

From Last Time:

0-20 %
20-40 %
40-60 %
60-80 %
80-100 %

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Fall 2016 – Bodwin/Tigges

Pasteurization

Hot enough to sterilize, not cook
Batch = 145°F, 30 minutes
HTST = 162°F, 15 seconds
UHT = 265°F, 1-3 seconds

Cooked flavor due to sulfur cmpds

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Foams

Heterogeneous Mixtures
Air in solid or liquid

Milk foams
Protein and/or fat and/or sugar

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Milk Foams

Frothed Milk or “Espresso Foam”

Protein-based foam
Heat from steam denatures milk protein (whey)
Denatured proteins tangle, form net around air
Not stable – as water drains, bubbles collapse

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Milk Foams

Whipped Cream

Fat-based foam
Mechanically shearing fat globules
Homogenization without the extra casein

WHEY PROTEIN MEMBRANE
CASEIN MICELLES
AIR BUBBLE
PARTIALLY CRYSTALLINE FAT GLOBULES, PARTIALLY COALESCED

(Not to scale)
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Whipped Cream

The structure of whipped cream as determined by scanning electron microscopy. A. Overview showing the relative size and prevalence of air bubbles (a) and fat globules (f); bar = 30 um. B. Internal structure of the air bubble, showing the layer of partially coalesced fat which has stabilized the bubble; bar = 5 um. C. Details of the partially coalesced fat layer, showing the interaction of the individual fat globules. Bar = 3 um.

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Whipped Cream

Cold, cold, cold – Keep fat solid
Don't over-whip

Let's whip!



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Over-whipped!

Fat globules combine = butter

Water and whey = buttermilk
“modern” buttermilk
Add protein and acid



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Butter

80% milkfat
21 pounds milk = 1 pound butter

“Churning” = mechanical shearing
of fat globules

Finishing



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Butter

Salted Butter

Reduces spoilage
Add salt or soak in brine

Sweet Cream Butter

No salt

Color?



Image: <http://funandmagnificreatives.blogspot.com/2010/02/butter-sculpture.html>
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Butter

Cultured Butter

Bacteria added
Acidified

Diacetyl – “butter flavor”

Used in butter substitutes
Inhibits enzymes that protect against
oxidative damage
Exposure risk for workers and heavy
“fake butter” eaters (popcorn)

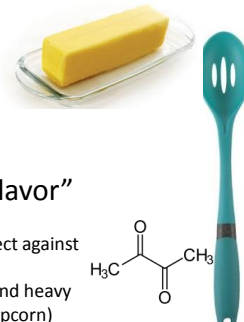
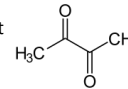


Image: <http://en.wikipedia.org/wiki/Diacetyl>
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Cooking with Butter

Lemon Butter

Add lemon and sugar

Restaurant trick

On steaks, and just about anything else

Clarified Butter

Heat to evaporate water (gently!)
Milk solids (proteins) separate
Used to flavor, fry or garnish – almost pure fat
Popcorn!
Ghee – south Asia



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Imitating Butter

Fake Butter

- Emulsified vegetable oils
- Added sugars and proteins – scorch easily
- Not good for cooking

Margarines

- “Partially hydrogenated” vegetable fat
- Tallow from beef fat mixed with milk {traditional “oleo margarine”}
- Saturated fats



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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 CORN NONFAT MILK, PEACHES, MODIFIED WHEY 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

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Image: <http://chessforum.org/forum/index.php?20030000>
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