

Cheese

Curdled milk with most of the water removed

Add acid and salt

Discourages "spoilage microbes"

Enzymes hydrolyse fats and proteins

Smaller molecules = flavor, aroma



Image: <http://blog.fooducate.com/2011/06/26/01-milk-is-white-why-is-cheese-yellow/>



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Storage & transport

Waterproof "bags"

Animal parts...

Stomach → Rennet (enzymes)

Makes cheese more cohesive, pliable

This is (was) SCIENCE!



Image: <http://blog.fooducate.com/2011/04/05/10-things-to-know-about-rennet-its-in-your-cheese/>



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Rennet

The original Biotechnology!

Chymosin enzyme (digests milk) from the
4th stomach of a milk-fed calf

Calf <30 days old

Once off milk, chymosin stops



Image: <http://www.petit2.com/blog/warning-babies-die-for-cheese/>



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Rennet

Modern rennets – “vegetable rennet”

Chymosin from yeast, mold, bacteria

From “genetic engineering”

Is that good or bad?



Image: <http://www.cheese-supply.com/>
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Rennet

What does it do?

Very specific activity

Attacks kappa-casein

Casein micelles merge/string together

Analogous to fat globules in whipping cream

Why not just use acid?

Destroys casein micelles too much

Lose some protein & calcium - nutrition

Tangy cheese?

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Cheese Ingredients

Milk

Milk bacteria

Rennet

Salt

Time

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Cheese Microbes

Bacteria are what make cheese

Lactococci (mesophilic, sour cream)

Lactobacilli & streptococci (thermophilic, yogurt)

Propionibacteria (holes, variant causes acne)

Brevibacterium linens (stronger flavors, salty environment, seashore & skin, "smear bacteria")



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Cheese Microbes

Molds

Penicillium – large family

Blue molds – *roqueforti*

Survive lower oxygen (inside cheese)

Breaks down fats – "peppery", aroma

White molds – *camemberti*

Surface ripening

Break down protein – creamy, flavor



Image: <http://www.gourmetsouth.com/Dictionary/M/Maytag-blue-cheese-6166.aspx>

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Making Cheese

Acidify (bacterial)

Milk sugar to lactic acid

Curdle casein (rennet) and drain whey

Stabilizes curd

Ripening

bacteria + time = good



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Curdling

Acid

Fine, fragile gel
Formed over hours
Retains moisture



Rennet

Firm, rubbery curds
Formed under an hour
Cut to small grains,
loses more water



<http://www.vinevil.com/cheese-making/cheese-at-home-16743/>
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<http://www.thecheeseprocessing.com/tag/cheese-curd/>
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After the curd...

Draining – gravity, press, heat

Salting – mix or smear, inhibit
spoilage

Shaping – Why wheels?

Ripening – Let the bacteria work!



<http://www.theardentepicure.com/2010/04/food-of-day-parm-reggiano.html>
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Enjoying cheese...

Don't cut too soon

Aromatics lost
Oxygen attacks!

Let it warm a bit

Humid & 55-60°F ideal
Softens fats – Don't go too far!

Store loosely wrapped

Puddles of moisture are bad



Image: <http://www.khiewcharita.com/archives/snacks/chilli-cheese-experiment-1.html>

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Cooking with cheese

Melting

~90°F – milk fats melt
~130-180°F – protein matrix breaks

Non-melting cheeses

Acid curdled – Why?

Stringiness

Casein strings stick together - crosslinking
Aging, acid, moisture, salt



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Cooking with cheese

Avoiding “stringiness”

Grate finely
Heat carefully
Minimize stirring
Add starch – coats protein and fat



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Tasting

Use all your senses!

Sight – What does it look like?

Touch – Is it smooth? Crumbly? Sticky?

Smell – Surface and inside

Taste – Salty? Sweet? Like it smells?

Touch – How does it feel on your tongue?

Hearing – OK, maybe not *all* your senses...



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