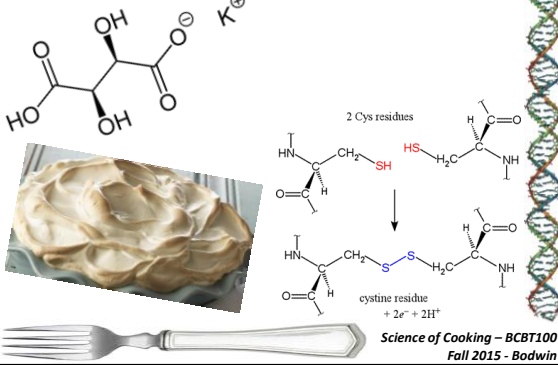


From Last Time:



Advising

Make an appointment early
 Show that you've planned
 Look at DAR and degree requirements
 Have alternatives
 Look at the long term

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Fruits & Vegetables

Fruit

Examples:

Vegetable

Examples:

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Fruit

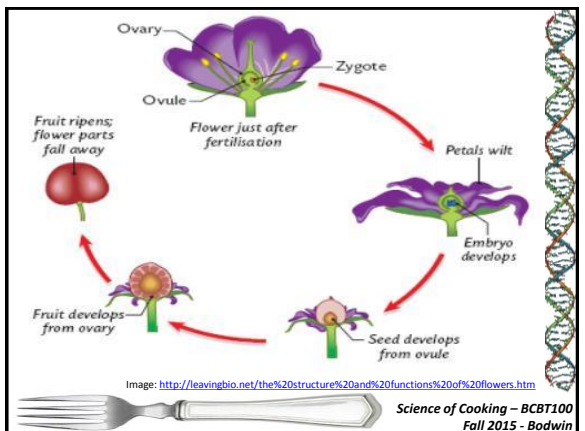
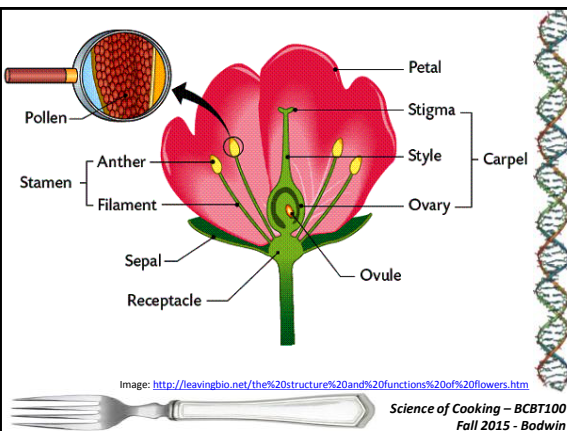
From <http://www.biology-online.org/dictionary/Fruit>

- (botany) Seed-bearing structure in angiosperms formed from the ovary after flowering.
- The edible, usually fleshy and sweet smelling part of a plant that may or may not contain seed(s).

Fruit = Reproduction

Evolved to spread seeds

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Apple Flower to Fruit

Image: <http://www.teechembio.com/biology/organisms/apple/>

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Fruits

Image: <http://www.classroomscience.org/check-an-apple-for-pollination>

Image: http://en.wikipedia.org/wiki/File:Cucumber_and_cross_section.jpg

Image: <http://www.citrech.it/english/informations.htm>

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Main Fruit Molecules

Reproductive bodies = energy

- Sugars
- Starch
- Carbohydrates
- Low protein
- Low fat*

Image: <http://www.shannondelvesfitness.com/2011/04/10-day-raw-fruit-and-vegetable-cleanse/>

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Fat in Fruits

Watermelon = 0.15% fat

Olives, pickled, canned or bottled, green - Fat
In 100g, Fat content = 15.32 g
Typical Fruits serving, 1 olive (or 2.7g), Fat content = 0.41 g

Avocados, raw, all commercial varieties - Fat
In 100g, Fat content = 14.66 g
Typical Fruits serving, 1 cup, cubes (or 150g), Fat content = 21.99 g

Roast beef = ~4-7% fat

from: <http://www.dietandfitnesstoday.com/fruits-high-in-fat.php>

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Other Fruit Molecules

Nutrients

- Vitamins – What type?
- Minerals

Phytochemicals – often colored

- Anti-oxidants
- Hormone-like activity

Image: <http://www.phytochemicals.info/>

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Carotenoids

Alternating bonds = color

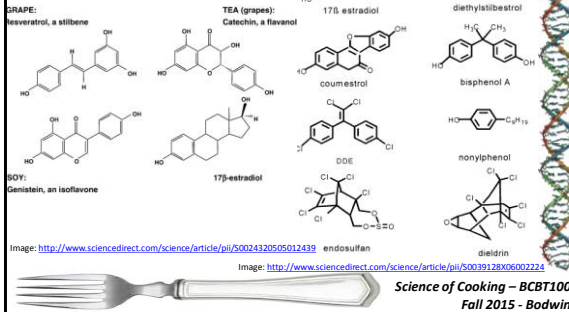
More = more color

Image: <http://www.bjcc.org/content/274/42/29613.full>

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Hormone Mimics

Shape and polarity



Properties of Fruits

Usually sweet
Often brightly colored
High water content

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Vegetables

Edible parts of plants that are **not**:

Fruit
Seed

Vegetables are:

Leaves, stems, roots

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Plant Toxins

Why do they exist?

Alkaloids – bitter, poisonous

Potato sprouts

Protease inhibitors – block digestion

Soy/kidney/lima beans (undercooked)

Flavors – If some is good, more kills

Oxalates – insoluble crystals, “gout”

Spinach, chard, beets, rhubarb

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Fruit & Veg Allergies

Fruit = Pollen

Allergies – reaction to “foreign” bits

Can be severe, deadly

“Oral allergy syndrome”

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OAS Triggers

Alder pollen: almonds, apples, celery, cherries, hazel nuts, peaches, pears, parsley, strawberry, raspberry

Birch pollen: almonds, apples, apricots, avocados, bananas, carrots, celery, cherries, chicory, coriander, fennel, fig, hazel nuts, kiwifruit, nectarines, parsley, parsnips, peaches, pears, peppers, plums, potatoes, prunes, soy, strawberries, wheat; Potential: walnuts

Grass pollen: fig, melons, tomatoes, oranges

Mugwort pollen: carrots, celery, coriander, fennel, parsley, peppers, sunflower

Ragweed pollen: banana, cantaloupe, cucumber, green pepper, paprika, sunflower seeds/oil, honeydew, watermelon, zucchini, echinacea, artichoke, dandelions, honey (if bees pollinate from wild flowers), hibiscus or chamomile tea

Possible cross-reactions (to any of the above): berries (strawberries, blueberries, raspberries, etc), citrus (oranges, lemons, etc), grapes, mango, figs, peanut, pineapple, pomegranates, watermelon

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List from: http://en.wikipedia.org/wiki/Oral_allergy_syndrome

Plant Structure

Cells and cell walls

Labels: cell wall, cell membrane, Golgi apparatus, chloroplast, vacuole membrane, raphide crystal, druse crystal, mitochondrion, cytoplasm, amyloplast (starch grain), large central vacuole, rough ER (endoplasmic reticulum), nucleus, nucleolus, smooth ER (no ribosomes), ribosome, Golgi vesicles.

© E.M. Armstrong 2001
 Image: http://www.wpsclipart.com/plants/diagrams/Plant_cell_wall_diagram.png.html

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Cell Wall

Structural, prevents dehydration

Labels: Middle Lamella, Pectin, Cell Wall, Plasma Membrane, Hemicellulose, Cellulose Microfibril.

Image: <http://www.sigmaldrich.com/life-science/metabolomics/enzyme-explorer/learning-center/lysing-enzymes.html>

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Cell Wall

Labels: Middle Lamella, Primary Cell Wall, Plasma Membrane, Pectin, Cellulose Microfibril, Hemicellulose, Soluble Protein.

Image: http://www.wpsclipart.com/plants/diagrams/Plant_cell_wall_diagram.png.html

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Vacuole

“Fullness” alters rigidity of plant
 Contains water & water soluble bits
 Acids, sugars, proteins, pigments, enzymes, etc

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Chloroplasts

Contain chlorophyll
 Makes green plants green (leaf)

Labels: Outer membrane, Inner membrane, Thylakoid, Stroma.

Image: <http://www.nature.com/scitable/topicpage/plant-cells-chloroplasts-and-cell-walls-14053956>

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Plant Tissues

Ground
 Most of the cell mass, thin cell walls
 Vascular
 Nutrient transport, tough & fibrous
 Dermal
 Surface (“skin”), epidermis/periderm
 Secretory
 Oozes things...

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What do we eat?

- Roots
- Stems
- Leaves
- Flowers
- Fruits
- Seeds



Image: <http://sea/harborfoodpantry.com/>
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Cooking!

Consider the molecules
 Cell walls = rigid/tough, fiber
 Cooking removes non cellulose part

Removing water?

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Tasting Fruit & Veg

- Multisensory:
- Flavor
 - Aroma
 - Touch
 - Irritation

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How Humans Experience Their Food

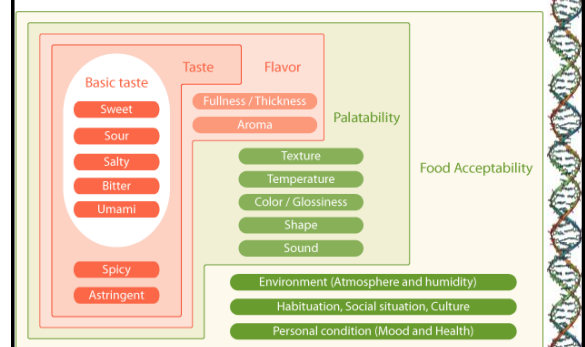


Image: <http://www.umamiinfo.com/2011/02/What-exactly-is-umami.php>
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Flavor/Taste

- Salty – salt
- Sweet – sugar & sugar-like molecules
- Sour – acids
- Savory – protein richness
- Bitter – alkaloids
- Umami – glutamate/DNA richness
- Metallic – bitter/sour

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Tastes Receptors

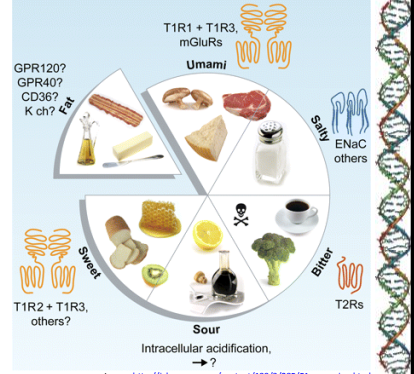


Image: http://ich.nyu.edu/content/190/3/285/E1_expansion.html
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Tongue Map...

Where do we taste?

Use *science* to *test* this!

Not completely accurate...

Image: http://www.musingsonthevine.com/tips_pai.shtml

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Image: http://www.nature.com/nature/journal/v444/n7117/fig_tab/nature05401_f1.html

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Image: <http://www.hhmi.org/uker/2pic.html>

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From Last Time:

Image: [http://www.hhmi.org/uker/2pic.html](#)

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Cooking Plants

Chlorophyll

Acid or base hydrolysis

Displace Mg^{2+}

Chlorophyll a (Natural Green 3)

Chlorophyll b

Image: http://www.bio.miami.edu/dana/236/226f08_10orint.html

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Keeping them green

Neutralize acid with baking soda

Baking soda = Sodium bicarbonate

Image: [http://www.hhmi.org/uker/2pic.html](#)

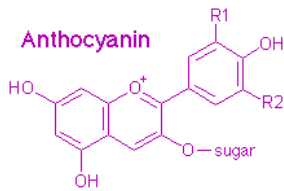
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Cooking Plants

Anthocyanins and Anthoxanthins

pH sensitive

Keep acidic?



R1, R2 = H, OH, OCH₃
sugar = glucose, arabinose,
galactose

Image: <http://www.succulent-plant.com/glossary/images/anthocyanin.png>

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Cooking plants

Texture = firmness of cell walls

Acid + “hard” water = firm

“hard” = metals with +2 charge = bridge

Base + salt = soft

Sodium = Na⁺¹ = cap



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Starchy plants

Starch grains are hard, BUT absorb water and swell when heated

Heat breaks down cell walls, starch absorbs water that's released

figure on p. 282 in McGee book...



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Starch

Starch is hydrophilic, but hard

Gel loses water, crystallizes

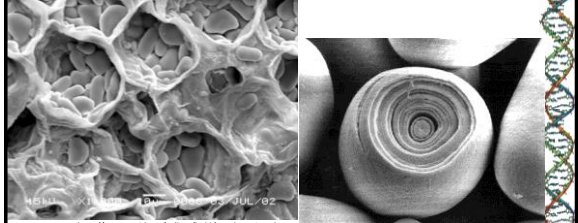


Image: http://www.arold.org/gallery/field/starch_grains.php

Image: <http://sciencegirlsrock.wordpress.com/2011/05/30/women-of-outstanding-achievement/>



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