellulose – β -glucose polymer, plants

Rigid, tough, cross-linked fibers

Insoluble vs. soluble fiber

Binds water

Ruminant animals break down with
bacteria in their rumen



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Exam 1

Milk and Dairy

Milk – aqueous phase

Milk – fat phase

Lactase & lactose intolerance

Milk proteins – whey & casein

Curdling

Acids and Bases



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Exam 1

Homogenization

Pasteurization

Milk foams – protein or fat

Butter – whip it good...

Fermentation – yogurt and others

Good luck!



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